

**ASSESSMENT OF OPTIONS
FOR COLLECTING STATISTICAL DATA ON
WILDLIFE HARVESTING IN NUNAVUT**

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Chapter 1. Introduction

1.1 Background

The Nunavut Land Claims Agreement (NLCA), signed in 1993 between the Inuit of the Nunavut Settlement Area and Canada, included a requirement to conduct a study to collect harvest data from Nunavut Inuit. Begun in 1996, the Nunavut Wildlife Harvest Study (NWHS) is the largest and most complex data collection program of its type to be carried out in Canada. The Study's objectives called for establishing a five-year record of Inuit harvesting in 27 communities within the three regions of Nunavut

The purpose of the NWHS, as stated in the NLCA (5.4), is to furnish data to assist the Nunavut Wildlife Management Board (NWMB) in establishing Basic Needs Levels for Inuit, and in general, to contribute to the sound management and rational utilization of wildlife resources in the Nunavut Settlement Area. Data collection for the NWHS, which we also refer to as “the current Study”, was completed in 2001 with a final report expected in 2003.

In late 1999, in conjunction with a Technical Review of the current Study, the Study Coordinator organized a meeting where representatives of the NWMB, agencies and departments of government began a discussion of their needs in relation to the data. This precipitated the development of a Request for Proposal issued by the Government of Nunavut in early 2001 to contract for an assessment of options for collecting statistical data on wildlife harvesting in Nunavut.

1.2 Purpose of review

During the course of the current Study it became clear that the data were expected to be extremely valuable for purposes other than establishing the BNLs. Agencies and departments of the federal and territorial governments expressed interest in using these data for wildlife management, implementation of other provisions of the NLCA, and policy and program development purposes.

Given the high level of interest in continuing some form of harvest data collection after completion of the current Study, these agencies and departments of government collaborated to develop a terms of reference for building on the experience of the current Study, to assess the scope and nature of future needs for harvest and other related data, and to advise on appropriate and cost-effective methods for collecting them.

P.J. Usher Consulting Services was awarded the contract. Dr. Peter Usher and Lorraine Brooke conducted the work.

1.3 Scope of work

The contract required that the relevant Inuit organizations, wildlife management organizations, institutions of public government and other government agencies (referred to hereafter as “the parties”) be contacted, and representatives interviewed to establish the following:

- The uses which they expect to have for statistical data on wildlife harvesting in Nunavut on an ongoing basis (e.g.. managing specific stocks, measuring the economic value of country food, using harvest effort as a measure of cultural integrity, etc.);
- The specific types(s) of harvest data which the specified organizations require on an ongoing basis to meet their needs;
- What commitment, both financial and administrative, they are willing to commit to a process to obtain the harvest data they require; and,
- What role they feel they should play in managing a harvest data collection process.

The information gathered through the interviews was to be analyzed to provide advice on a series of elements considered crucial for taking informed decisions when designing future programs for collecting statistical data on harvesting in Nunavut.

1.4 Methods and approach

The interview guide

A detailed interview guide (Appendix 1) was prepared in consultation with the client. The questions were developed to permit a broad range of responses and stimulate discussion, understanding that most respondents were not fully familiar with the range of issues being reviewed. Many of the individuals had previous experience outside of their present roles with harvest studies and consequently their broader, professional opinion was encouraged.

All relevant organizations were contacted and an interviewing schedule was established for the week of June 18-23, in Iqaluit. All individuals scheduled to be interviewed received a copy of the guide permitting time to prepare and consult with their colleagues, if necessary.

The interview process

A total of 11 interviews were conducted, involving 14 persons. The interviews averaged three hours in length. Some were held as group sessions. In addition to the interviews in Iqaluit, two telephone interviews were conducted with the Regional Liaison Officers in Kitikmeot and Kivalliq regions. Verbal responses to the open-ended questions were summarized or paraphrased by direct computer entry during the interview, then shortly after cleaned and edited as the interview record. The interview record then sent to each participant for his or her review and approval. A list of the persons interviewed is provided in Appendix 2.

Each interview was preceded by a careful explanation of the purposes of the work, stressing that the intent was not to evaluate the current Study, but to draw from this experience to inform views on the interests in, objectives of, and methods for the conduct of future surveys.

At the end of the week, a workshop was organized with all the participants where key issues emerging from the week's interviews were summarized and further discussed in a group setting. A written record of this session was also maintained.

Analysis

The principal investigators met to review the contents of the interviews and developed a set of conclusions and options that are presented in this report. While based primarily on the results of the interviews, the professional knowledge of Usher and Brooke, both of whom have extensive experience in the design, conduct, use, and evaluation of aboriginal harvest studies throughout northern Canada, contributed in refining and crafting advice to assist the client in determining if there should be a new survey, and if so, how should it be designed.

A draft report was prepared and distributed to those individuals and organizations who participated in the interviews for their review. Usher and Brooke returned to Iqaluit in September to facilitate a round table discussion, in which the draft report and its preliminary recommendations were considered. The report was then revised and submitted as the present document.

1.5 Organization of the report

Chapter 2 outlines the objectives, users, and uses of a future study as identified by the parties, and identifies some key issues that need to be considered before deciding whether to proceed with a new harvest survey. Chapter 3 considers the technical issues that would have to be addressed in any new study resembling the current model. Chapter 4 identifies the main outputs or deliverables that should be expected of a new study, and considers some key issues relating to data access, control, privacy, and informed consent. In chapter 5 we discuss management and funding issues, and chapter 6 provides overall conclusions and recommendations.

Chapter 2: Objectives of a New Harvest Survey

The interviews revealed an array of needs for harvest data and related information. The workshop also provided information and insights on the expectations, priorities, obligations and some misconceptions about the current Study and the objectives and value of any future study.

An important first step in the analysis of the interviews and workshop was to determine “who needs to know and why?” (mandate) and, once established, to ask the next question, “what does each organization need to know?” (content).

In fairness to the participants in this review, it is important to note that their ability to comment on the utility of harvest data for their particular purposes was limited by the fact that the full results of the current Study, along with descriptions of methodology (field and statistical), are not yet available. Despite this limitation, there was enthusiasm and general support for continuing surveys or studies. At the same time, caution was expressed that it may not be possible, or at least very difficult, to harmonize the varying needs of users under one study.

The objectives of a future study, therefore, will be strongly influenced by:

- the mandate of the institution or agency,
- the type of data required (kill records and/or other), and
- the level of precision required (content and coverage) to assist in fulfilling the mandate.

2.1 What is a harvest survey?

It will be helpful in the context of discussing objectives of a future study to consider briefly the nature of harvest surveys as they are conducted in the North. Harvest surveys (often referred to as “Native harvest surveys”) are a means of estimating the harvest of fish and wildlife by aboriginal harvesters, based on self-reporting of harvest where independent observation is impossible. Although they have been used primarily for wildlife allocation and management, they are human surveys, not biological surveys. Ensuring that survey design, measurement, and conduct will meet acceptable standards therefore requires primarily the expertise of social and behavioural scientists familiar with survey research methods, not biologists, although certain aspects of sampling design are common to all of those disciplines.

Native harvest surveys came into common use in northern Canada in the 1970s, as a result of the James Bay and Northern Quebec land claims settlement, where they provided the basis for establishing “guaranteed levels of harvesting” for Inuit and Crees (JBNQ 1982a,b). Several harvest surveys were undertaken in Nunavut in the 1980s prior to the NLCA (Donaldson 1983, Gamble 1986, Jingfors 1986). A harvest survey begun in the ISR in 1987 has been conducted almost continuously since then (Fabijan 1991, Usher and Fabian 2001). Harvest surveys similar to the NWHS are underway in the Gwich’in and Sahtu areas of the NWT, also mandated by their respective land claims agreements.

All of these surveys are designed as multi-year, repetitive surveys conducted at monthly intervals, for all species, with a goal of census coverage (100% sample). The result is an annual estimate of the harvest of each species for each community, based on twelve monthly estimates. These “kill surveys” typically provide standardized estimates of the harvest of all species by community by year, and especially since the early 1990s, also provide the location of kills. For a number of reasons, this has become the standard model for harvest surveys in Canada (Usher et al. 1985, Usher and Wenzel 1987), and we will refer to it as the “Canada model”.

In Alaska, a different survey model is commonly used, which we will refer to here as the “Alaska model”. The Subsistence Division of the ADFG has conducted hundreds of subsistence surveys in implementing the state’s subsistence statute (Fall 1990). The chief differences as compared with the Canada model are:

- the surveys are commonly stand-alone and non-repetitive (many years may pass between surveys in any particular village), and are intended to establish baseline conditions;
- the reference period is normally a year, not a month (thus the recall period is at least a season and as long as a year);
- the survey coverage objective is seldom 100%; a random sample is normally used, and in larger communities, a stratified sampling approach is used to minimize survey costs; and
- the survey instrument includes a broader range of questions including household demography, employment, income, harvesting gear, and country food sharing.

The reports of the Subsistence Division are narrative as well as data reports, and provide substantial context and analysis of subsistence harvesting activities.

Hunter surveys are also regularly conducted among recreational hunters in most North American jurisdictions, but these typically rely on only a small sample of hunter reports (Filion 1980). Low sampling rates are generally adequate for these surveys because they focus on one or a few species (e.g. deer, fish, waterfowl), and because there is usually a legal harvest limit per hunter, variance is low. As well, because the legal hunting season is generally short, a single, post-season survey can be undertaken without risk of recall failure. The circumstances of recreational hunting are sufficiently different from those of aboriginal harvesting that the survey methods used by and large do not provide much guidance for estimating Inuit harvests.

2.2 Who are the potential users?

There are a variety of potential users of harvest and related data in Nunavut. The primary ones are:

Inuit organizations

Nunavut Tunngavik Incorporated (NTI)

Nunavut Tunngavik Incorporated implements the Inuit obligations of the Nunavut Land Claims Agreement. The organization promotes the development of Inuit self-sufficiency and provides support to Inuit businesses in Nunavut. The Land and Resources Department administers Inuit-owned lands providing support to local authorities on land use planning and land management, environmental protection and resource development. Its Wildlife Department carries out NTI's implementation responsibilities for wildlife and Inuit harvesting and assists the Regional Wildlife Organizations and community Hunters and Trappers Associations. It also works closely with the Nunavut Wildlife Management Board. NTI established and delivers the Nunavut Harvester Support Program.

Hunters and Trappers Organizations (HTOs)

Each community has a hunters and trappers organization that regulates harvesting practices, allocates and enforces community basic and adjusted basic needs levels, is responsible for assignment of harvesting to non-members, and is generally responsible for the management of harvesting among the Inuit members.

Regional Wildlife Organizations (RWOs)

Nunavut is subdivided into three regions - Qikiqtaaluk, Kivalliq, and Kitikmeot. Each has regional wildlife organizations that represent the HTOs. These RWOs meet annually to discuss wildlife concerns. They have the same responsibilities as the HTOs, but on a regional basis. Therefore, the RWOs have an important coordination and communication function regarding Inuit harvesting.

Government of Nunavut

Department of Sustainable Development (DSD)

The Department of Sustainable Development is responsible for promoting sustainable economic development in Nunavut and is responsible for the management of all terrestrial wildlife, including polar bears. Its Wildlife Division was founded on the principle of co-management requiring a cooperative and coordinated effort on the part of government and resource users. In implementing its mandate it seeks to balance Inuit Qaujimaqatunqangit and western science. The Community Economic Development Division works to support the traditional mixed economy of Nunavut.

Executive and Intergovernmental Affairs, Evaluation and Statistics Division

This division develops accurate and independent data and information to support government decision-making, evaluate government performance and contribute to policy and program development.

Government of Canada

Department of Fisheries and Oceans (DFO)

The Department of Fisheries and Oceans is responsible for the management of fish and marine mammals. It also manages commercial fisheries and participates in the development and implementation of community-based co-management plans.

Canadian Wildlife Service (CWS)

The Canadian Wildlife Service of Environment Canada is responsible for the management of migratory birds throughout Canada. It represents Canada for implementing the Migratory Birds Convention Act and its Regulations. Its international obligations require that it have available harvest data, by population or flyway, in order to participate in the effective management of these transboundary resources.

Institutions of Public Government created by the NLCA

Nunavut Wildlife Management Board (NWMB)

The Nunavut Wildlife Management Board is the main instrument of wildlife management in Nunavut, and conducts its work consistent with the principles of conservation, sustainability, and ecosystem integrity. It is responsible for establishing levels of total allowable harvest, determining and adjusting basic needs levels for Inuit, allocating wildlife resources among users and a variety of other wildlife and habitat management functions. It coordinates its activities with the RWOs and HTOs.

Nunavut Planning Commission (NPC)

The Nunavut Planning Commission establishes broad land use planning policies, objectives and goals for the Nunavut Settlement Area, and develops land use plans that serve as a guide for evaluating resource use and development projects.

Nunavut Impact Review Board (NIRB)

The Nunavut Impact Review board is responsible for screening proposals for development projects and upon request reviews and evaluates the ecosystemic and socio-economic impacts.

2.3 Range of needs and data requirements

Based on an analysis of the interviews and workshop discussion, it was possible to organize stated or implied needs for a new study (why do we need to know?) into the following categories along with the type of data required to fulfill the need (what do we need to know). The reader will note that the entire matter of BNLs is not included, because the data required to establish the BNLs will be provided entirely through the current Study.

Wildlife management (NLCA related, domestic and international) obligations

Harvest levels, by species - Inuit and all licensed harvesting

Wildlife managers need to know how many animals are being removed by all harvesters/hunters. The need for data by species depends on intensity of use and susceptibility to overharvest. The degree of precision depends on the species being managed. Kill data for quota-regulated species, commercially harvested species, species at risk, and large mammals, are considered particularly desirable for proper management. There are other species harvested by Inuit for food or fur which are not “managed” or “manageable” under the current regimes and harvest data on these species may be less useful.

Location of harvest

The location of harvest is considered important for certain species. For others is it not particularly useful data. Locating fish harvests and attaching them to water bodies or systems is extremely useful. Location of caribou kills (especially when attached to season) can help distinguish the herd it is being taken from.

Sex and age-class

Again, this information is more useful for some species than others. Knowing the sex and relative age of large marine and terrestrial mammals being harvested is considered important. For small game, fish and birds, this information is less important for management purposes.

Season of harvest

Season for most species is considered useful information.

Inuit Qaujimagatuqangit (Inuit knowledge)

Inuit knowledge of animal ecology and environment is valued for providing important contextual information and detailed observations. Drawing conclusions on trends, patterns or explanations for changes in harvesting patterns or success from kill data alone is tenuous at best. Recording discussions with Inuit on the conditions affecting their harvest (environmental and social) is

considered extremely important.

Developing and implementing co-management agreements

Co-management agreements for specific species or groups of species require that harvests be monitored. Along with kill data, other information such as season, location, Inuit Qaujimajatuqangit are necessary. For example, as partners in the current community-based management systems for beluga, Inuit are contributing their harvest data.

Socio-economic and land use planning and impact assessment

Socio-economic and land use planning, along with impact assessment in Nunavut must find a way of accounting for the importance of Inuit harvesting. This requires moving far beyond a kill survey with basic tombstone data attached. It requires the collection of detailed information on levels and sources of income, levels of food production, investment in harvesting (financial and time), equipment and skills inventories. Inuit Qaujimajatuqangit particularly regarding important habitat and species behaviour will also be required. The further development of commercial fish and wildlife harvesting may also require subsistence harvest data.

Implementing the wildlife compensation provisions of the NLCA

The NLCA created a wildlife compensation regime designed to compensate Inuit for loss or damage suffered as a result of development activity, including loss of income from harvesting. A claimant will have to provide proof of this loss. Although to our knowledge, no claim has yet been made, harvest data over time to demonstrate trends would likely be a required element of any claim. It is also likely that information on effort would be required for proof of loss and to determine the level of compensation.

Policy and program development

Much of the policy and program development of the participating organizations will focus on supporting and promoting Inuit harvesting. A range of socio-economic data, along with a perspective drawn from Inuit Qaujimajatuqangit will be required. Harvest data alone will be a key element in determining the contribution of harvesting to the Nunavut economy. More specific information on costs of production, including effort for at least the major food species will also be required. Although not mentioned by respondents, harvest data can also be used to assess potential exposure to contaminants through the consumption of country food, at a community level.

General education

Promoting the importance and continuing viability of the traditional mixed economy and its role in Nunavut is a concern for all organizations and agencies. While kill data can make a

significant contribution to this area of work, other data would certainly help in developing programs for general education. This would include income generated by harvesting and food production.

2.4 Key questions and issues

A number of key questions and issues arise from this overview of needs and data requirements. Each will require careful discussion before a decision can be taken on the objectives of a new study and a methodological approach and study design developed. For any on-going survey to be useful and as cost-effective as possible, clear objectives need first to be agreed upon by the participating organizations. To do this, it will be important for the participants to step back and consider these broader issues. Decisions taken at this stage of the process can then be reflected in the design, content and costs development stage. Chapter 3 provides more detail on the variety of opinion surrounding those questions and issues.

1. Can each of these needs and associated data requirements be accommodated within a single survey? Would participants be overburdened? Would non-participation increase? Would reliability of the results be effected?

The data required by the potential users varies considerably. For resource managers, for example, surveys would need to produce detailed information beyond simply kill data. Depending on the species, kill location, season, sex, age are important data. Events related to harvesting, including Inuit Qaujimaqatugangit, effort, and other observations related to the resource can be very useful. Designing a study to collect these more subjective data would have to carefully consider response burden. The likelihood for self-reporting of all these data is limited, requiring more extensive interviewing time and interviewer training.

2. What level of precision is required? Is an order of magnitude sufficient? How does this affect study design? Is a full-blown study necessary to achieve precision for those species where it is required?

Several participants indicated that for management purposes, order of magnitude data are sufficient, depending on the species. It was offered, for example, that in the case of migratory birds, gross numbers were entirely sufficient for meeting Canada's international obligations for providing harvest statistics. For other species such as polar bear and whales, however, much more precision is sought. It was brought to our attention, however, that under the community based co-management agreements being developed with the responsible government agencies, reporting of harvests is a requirement. This is also true for species harvested under quota.

3. For which species are harvest data really needed and useful?

Harvest data is one part of the management equation. Regular reporting of kills, along with information on other environmental and related events can possibly provide an indication of trends in a wildlife population. Ideally, however, managers would also have at their disposal basic population data. For most species, this is not available. Those species for which there are management concerns at the present and into the foreseeable future are species harvested in relatively limited numbers (e.g. polar bear, beluga, narwhal). It was suggested that a full harvest survey might not be required to obtain these data.

4. Frequency of surveys

An important consideration is a careful evaluation of the need for regular, yearly data. Is this continuity of coverage actually required for management, allocation or planning? If the user organizations are satisfied with gross data and general trends, can this be accommodated by less frequent reporting? What is the risk of excessive response burden?

5. Should a future study be Inuit specific or Nunavut-wide?

The purpose of the current Study was specifically to provide data for establishing basic needs levels for Inuit, to assure Inuit harvesting priority over other uses of wildlife as specified in the NLCA. If the objective is expanded to support many of the needs of the user organizations, it will be necessary for all harvests to be recorded. The impact of this would differ from smaller to larger communities.

6. Can the collection of socio-economic data be accommodated in a harvest survey?

Most participants agreed that access to socio-economic data was desirable for many reasons. The issue is whether this type of data can reasonably be collected in a harvest survey. Inuit organizations expressed reservations about how Inuit would react to such questions and the compatibility of asking such questions in the context of their harvesting activities. The collection and existence of these data immediately raise the profile of issues related to confidentiality and data sharing.

7. Assuming research dollars are limited, and the costs of harvest surveys high, how are costs justified - or can they be? Would funds be better spent on other work?

The projected cost for repeating a harvest survey similar to the current Study is approximately \$10M over seven years (one year start up, five years of collection and one year to finalize). Adding on additional data requirements or expanding the survey to capture all harvests in Nunavut and collecting other socio-economic information would likely increase the costs.

Table 1. Data requirements as expressed by potential users

	NTI RWOs HTOs	DSD Wildlife	DSD CED	GN Stats	DFO	CWS	NWMB	NIRB	NPC
Kill Data									
All Species	x		x						
Some Species		x		x	x	x	x	x	x
Location									
All Species	x								
Some Species		x			x	x	x	x	x
Season									
All Species									
Some Species	x	x			x	x	x	x	x
Sex/Age/Stock									
All Species									
Some Species	x	x			x	x	x	x	x
Effort									
All Species	x								
Some Species		x			x				
Tombstone	x		x	x			x		
IQ	x	x			x	x	x	x	x
Other Socio Economic	x		x	x	x		x	x	

Chapter 3. Designing a New Survey: Technical Issues

In this chapter we consider the major issues of survey design, sampling, and measurement. The main basis for the parties' opinions on these matters is necessarily the current NWHS. Our questionnaire was designed to capture respondents' experience with or views on the current survey, or the "Canada model". However, although the designated survey period has just concluded, final results and methods statement have not yet been released (some raw data have been released to federal and territorial wildlife agencies on an ongoing basis under "database agreements" (see ch. 4)). Many respondents' impressions of the methodology and likely reliability of the study are therefore based not on having seen the data or analyzed the results, but on anecdotal and piecemeal information gradually accumulated since the study began in 1996.

All respondents recognized that in the absence of a final report and actual data there is little basis for evaluating the current study or for saying much about the design of a new one. While there have been several harvest surveys in Nunavut since the mid-1980s, not all were accompanied by final results and formal methods statements, and at least partly for this reason, there is unfortunately little current memory or awareness of them, or what might be learned from them. At the same time, there is a prevailing view that the current Study has more or less achieved its basic objectives to an acceptable standard, and that a new study ought to look more or less like the old one, with a few modifications. The parties are predisposed to one degree or another to a continuation of the "Canada model".

Those respondents with prior experience of conducting or participating in harvest studies (and using them) had more opinions on the technical aspects of design and conduct. This tended to include the wildlife agencies and the Inuit harvester organizations. Those with the greatest interest in expanding the role and topic coverage of the surveys (other government agencies) tend to be the least familiar with the actual design and content of the existing NWHS, and to some extent, with the technical aspects of harvest surveys generally.

The purpose of this section is not to evaluate the design of the current Study, which has already been done by others (e.g. Strata 360). It is instead to consider the design implications of what the different parties would want from a future study, and to assess the feasibility, compatibility, effectiveness, and cost implications of different study options based on experience with previous harvest studies.

We begin by discussing survey reliability and acceptable error. We then consider issues of sampling and coverage, content and measurement, survey mode, and finally organization and communication.

3.1 Overall reliability and acceptable error

None of the parties identified specific criteria for acceptable reliability of harvest data, for example in terms of confidence levels, margins of error, or reporting rates. The general view is

that harvest estimates based on survey data are the best if not indeed the only source of information available for most species, and there is in some cases little expectation that they provide much more than an order of magnitude estimate. Results are considered sufficient to identify relative differences over space and time, but not necessarily to establish clear year over year trends (especially for management purposes) as it is assumed that confidence intervals will not be sufficiently tight for this purpose. Most suggested the data will certainly be good enough for their primary intended purpose which is to establish BNLs.

Are these relatively low expectations appropriate? The main sources of error in human surveys arise from either sampling or measurement. Other harvest surveys (JBNQ 1982, Jingsfors 1986, Fabian and Usher 2001) have shown that where census coverage is intended and high reporting rates are achieved, the resulting estimates for most key species are at least as reliable as animal population and similar survey information routinely used by wildlife managers, at least with respect to sampling error. Measurement error arises from those aspects of survey design or limitation – questionnaire design, interview format, recall error, and response bias – that cause the respondent’s answer to vary from the “true” answer. Unlike sampling errors, these types of error may be difficult or impossible to quantify. But even allowing for these additional sources of error, a properly designed and executed harvest survey should provide much better than “order of magnitude” results.

While most potential users in Nunavut may have unnecessarily low expectations of the reliability of harvest survey information, it begs the question of whether “order of magnitude” data are truly sufficient to meet their needs. For example, order of magnitude information should be unacceptable for establishing BNLs. But if only that level of precision is truly required, then perhaps the level of expenditure for a future study need not be as great as for the current one.

Most parties indicated that the acceptability of harvest data (particularly with respect to the current NWHS) for both wildlife management and economic policy purposes depends on a clear statement of survey methods that assesses both the qualitative and statistical integrity of the data, and on the consistent application of methods and procedures. These are sound general principles and they should apply to any new study undertaken. We suggest nonetheless that the parties consider the reliability criteria for any future study more carefully, before committing themselves to any particular design and, hence, level of expenditure.

3.2 Sampling and coverage

Objectives

The basic objective of a sampling strategy is to ensure that, based on the harvests reported to the survey by those interviewed, one can estimate the total harvest with reasonable accuracy. The common method for estimating total harvest is to multiply the reported harvest by the inverse of the response rate:

$$H_e = H_r (1/R)$$

where H_e = estimated harvest
 H_r = reported harvest
 R = response rate

The response rate is calculated as the proportion of the sample frame that responded to the survey, or

$$R = n/N$$

where N = the population or sample frame (in this case, the hunter list)
 n = number of hunters responding

Alternatively,

$$H_e = H_r (N/n)$$

(This is effectively the same formula used by the NWHS in its interim community reports).

This procedure assumes that:

1. N fully and accurately represents the hunter population.
2. The n respondents form a reasonably unbiased sample of the N hunters.
3. The response rate is high enough to minimize the potential impact of non-response bias.

Sampling frame

Respondents did not address the question of harvester definition and identification specifically, perhaps because of the somewhat controversial stratified classification system adopted by the present study. Some suggested that there should be more attention to ensuring that more women and young people are included, as well as harvest under assignment.

In year 3 (the middle year) of the NWHS, the sampling frame consisted of 5250 hunters in 28 communities.

The sampling frame or universe should be the essential starting point for a reliable survey. Although it is customary in the Canada model to leave the identification of hunters (through the creation of a hunter list) to community field workers and/or HTOs, according to rough guidelines, it has been a continuing problem in some surveys that these guidelines are not clearly specified or understood, and are inconsistently applied (viz. Usher and Wendt 1999:11-12). Where this is not done, the first condition for reliable estimation of total harvest as noted above is not completely fulfilled.

The rules for identifying the sampling frame should be clearly established at the outset, and consistently applied. Equally important, if there are changes in the method over time, their nature and rationale must be recorded. It is essential to ensure that hunters are defined and identified accurately and consistently throughout the study. Arbitrary assumptions about who is a hunter (e.g. adult males only) should be avoided. While the principles for hunter identification need to be discussed cooperatively between harvester and sponsoring organizations, once established they must be applied consistently thereafter. If this is to be primarily a community-level responsibility, the survey agency must nonetheless carefully monitor the process and provide support.

Sampling strategy

The NWHS, like other harvest surveys in the Canadian North, for the most part sought to achieve census coverage of the population. Unlike the other surveys, however, the NWHS classified hunters into three types (intensive, active, and occasional), based on self-identification, for the purpose of stratifying coverage.¹

Respondents to our survey generally expressed dissatisfaction with the tripartite classification and subsampling approach (rightly or wrongly without seeing the results), and were of the view that the tripartite classification and subsampling approach should not be repeated in a future study. We concur, because a) there is little evidence that these designations were or can be done accurately on a self-reported basis, and b) super-harvesters² for one species are not necessarily such for others (thus stratified sampling was rejected as impractical for the IHS - Usher and Wendt 1999:17-18).

If the hunter list (sampling frame) is consistently and accurately maintained, a straightforward census approach should achieve a high enough coverage to ensure that straightforward projection estimates of total harvests are reasonably reliable, especially for the main species. It should not be necessary to rely on a stratified sample, even in the largest communities. Ensuring adequate coverage using the Canada model depends heavily on having enough competent and dedicated field workers. While this may be viewed as expensive, it should be noted that as soon as a census coverage strategy is abandoned in favour of sampling, methodological questions arise that require a greater level of expertise to resolve than has often been available to (or at least used by)

¹Based on preliminary information supplied by the NWMB, a stratified sampling approach was applied in the seven largest communities (each with a Year 1 hunter list of >250 persons), with the “occasional” hunter population randomly sampled at an intended rate of 33%. The total sampling frame for Nunavut as a whole for Year 3 (the mid-year) of the survey, and the actual sample size was 4219.

²The term “super-household” was used by Wolfe (1987) to denote harvest specialization as observed by harvest surveys conducted by the Subsistence Division of the Alaska Department of Fish and Game. It refers to the minority of highly productive households in each community that produce most of the community’s wild food supply. We use the term “super-harvesters” here to denote individual harvesters that account for a disproportionately large share of a community’s harvest.

most harvest surveys.

Most respondents considered that a census coverage objective is appropriate for a harvest survey, and their general expectation is that the current Study is not excessively affected by sampling error.

Adequacy of response rate and non-response bias

Leaving aside the attempted stratification procedure in the seven communities, the question of response rate is really one of the adequacy of the sample size. Although census coverage is attempted, it is rarely achieved. In effect the hunter population is sampled at a very high rate. But given the small hunter populations of most Nunavut communities, the minimum acceptable sample size at the community level is quite large - perhaps 60-90% depending on the population.³ Consequently if response rates fall much below 80% there may be concerns about the adequacy of the coverage achieved, especially if reliable estimates are needed at the community, as opposed to simply a Nunavut-wide, level.

Most respondents to our survey were unaware of actual response rates to the NWHS as these have not been available, and based their opinions on anecdotal information only. Some were of the view that response rates may have declined during the survey, but none considered response rates to have been so low as to be problematic. The prevailing view was that hunters were generally receptive to the survey and that response burden was not excessive.

The NWMB provided us with final response rate data for the first three years of the survey for each community. In most communities in most months, coverage exceeded 80% and in some cases was at or near 100%. There were a few “problem” communities and months, but the record appears to indicate a substantial accomplishment on the part of fieldworkers. One effect of the design decision to sample the occasional harvest stratum at 33%, however, was to reduce the overall coverage rate in the large communities to well under 80% in many cases. There is no consistent trend of increase or decline in response rates among communities for which data are available.

Non-response rates may not be the sole measure of potential bias in harvest surveys, however. Certain unmeasurable forms of non-response may also exist. In the first, hunters who do not want to be interviewed simply state that they did not hunt during the reporting period. This ends the interview without having to report the harvests that actually occurred. Another form is item non-response. In effect, the harvester reports some, but not all, of his or her harvest by mentioning the take of some species but not others. Both are covert forms of refusal to

³For example, if the hunter population of community x is 200, then the required random unstratified sample size (assuming 100% response) at the 95% confidence level ($\pm 5\%$) is 133, and at the 90% confidence level ($\pm 5\%$) is 115. If the hunter population is only 50, then the required samples sizes are 44 and 42 respectively (Gower and Kelly 1993).

participate, but unlike an outright refusal, cannot be measured. It is thought that the “did not hunt” response as a form of hidden non-response may have accounted for apparently declining participation rates in the IHS (Usher and Wendt 1999:14). Falsification of records by field workers can have the same effect.

Even with high response rates, non-response bias is a concern in harvest surveys for at least two reasons. One is that even if the sample is very large, it is quite likely not to be random. Whether those not interviewed are deliberate refusals, or were not contacted by the fieldworker, there are reasonable grounds to suspect that they might not be typical of the responding harvesters. The other is that for many species there can be substantial variance in harvest rates by individual harvesters (viz. the “super-harvesters” note above). In the case of the IHS, coefficients of variation were found to exceed 33.3% in a few of the sample cases examined, a rate above which Statistics Canada does not consider data suitable for release. This is in effect a worst case scenario, because no finite population correction factor was applied to the data and the number of hunters was in every case small, but it does highlight the risk of under-coverage (Usher and Wendt 1999:15-21).

Hidden non-response can be reduced by increasing the incentive to participate, through an effective communications program or material incentives such as payments or prizes (however this approach carries its own risk, by providing incentives for non-hunters to get on the hunter list). Field-worker falsification can be reduced by improving pay and training, and eliminated by requiring harvester signatures on the data sheet. Most importantly, achieving consistent high reporting rates requires that field workers be well trained, consistent, and dedicated to their work. Maintaining their attachment to the survey over a long period of time has clear implications for rates of pay, working conditions, and general support from the survey agency. As a general rule in multi-year harvest surveys, the communities with the lowest turnover rate in fieldworkers have the higher response rates. Keeping response burden to a minimum is also important in promoting harvesters’ willingness to report, especially in a repetitive, monthly survey. Where hidden non-response is nonetheless suspected, follow-up surveys should be used to test for it. All of these things need to be done to an adequate standard to ensure that the second and third conditions required for reliably estimating total harvest, cited at the outset of this section, are met.

3.3 Survey content and measurement

Response error

Response error refers to the difference between the “true” answer to a question and the respondent’s answer to it. Response error may arise from misunderstanding of the question, or recall failure, or it may be strategic. A successful harvest survey requires the following conditions be fulfilled:

- Parameters or variables must be properly identified and the questions made comprehensible to the respondent (measurement and questionnaire design).

- Respondents must know and remember the “true” answer (minimize recall failure).
- Respondents should have an interest in answering the questions truthfully and accurately (minimize incentives to strategically bias their responses upward or downward).⁴

Interview respondents could only comment intuitively or speculatively on the various sources of response error, due to lack of specific knowledge of the survey. Many cited various reasons for and possibilities of strategic bias, chiefly under-reporting due to modesty or fear of restrictions, or over-reporting due to pride or hope of program eligibility. Technical problems such as lack of clarity over who is supposed to report group harvests, and the like, were also mentioned. The problem of recall failure is recognized, but presumed minimized by the monthly reporting period and the use of calendars as recall aids, although some commented that the calendars are used more as wall decoration than for recording, and that a pocket calendar or diary would be better. It was also suggested that as people got more used to the survey, they became more diligent in recording or recalling their harvests. No respondents considered that response error, whether strategic or as a result of recall failure, is so large or systematic as to unduly affect the results.

One important reason for recall failure is that the events the respondent is asked to recall are not salient to them; they are instead routine or unimportant, or so frequent as not to be counted or committed to memory in the first place. Not surprisingly, the problem is insignificant with respect to large mammals. It is likely to be greater with birds, and even greater with fish, especially staple species taken in large quantities. Hence the strategy of providing suitable and convenient recording aids, and of minimizing the recall period, can be especially important for some fish species and for small game.

Remedying strategic bias is a larger and ongoing problem. In effect, respondents are assessing the source and degree of risk in providing the “true” answer. While it is often said that Inuit are for cultural reasons predisposed to being truthful about such matters, the reality is that concerns about possible adverse or beneficial consequences with respect to harvesting restrictions, exposure to taxation, eligibility for harvest support (mentioned by some respondents as causing reluctance to participate in the current NWHS) or other transfer payment programs, and eligibility for wildlife compensation, must necessarily play a role.

Only some sources of bias can be accurately measured (and then only with substantial technical resources), and none can be completely eliminated. But they can be reduced and accounted for. Effective communication, transparency of purpose, informed consent, and the dissemination of useful results to harvesters, will all play a role. So will eliminating suspicions that harvest data are or could be used in ways that will adversely affect the interest of harvesters, and this includes linking or disseminating record-level data for unclear or unstated purposes. While some incentives for bias cannot be removed (some may exist independently of the survey and some may be inherent in the purposes of the survey), ideally there will be a balance of incentives that

⁴A useful discussion of the sources of response error and approaches to minimizing it is provided by Eisenhower, Mathiowetz, and Morganstein 1991.

minimizes systematic, one-directional bias.

What is a harvest?

It is essential to define what a harvest actually is, for the purpose of the survey. If, for example, it is a subsistence harvest survey, then commercial harvests should be excluded. Likewise the rules for reporting harvests (e.g. how to attribute harvests from group hunts to individuals) should be clear to all.

In any event, harvest can be defined in at least three ways:

- Kill, or the number of animals removed from a population by harvesting activity, whether or not retrieved by the hunter. This is the quantity of most interest to resource managers.
- Production, or the number of animals retrieved for potential use. This is the quantity of most interest to economists.
- Consumption, or the number of animals (or parts thereof) actually consumed. This is the quantity of most interests to nutritionists and health professionals.

Each of these numbers is progressively smaller but by unknown factors. In practice harvest surveys record production, i.e. the number of animals killed and retrieved.

Species

The wildlife agencies require a core list of species for management purposes. The minimum or core list would likely include large ungulates, bears, wolves, wolverines, all marine mammals, char, trout, and waterfowl. It was suggested that harvest data might be useful in connection with the forthcoming Species at Risk Act. Although as a general principle, a mass harvest survey cannot be relied on to provide reliable data for rarely harvested species, it should be possible to obtain reliable harvest data by means of harvest surveys, for species or populations at risk that are taken in any significant numbers, as is the case with some beluga or caribou populations.

Reducing the list does not provide much savings in survey time, response burden, or data input. Considerations that should affect the species list include:

- Are as good or better data already obtained by other means (e.g. tagged species, or closely monitored species such as marine mammals or char)? If so, it may not be necessary to include these species in the survey. This would avoid the risk of confusion over purpose, and respondent fatigue due to reporting the same harvest to different surveys. On the other hand, these data may provide useful cross-checks for the validity of harvest survey estimates, and they are also likely to provide more accurate and complete information on sex and age-class of animal, if required (see below).
- Is there an interest in counting occasionally harvested species as environmental indicators, even if there is not a management problem? If so, this question could be asked

- less frequently.
- There is little to be gained by recording occasional harvests, or incidental harvests of such species as rabbits and ptarmigan, unless they are reported consistently.
 - Can harvesters routinely and accurately identify the species for which information is asked? There is little to be gained by recording harvests of unidentified species (e.g. fish, geese) or inaccurately identified species. Several participants suggested that field identification guides to sub-species and rarely seen species, would be very helpful.

It is important to distinguish between “need to know” and “nice to know”, and to establish clear rules about the species list at the outset of the survey and stick with them.

For certain socio-economic purposes, a combination of harvest data and tag data that cover the main species should be sufficient. In the case of the ISR, although over 100 species were reported to the survey in a ten-year period, about 30 of these species were estimated to have accounted for 99% of the harvest by weight (Usher 2000:19). The current NWHS collects data on just over 60 species (not counting eggs, and races or colour-phases of individual species, and it is quite likely that, as in the ISR, not more than one-third of them account for virtually all of the harvest by weight. Although some respondents suggested that complete species coverage is desirable for compensation purposes, the above-noted facts suggest otherwise.

Discrimination by stock, herd, or population

This information is important primarily for caribou, muskoxen, polar bears, and fish. Caribou, muskox, and bear kills can be assigned to specific herds based on location and date of kill, so it is not necessary to ask this question specifically. This is in principle also true for fish, although location must in some cases be more specific. A separate question (that would necessarily rely on the hunter’s ability to discriminate) is not required.

Discrimination by sex and age-class

This information is important primarily for large mammals and fish. Hunter ability to discriminate and recall sex and age-class for large mammals is normally sufficient for the purpose. In the case of the IHS, sex and age-class data were reported for over 80% of the harvest of large ungulates (Fabijan and Usher 2001). The reporting rates for seals were much lower and the data were not regarded as useful.

Sex and age-class information for other marine mammals, and for bears, are generally better obtained by the existing tag and monitoring systems.

The required level of detail on sex and age for fisheries management is usually beyond harvester discrimination and recall capability. Although the IHS recorded this information for some char populations, data were actually provided for only a small proportion of the catch, rendering its usefulness even more questionable. These data are more reliably obtained by targeted and

dedicated fisheries monitoring programs.

Sex and age class data for selected species, particularly large mammals, are of interest for estimating edible weight of country food production.

Based on these considerations, a future NHS should consistently limit sex and age-class data to ungulates and particularly caribou. These data, combined with the results of tag and monitoring data, will provide sufficient information for socio-economic purposes.

Geography (kill location)

The level of detail (10 km² grid) provided by the current NWHS system of geographical location of kills appears to be satisfactory to all parties. Only fishing locations might require greater detail, where there could be confusion between bodies of water (and hence possibly fish stocks) within a grid square. For critical fisheries, this more detailed information can be obtained on a case by case basis, or by specific monitoring program.

For socio-economic purposes, location of harvest by community harvesting area is sufficient.

It should be anticipated that the results of both the existing NWHS and any future survey will be used for environmental impact screening and review (as is already routinely the case in the Inuvialuit Settlement Region), and for land use planning. Kill location data are of particular importance for these purposes. However the inclusion of kill location in the survey has significant implications for both the products required of the survey, and for data access and control, in both cases entailing additional costs for data analysis and data base management (see chapter 4).

Effort

Table 2. Need for and feasibility of effort measures relating to harvesting

	Need	Availability of reliable and accepted measures	feasibility of self reporting within HS	feasibility of subsample or separate survey	observation required
Mammals	moderate	low	low	moderate	no
Birds	moderate	low	low	moderate	preferable
Fish	high	high	low	moderate	yes
Economics	moderate	moderate	low	good	no
Compensation	possibly high	moderate	low	good	no

For wildlife management purposes, it can be helpful but not necessarily essential to obtain measures of harvesting effort in a harvest survey. In the case of mammal or bird management, there are few generally accepted standard measures of harvesting effort (although see, e.g., Byers and Dickson 2001:125-126), although such indicators as time spent and gear used have been applied. Some general indication of changes in effort is helpful in interpreting variations in kill levels and to alert managers to potential problems. While measuring effort is essential for fisheries management, this is best done by direct observation rather than recall survey. In fisheries, catch per unit of effort (CPUE) is measured using a specified dimension and mesh size of net set over a specified period of time.

Effort is important for some types of economic analysis, but the preferred indicator is investment, i.e. type and amount of equipment, cost and depreciation.

The NLCA provides for wildlife compensation (article 6). Under this provision, harvesters may file claims for loss of use or other inconvenience, before a Surface Rights Tribunal. The evidence on which a claim shall succeed is not specified, although the Tribunal “is not bound by strict rules of evidence” (6.4.3), and the NWMB is assigned a role in advising on compensation (5.2.34.e). To our knowledge no such claims have been made in Nunavut to date, and the Surface Rights Tribunal has not been established. However, harvest data have been used for personal claims in relation to workers’ compensation.

The Inuvialuit Final Agreement also provides for wildlife compensation, and in fact data from the IHS have been used by mutual agreement in negotiating collective or comprehensive wildlife compensation agreements with developers in advance. These agreements (similar to those envisaged in 6.6.2 of the NLCA) have provided in effect a cap on probable corporate liability, and are understood to have amounted to several million dollars. There has been no call for actual damage payments under these agreements to date.

While effort data have not so far been required to conclude such agreements, we believe that in any contested situation, especially where large dollar amounts might be involved, questions would in fact be raised about whether reduced harvests were the result of actual damage or simply of diminished effort (as was the case in the *Exxon Valdez* oil spill in Alaska). Consequently, if NHS data are to be used as a basis for making claims under article 6, or for that matter under any other legal recourse available, then it would be advisable to ensure that some baseline measurement of effort on a collective if not also an individual basis is on record to support the claim. The indicators that would probably be required would include both time and gear measures of effort, and investment or costs of harvesting in order to establish the net value of country food to the producer.

We conclude that the requirements for effort data are significantly different depending on whether the intended use is for wildlife management, economic analysis, or compensation. We also note that, with the exception of fisheries management, effort indicators are not well established and the measurement of them not always conclusively reliable. Consequently we

recommend against including effort measures in any future repetitive survey on the grounds that much would be added to response burden and processing costs, with relatively little gain in solid information, but a risk in reducing harvester participation and cooperation for the core survey.

Effort information, where necessary, should be obtained by specifically a specifically designed and targeted survey. This need not be entirely independent of a future NHS, in that the sample could and probably should be drawn from the same sampling frame. However it need not be repeated frequently. Adequate data for both economic analysis and wildlife management could probably be obtained by a survey done every few years, and this is probably true for compensation purposes as well, although a higher sampling rate might be required for the latter purpose. It should be entirely feasible to obtain data for management, economic, and compensation purposes from the same survey, however determining the appropriate variables and measures would require significant expert consideration and cooperation among participating agencies.

Socio-economic information

There is general agreement that it would be very useful to have certain key socio-economic data both in relation to, and as context for, harvest data. However there is significant disagreement among the parties about the advisability of obtaining socio-economic data directly through a future NHS, or how to link socio-economic and harvest data. The wildlife management agencies do not require such data and in some cases are reluctant to include it for fear of jeopardizing harvester cooperation with the core survey. This view is generally shared by Inuit and harvester organizations. Other government agencies are, however, very interested in such data for the purposes of economic analysis, and of program design and delivery.

The type of socio-economic data required can be classified on the one hand as “tombstone data” - the fixed and unchanging characteristics of harvesters -- and on the other, as variable characteristics. Tombstone data consist of sex, date of birth, and status (e.g. beneficiary or non-beneficiary). These need be obtained only once in a repetitive survey, for example while establishing the hunter list, and can be recorded in a separate file along with harvester ID. Tombstone data can thus be obtained easily in the context of a new NHS without jeopardizing participation, and enable analysis of certain harvester characteristics such as age and sex against harvesting success. For these reasons, we would recommend that tombstone data should be obtained in any new survey, so long as harvesters are aware of and consent to it.

More problematic is the gathering of variable harvester characteristics such as education, skills, labour force status, income, use of various social programs including social assistance and unemployment insurance, and even health status, all of which have been suggested. These characteristics would have to be established on a repetitive basis: not necessarily every month but certainly annually at a minimum. These data can be obtained in conjunction with a new NHS, e.g. by periodically adding on a socio-economic module, or by linking NHS data to other government records. The first could raise significant problems of response burden and would

definitely entail extra costs in design, administration, processing, and analysis. Either method would require substantial explanation and communication to harvesters as each would require harvester consent, and could well jeopardize harvester participation in the core survey.

Independent data sources

The availability of reliable and comparable harvest data from independent sources for enhances the possibility of validating survey data, of adjusting the survey method, and thus the credibility of survey itself. Virtually all respondents agreed that it would be desirable to have such data, but also recognized that little is available and even less is error free. The polar bear tag data were often cited as the most reliable. While probably true, because polar bears are infrequently taken in most communities, the possibility of incomplete reporting to the harvest survey due to sampling error is higher than for most other major species. It cannot be assumed that the difference between harvest survey and tag data for polar bears will apply to other species. Other independent sources, such as fur sales or marine mammal monitoring programs, may be accurate for the situations covered but nonetheless incomplete. Case study data obtained by more intensive survey or observation may also provide a basis for comparison, but are infrequently available. Such studies should be encouraged as they provide essential context for, as well as an independent cross-check of, survey data.

We suggest that harvest surveys be designed with internal methods of validation rather than relying on the independent sources above. Given the limited number of species for which independent monitoring data are available, reducing the species list in favour of those data is of limited value and entails virtually no cost savings.

3.4 Survey mode and conduct

Individual or household reporting

Should the basic reporting unit be the individual or the household? Respondents' opinions varied on this question.

To establish kill levels it is only necessary to interview individuals. This implies that, where there is more than one hunter in a household, each will be separately identified in the hunter list and thus have an equal chance of being interviewed.

For socio-economic purposes it is useful to know about household activity. However this requires some common understanding of what constitutes a household, and the maintenance of a household list in addition to an individual hunter list. This is necessary whether the reporting unit is the individual or the household, but requires extra diligence and work at the community level.

Data can be obtained on a household basis either by asking every member of the household to self-report, or by asking a single person to provide proxy reports for other relevant members in addition to a self-report. If the latter, the person designated to report for the household should be done consistently by the Person Most Knowledgeable (PMK), whoever that might be. This procedure assumes that the PMK is in fact aware of the harvest by every member of the household and can accurately report on everyone's behalf. This assumption is often made but seldom verified in harvest surveys. The need for recall aids such as pocket calendars for each individual is increased. If kill location is required, it is probably better to get harvest information directly from each individual and not rely on proxy reports. Respondents with direct field experience cautioned against attempting to collect harvest data by proxy reporting, suggesting it is just not possible for any single individual in the household to keep track of the harvests of all members.

If a household approach is taken, then an additional variable must be recorded as, in effect, tombstone data (see below): the relationship of each individual to the head of household or to the PMK. Whatever the choice, the rules must be clear to both interviewers and participants, and be consistently applied, and careful records must be kept of any problems and variances.

Reporting cycle and survey mode

The current NWHS (like the Canada model generally) uses a monthly reporting cycle in which harvesters are interviewed on a face to face, or door to door, basis. All respondents considered this monthly cycle about right, for two main reasons. First, it enhances the likelihood of accurate recall, and secondly, it ensures continuing employment for field workers who are regarded as essential to the process. Some acknowledged that the recall period could be lengthened, for example to a seasonal period, especially with enhanced emphasis on the use of recording aids, and that this might reduce participant fatigue. In practice, however, harvest surveys sometimes necessarily rely on longer recall periods. Some harvesters, and perhaps especially those who harvest a lot, may be out of town during the monthly survey period. When contact is established, they are asked to recall their harvest for each month since the last contact (backfill). Three or even four months of backfill may occur, and this is not generally considered detrimental to recall.

In at least some communities, field workers make initial contact by telephone and follow up in person if there is a harvest to report, and some harvesters prefer this. Most respondents considered that the door to door mode should be maintained, on the grounds that it has worked well in the past. Some observed that it allows for a more informal interview that may provide contextual details. Although one respondent observed that self-reporting would be cheaper, it would likely require the provision of greater incentives to report.

If the participant's signature is required on the interview (see response rate, above), or if kill location data are required, then a door to door mode is necessary.

Duration and frequency

Most respondents considered that adequate information could be obtained for their purposes without conducting a year over year harvest survey indefinitely. Opinion varied as to whether it would be best to survey all of Nunavut every few years, or continuously for 3-5 years with no survey for a similar period, or to survey only selected communities each year. Some noted that there is insufficient certainty of confidence intervals to clearly establish year over year trends. All of these views are plausible but also speculative, because until the data are analyzed for both internal quality and integrity, and for what they show in terms of stability or variability of harvest from year to year, it is not possible to say with any certainty what course would be the most desirable or feasible.

From a practical point of view, there is a need to balance the maintenance of survey infrastructure, perhaps especially the continuity of fieldworker employment, promoted by a continuous survey, against the risk of informant fatigue and survey cost. The possibility of excessive response burden imposed by a repetitive survey must be considered in the light of other ongoing surveys in Nunavut by both Statistics Canada and the Nunavut Bureau of Statistics.

3.5 Improving communications

A number of other important communications-related considerations arose during the course of the interviews and the workshop. Each of these should be taken into account when making decisions on future studies. They will affect the design of any new study. Most importantly, however, improving communications will have the likely effect of improving the quality and reliability of the data. For any future survey or study to be effective, the harvesters themselves must be willing to participate and this willingness must be based on mutual trust and co-operation. This relates to obtaining informed consent, which can be achieved with greater confidence when information is cooperatively developed and effectively shared.

There was a strong consensus among respondents that any new study should have a built-in communications strategy. This strategy should include the following features:

- Development of materials for explaining the objectives of the new study;
- Inclusion of these materials in the staff information and training manual(s);
- Relationship between these materials and the requirement to obtain informed consent;
- A protocol to guide the relationship between the sponsor(s) and the staff, including how decisions are made and communicated;
- Clear lines of communication between headquarters and the field staff including the involvement of field staff in making any changes to study design or delivery;
- A protocol for working with the RWOs and HTOs, including agreed upon responsibilities, how decisions are made and accountability mechanisms;
- The study design to include timely feedback of information to the participants;

- Participants, possibly through their representative HTOs, should be involved in data verification creating a feedback loop;
- Annual reports should be provided to participants (not just sponsors) using a variety of communication media and in non-technical language; and
- Study personnel (headquarters and field staff) to become more involved in public education and information efforts.

The implementation of a communication strategy will add to the costs of any new survey, particularly for training and production of regular reports in a non-technical language. We strongly recommend, however, consideration of these issues in any future study design.

Chapter 4. Survey Outputs, Data Access and Control

In previous Canadian harvest surveys, including the NWHS, insufficient attention has been given at the outset to the desired products of the survey, and to matters of data access, control, and privacy. Possible reasons include:

- The surveys were authorized with limited objectives, and other possible uses were not foreseen or taken account of.
- Law and policy with respect to access and privacy in the gathering of personal information for research, administrative, and commercial purposes have been evolving rapidly, with the result that acceptable standards in 2001 are quite different from those of the 1980s when most of the “Canada model” surveys began.
- Harvest surveys are often seen (incorrectly) as “wildlife” surveys rather than as the social surveys which in fact they are. To the extent that technical and management committees are staffed with wildlife scientists rather than social scientists or social survey experts, there is not surprisingly a lack of awareness of the importance of such matters as informed consent, privacy, confidentiality, and of the best practices for dealing with these matters.

The NWHS has tried to address some of these issues, although more often during rather than prior to the survey. Any future survey must consider these issues prior to start up, as they are no less important than the technical design issues addressed in the previous chapter.

4.1 Survey outputs (data products)

Status and views

Currently, each of the wildlife agencies obtains a copy of the record level data base, under a “database agreement” with the NWMB, as specified in the NLCA (5.4.6). This data base includes the harvester identification number but not harvester name (5.4.7). Each agency has the staff and technical capacity to store securely, and analyze, a record-level data base.

Each of the wildlife agencies indicated that, under a future harvest survey arrangement, it would want similar access to a record level data base. Most indicated that they wanted to continue to obtain harvester identification numbers, although one agency did not consider this level of identification necessary. Specific reasons for needing harvester ID numbers were not specified, but without them it is not possible to ascertain response rates and hence to estimate total harvest. Other parties do not yet have access to the NWMB data base, and in some cases are insufficiently familiar with how it is constructed to be able to specify exactly what they want in the future.

Other government agencies seek access to a record-level data base or “micro-data file” (see below). These agencies seek to undertake socio-economic analysis of harvest data and consequently would like certain “tombstone” data attached to the file. These data consist,

essentially, of the unchanging characteristics of each harvester i.e. date of birth, sex, and status (beneficiary or non-beneficiary). These agencies have the capacity to analyze the data base at the level to which they seek access to it.

Without a record level or micro-data file, any party wanting detailed information about harvesting activities, harvest locations, and especially their relation to harvester characteristics, requires custom tabulations. This involves a request of the agency holding the data base to undertake work, which involves time and cost.

Inuit organizations are the least certain of their technical data needs, and do not currently have the capacity to analyze a record-level data base.

For the most part, agencies require data on an annual basis as released (preferably cleaned and verified), whether record level data or the various products generated from it such as maps and tables. Annual reports summarizing the harvest by community and species are an essential output, and the data base system should include a report generating function so that annual reports are quickly and easily produced for general distribution.

All agencies consider that data must also be summarized and presented in a form accessible to and understandable by Inuit, and particularly Inuit harvesters. It is generally considered that posters consisting of maps, diagrams and photographs would be the most useful format for communication and promotion purposes.

It should be assumed that once NHS data are available, other parties will seek to use them. In the case of the IHS, kill data including location have been used routinely by the screening and review comanagement bodies (similar function to NIRB). These uses have accounted for a large part of the custom mapping requests. Resource development companies have also requested custom tabulations for the purpose of preparing environmental impact statements.

Issues and options

Assuming a broad coverage, repetitive harvest survey along the lines of the existing NWHS, the potential products are:

1. Clean master file

This is the complete line by line, field by field, ongoing record of the survey, as maintained by the agency administering the survey. It is a record-level file in the sense that it includes the complete record of every harvesting event (the basic unit of record) captured by the survey. In its complete form (which may consist of several linked data sets), including harvester names, ID numbers, and characteristics; harvest quantities, characteristics, and locations; and comment columns, it should be housed securely by the survey agency, neither accessible to nor released to any other party.

2. Anonymized master file (share file)

This is a record-level or near record-level product intended for sharing with other competent agencies under strict agreement. It may collapse individual harvest records by summing them for each harvester for each survey wave. Most importantly, while it may include harvester ID numbers, there must be no link to individual harvester names, and other steps for anonymization of respondents may be required, especially with respect to kill location. It may be edited to exclude data fields not needed by the receiving agency, for example, species not within its jurisdiction, or geographical information (harvest location). It could be released on an annual basis for the year of record, after data cleaning and verification.

3. Public use micro-data file

A public use micro-data file is a partially collapsed version of the record-level file, in which certain fields have been combined, and certain cells suppressed, in order to ensure that individual harvesters cannot be identified in the process of data analysis. Public use micro-data files are constructed by statistical agencies according to certain rules that ensure the protection of privacy and confidentiality, with the intention of making unpublished data available for public use and analysis. The NBS indicated that it does not create public use micro-data files and we therefore assume that such files will not be created by any agency in Nunavut.

4. Custom tabulations

A party can request a specific tabulation of survey results not otherwise published, for example a map of kill locations of certain species over a specified time, or a table showing the relationship between caribou and char harvesting, by harvester type. Custom tabulations consist of aggregated data but in more detail or with cross-tabulations not available in the published record (e.g. annual report). The agency responsible for the data base should establish a protocol for dealing with these requests, including the priority and basis on which it will respond to these requests, cost recovery if desired, and rules for ensuring harvester privacy.

It is the experience of other harvest surveys that requests for custom tabulations can be time consuming, and fulfilling them can interfere with the ongoing management of the survey and the data base. This is one important reason for providing record level data files under agreement, so that the requesting agency can do its own tabulations. However this will not be feasible or desirable in relation to all requests, particularly those coming from private consultants or university researchers.

5. Annual reports

At a minimum, harvest surveys typically issue annual reports, for general distribution, with tables showing the harvest by species by month by community (see, for example, Fabian xxx). If the annual report is the key product available for general distribution, it must include a statement of

methods and evaluation of the reliability of the data.

6. Non-technical products

In order for harvesters and the general public to appreciate what the survey is finding out, and indeed why they should participate in the survey, it is important to disseminate a variety of non-technical products. Posters consisting of maps, charts, diagrams, photos, and brief, non-technical text, in English and Inuktitut as appropriate, are generally considered the most effective method of doing this.

Table 3 shows the outputs of a NHS, in the sequence in which they would logically be produced.

Table 3. Survey output and products

Product	Who prepares	Who receives	When	Comments
Master file	Survey agency			
Anonymized master file	Survey agency	Other participating agencies	Annually	By formal agreement with conditions
Public use micro-data file	Survey agency	Public		Not feasible in Nunavut
Custom tabulations	Survey agency	Third parties	On request	As agency time and resources permit
Annual report	Survey agency	General public	Annually	On request
Non-technical reports	Survey agency or other participating agency	Nunavut harvesters and public	Annually or as needed	

The data base itself is an ongoing output of the survey, from which four other products should be made available:

- record level files provided to a limited number of agencies under agreement
- custom tabulations to requesting parties
- annual reports for public distribution
- non-technical material primarily for Inuit harvesters.

The first three products can only be provided by the survey agency itself. Once a standard format is decided on, the effort and resources required to produce record level files and annual reports is relatively small on an annual basis. The need for custom tabulations can be reduced, but not eliminated, by providing record level files to agencies, which are likely the primary customers.

Among likely third party users are consultants preparing impact assessments. It is entirely appropriate that the survey agency charge a cost recovery fee for such requests. The non-technical material can be produced not only by the survey agency but also by the other parties receiving record level data. The wildlife and fisheries agencies can and should be encouraged to prepare such material, in consultation with the survey agency.

While the key products – record level files and annual reports – need only be produced once a year, timeliness will likely be a concern. Key steps in the process are data cleaning and verification. This means, firstly, an internal process by which survey data are reviewed and edited, and if necessary checked and verified with field workers, and data entry is checked for accuracy. Verification also refers to a process whereby community totals are given to the HTO for a “reality check”. This should include the monthly and annual totals by species, and preferably a map of kill locations by species. The purpose of this verification is not to check individual responses for accuracy (because the HTO should never see individual responses), it is for the community to alert the survey if the result does not fit their “common sense” knowledge of recent community harvesting activities. Once the community has reviewed the data in this way, it should formally advise the survey agency that it has “signed off”, and the data are eligible for release. At this point they are no longer “raw data”.

Public release

Until these two processes are completed, the survey data exist only in draft or pre-release form. In practice, however, data in this form has in fact been released to government agencies under “database agreements”. This situation has been created by, first, the requirement to make “raw and interpreted data” freely available to the federal and territorial governments, and to Inuit (NLCA 5.4.6), and secondly, because the practical demands on the NWMB to ensure ongoing data collection during the requisite five-year period have necessarily deferred a complete data review and verification process, especially with respect to reporting rates, until the end of the project. Similarly, in the case of the IHS, unverified data were released on a provisional basis to wildlife and other agencies (which until recently did not have access to record level files) in the form of custom tabulations on request. The system was inconsistent and sometimes interfered with the timely completion of ongoing survey work. Further, the IHS for many years released reported data only and did not have a sound and agreed upon method for estimating total harvest.

We strongly recommend that in a future NHS, raw, provisional or draft data should not be released to any party for any reason, and this should include reported harvest totals where response rates have not yet been established and there is hence no basis for estimating total harvests. Data release and publication should be predicated on:

1. Cleaning and verification of all raw data by the survey agency itself, and internal technical approval for release (this creates draft data for community verification).

2. Community verification of draft data, which requires clear procedures for providing draft data for community review, and for ensuring timely community signoff and turn-around. This results in final data approved for release.

Steps 1 and 2 occur in sequence and are likely to require several months.

3. Development and approval of a survey methods statement that includes procedures for quality assurance and control and for estimating total harvest from reported harvest. This should occur early in the study, and be available for inclusion with the first annual (or other) release, and modified as needed for subsequent releases. This should be standard procedure for public release by a statistical agency.

As all of the above products imply some form of public release, there needs to be a clear public release policy by the survey agency, especially for those products that require an agreement among parties or are intended only for limited distribution with conditions. This release policy should be created by agreement of all participating organizations, but most importantly Inuit harvester organizations. The policy provides essential information for informed consent and should be available for public disclosure.

4.2 Data access and control

Basic principles

The survey agency (yet to be identified) is the body responsible for:

- conducting the survey
- ensuring that survey objectives and deliverables are met
- ensuring proper control of the data, and
- providing access to data under specified conditions.

The public release policy referred to in 4.1 is an essential aspect of the issue of data access and control, but there are other considerations, which are based on the proposed uses of the data. Our discussion of these considerations is informed by the substantial evolution in recent years of the standards and expectations around privacy and informed consent in data collection and social research. A useful codification of these standards may be found in schedule 1 of the federal *Personal Information Protection and Electronic Documents Act* (PIPEDA). Although this act does not apply to the present NWHS, nor would it apply to a future survey,⁵ its attached “Model Code for the Protection of Personal Information” sets out ten “privacy principles” that those participating in any new survey should consider.

⁵However if the survey pursues cost-recovery for its products, the Act may apply. Whether cost-recovery constitutes a commercial activity under the Act is still subject to legal interpretation.

These privacy principles are:

1. *Accountability* (designation of organizations and/or persons accountable for compliance)
2. *Identifying purposes* (of personal information at or before time of collection)
3. *Consent* (for collection, use, and disclosure)
4. *Limiting collection* (to what is necessary for the identified purposes)
5. *Limiting use, disclosure and retention* (for purposes other than originally identified, except by consent; retain data only as long as required for the original purposes)
6. *Accuracy* (with respect to a data base used for statistical information and research rather than program administration, ensuring that the survey design promotes accurate reporting of data)
7. *Safeguards* (security protection appropriate to the sensitivity of the information)
8. *Openness* (advice to public on policies and practices on the management of personal information)
9. *Individual access* (with respect to a data base used for statistical information and research rather than program administration, the right of an individual to have access to his or her own data if required)
10. *Challenging compliance* (opportunity for individuals to verify and ensure compliance by the accountable organization)

The current NWHS is a voluntary survey, authorized by the NLCA, which specifies its objectives (5.4.5), administration (5.4.3), and funding (5.4.4), and provides certain guarantees of privacy and immunity to harvesters (5.4.7, 5.4.8). As was the case with other harvest surveys begun in the 1970s and '80s, harvester consent was considered to have been obtained by the declared support and participation of representative harvester organizations, and individual willingness to participate, without the need for individually signed consent forms.

All of the agencies likely to fund or undertake a new NHS are public bodies to whom either the NWT *Access to Information and Protection of Privacy Act* (1996), which now applies in Nunavut, or the corresponding federal Act. This includes the NWMB which is a federal board. The Nunavut ATIP addresses all of the privacy principles listed in the federal PIPEDA.

All parties agree generally that privacy issues must be properly addressed in a future survey not simply to meet any legal requirements that may apply, but more importantly to ensure a high participation rate and promote accuracy and completeness of reporting. We consider that a future survey would have to address the following issues in a cooperative and transparent manner:

- Informed consent
- Security and retention of data
- Privacy protection
- Access to personal information
- Data sharing agreements
- Record linkage
- Public release policy

The last item has already been discussed under Data Products

Informed consent

All parties agree that there must be informed consent on the part of the harvesters who take part in the survey. Harvesters need to be aware that any new survey, even if it is conducted in similar fashion to the existing survey, is likely to be conducted under different authority and auspices, perhaps with some different objectives, and that the data may be used for different purposes by the parties with access to them. In our view this means, based on current standards (see, for example, Statistics Canada's *Policy on Informing Survey Respondents*, available online at www.statcan.ca), that harvesters should be advised specifically on:

- why the information is being collected
- who will be using it
- what they will do with it
- with whom the data will be shared (if applicable)
- with what other records the data will be linked (if applicable).

There is general consensus among the parties that it would be advisable to obtain individually signed consent forms. These consent forms should include not only acknowledgement of the nature and purpose of the survey, and willingness to participate on the basis of that knowledge, but also whether the participant authorizes the data collection agency to share his or her personal information with other specified agencies, or to link that information with other specified data bases (*see record linkage*). There should also be provision for withdrawal of consent.

Assuming that a renewed NHS is a repetitive survey, we suggest that there be a standard written consent form, explained and signed at the outset of the survey. There should not be a need to go through the consent procedure every month (or whatever reporting interval is chosen), but there should be renewed consent and authorization perhaps every year and certainly if any changes are proposed to data sharing and record linkage procedures, or if there are significant changes to the objectives, duration, and conduct of the survey itself.

It should be the role of NTL, the RWOs, and the HTOs, in their capacity as Inuit and harvester organizations, first, to ensure that the survey agency properly explains the purpose of the study and uses of the data, and secondly, on behalf of harvesters, participate in the design of the study, in developing data control, access, and release policies, and in ensuring that the outputs meet the needs of harvesters. This would entail a cooperatively developed communication plan including information on all of the following matters.

Security and retention of data

The survey agency must have demonstrated capacity to (in the words of the Nunavut ATIPP Act, s.42) “protect personal information by making reasonable security arrangements against such risks as unauthorized access, collection, use, disclosure, or disposal” of data. This includes the secure transmission and storage of data (both physically and electronically). Its staff should be fully aware of and trained in the requirements for ensuring this. There should also be a clear policy on whether data are to be retained indefinitely or there is a timeline for destruction.

Privacy protection

The current survey assures participants of immunity from civil or criminal proceedings (examples would include infractions of wildlife or income tax legislation). If this assurance is to apply to a future study, harvester organizations would be advised to consult the applicable legislation, because the applicable NLCA provision (5.4.8) will not apply. A future survey should also specify that no information collected will be used to make any decision about a specific individual, including, for example, his or her eligibility for harvester support programs, and provide assurance of anonymization for purposes of planning and analysis. Such assurance would necessarily specify the actual tools by which this is to be done. The inclusion of kill location in harvest studies is of specific concern, because retaining it in a share file effectively nullifies any collapse of fields that would normally ensure anonymity.

Access to personal information

Harvesters should have access to their own information on request, and be able to request that it be forwarded to another agency, as they do currently. This should not, however, include access to the information of others, even their own family members.

Data sharing agreements

The current “database agreements” between the NWMB and fish and wildlife management agencies provide a basis for future data sharing agreements (except that unlike the current situation, they should be negotiated prior to the start-up of a new survey, not after).

The parties are generally satisfied with this model although some indicate they would like minor modifications in any future agreement, chiefly with respect to reducing limitations on access within the agency, and for streamlining the approval system. The current requirement for the database to be stored on a single computer under the control of a single “Database Manager” constrains the use of the data base within the user agency and in particular it constrains the possibility of the user agency hiring temporary staff or consultants to analyze the data. In effect, the “Database Manager” within the user agency becomes responsible for all analysis or for producing custom tabulations for internal use, which may require the survey agency’s approval.

The advantages and disadvantages of changing the current arrangement would have to be carefully discussed among the parties. If consultants are to be provided access to the user agency's data base, then there would have to be clearly understood procedures consistent with security requirements. Future agreements should clearly address the issue of record linkage, and it may be appropriate to specify the user agency's requirements for and contemplated uses of the data more clearly. At least some of these problems could be eliminated by ensuring that what is shared is not simply a raw master file stripped of names, but a properly constructed share file or micro-data file that would ensure the appropriate protections for personal information as well as reduce the scope for misinterpreting the data.

Record linkage

This refers to the linking of data bases by means of a personal identifier (e.g. harvester name, social insurance number) so as to create new information about individuals. Examples would include the linking of personal harvest data to employment and income data or social assistance data. One advantage of record linkage is to reduce the burden of the survey on respondents by using information that already exists rather than collecting it again. However the practice does raise concerns about privacy protection.

The main agency expressing an interest in record linkage is the NBS. The most obvious means of record linkage is by personal identification, i.e. harvester names. But merely stripping harvester names from a master file does not prevent record linkage, as there are other methods of data matching, e.g. by using tombstone data, especially date of birth. The means by which record linkage is to be prevented, unless specifically authorized, should be specified in the data sharing agreement and in the rules for constructing the share file.

As a general rule, user agencies should have to make a very strong case for record linkage, based on a clear hypothesis or research need in support of a proposed program (see, for example, Statistics Canada's *Policy on Record Linkage*, available on-line at www.statcan.ca). There is a concern that public perception of record linkage could jeopardize participation.

Concluding observations

The parties may wish to satisfy themselves that they have accounted for current "privacy principles" by conducting, at a minimum, a self-assessment of the privacy impact of whatever survey model is adopted. If all participants conduct such an assessment cooperatively at the outset, it would ensure that the privacy risks to participating harvesters are clearly identified and understood by all participating agencies, and this would provide essential information for informed consent by harvesters. Parties may wish to obtain legal advice or the advice of privacy experts. It is essential to keep in mind, for planning and budgeting purposes, that implementing the basic requirements of privacy and confidentiality of survey data requires ongoing training of personnel, program monitoring, and physical resources, and hence both staff and financial resources.

Chapter 5. Management and Funding

5.1 Management

There was general support for the NWMB to continue in its present management capacity, on the grounds that:

- The success of a survey rests on the willingness of Inuit harvesters to participate. They must trust the delivery agency, which should therefore be arms-length from government. Survey management cannot rest with a regulatory agency, and this would be especially so if the data were to be used for compensation purposes.
- If the survey is to be Nunavut-wide (not Inuit-only) the NWMB is the logical choice.
- The NWMB has the capacity to work effectively with the RWOs and HTOs.
- The NWMB has the experience.
- NWMB management assures a partnership philosophy with participating government agencies.

It was also noted that if the NWMB were to manage a future survey, several improvements would be required. This would involve increasing the participation of the field staff in the decision-making and providing regular reports and feed-back to the harvesters and sponsors. Some respondents suggested that if a future survey focused only on Inuit harvesting, then NTI should be the managing agency, because this would be the only way to assure Inuit control over data collection and the nature of data sharing agreements. Whether NTI could meet the requirements of security and privacy discussed in chapter 4, would have to be considered.

There were also strong arguments made for the establishment of some type of advisory board comprised of individuals with technical expertise in a variety of matters including very importantly, social sciences, community involvement and communications. While the NWMB could retain overall management responsibility, it would act based on the advice of this board. As pointed out earlier in this report, harvest surveys are essentially social surveys, particularly if more socio-economic information is sought. Design, collection methodologies and analysis must, therefore, draw on the expertise of social scientists and the knowledge of Inuit harvesters themselves.

It would be both premature and inappropriate for us to recommend which agency would be the most appropriate to conduct a future survey. Whatever agency is selected, however, must have the competence and the resources to ensure that key concerns of data security, privacy protection, data base management, and data quality assurance and control. Doing a large and ongoing survey successfully requires much more than being able to send people door to door to ask questions, and entering the data into a computer.

5.2 Funding

Level of funding

The NWMB indicates that the current Study will cost nearly \$7.5M when completed. This included a year for start up, five years of data collection, and a year to analyse the data and prepare final reports. Based on a sample size of approximately 4200, the cost per harvester per year of data is in the order of \$360. This is similar to the cost per harvester per year in the Inuvialuit Harvest Study, and in that case at least half of the cost is in field worker salaries (Usher et al. 1996:18-20).

We do not believe that per harvester data costs in the Canada model can be significantly reduced. While there may be some savings from streamlining aspects of a future NHS based on past experience, the overall costs may even increase to accommodate required improvements in communication, reporting and increasing the number and salary of fieldworkers. Adding additional data requirements, such as more elaborate socio-economic data, will further increase the costs both in the collection and analysis stages, as will improving design and implementing privacy and security requirements.

The Alaska model on the other hand would appear to offer some significant costs savings, chiefly by reducing the reporting cycle interval and by conducting surveys in any one place on an occasional rather than annual basis. However, there are likely higher design and analysis costs. Either way, conducting harvest surveys is costly. Equally clear is that sufficient financial and human resources should be committed to the work, particularly in survey design, data collection, data analysis, and communications, to produce reliable data.

Sources of funding

Participants generally agreed that the organizations who choose to participate in a future study (or studies) should contribute funds. There was no indication, other than from the NWMB, of the levels each would be willing to contribute. However, several participants suggested that funding should be proportional to what each agency is obtaining from the study.

The government agencies - both Nunavut and federal - expressed a willingness to participate financially in any on-going work. One suggestion from a representative in the Nunavut Government was rather than seeking funds on a department-by-department basis, that collection of harvest data could be considered a government-wide responsibility. It was further noted that inter-departmental negotiations would be required before the GN could make a block contribution.

The possibility of on-going implementation funding through a renewed NLCA Implementation Contract arose in the funding discussions. If the NWMB decides it needs to conduct another study as part of its on-going mandate, it may choose to recommend a level of funding for

discussion in the next round of Implementation Contract negotiations. It was suggested that some agencies may look at whether or not they continue to have any implementation obligations to participate in harvest surveys after completion of the current study. Most government representatives agreed that their needs for harvest data went beyond their NLCA implementation responsibilities and involved their departmental mandates specifically.

Chapter 6. Observations and Conclusions

Our review of the parties' objectives and related data requirements (in chapter 2) suggests significant incompatibility between the usefulness of a typical multi-year kill survey and the varied needs of the potential users. Under the rationale of the current study as specified in the NLCA, the primary user was the NWMB for allocation purposes, and the secondary users were wildlife agencies with management responsibilities (5.4.5). Although the data were to be made "fully and freely available" to the federal and territorial governments (5.4.6), the form in which the data were collected meant that in effect its usefulness was limited to the wildlife agencies, which in fact have legislated mandates that at least imply if not actually specify a need for harvest data.

Now, other agencies would like access to harvest data, but in order for it to be useful to them, they need to be able to link those data to certain socio-economic characteristics of the harvesters, either by adding new questions or through record linkage. Further, it is likely that any new data would become useful in land use planning and environmental assessment, both of which would emphasize the need for a geographical component. Complex questions of data sharing and record linkage thus arise, to an extent neither foreseen nor required in the current survey.

Consideration of how the parties would actually make use of the data, either from the current study or a new one, is constrained by the fact that cleaned and verified data, accompanied by a methods statement and quality evaluation, are as yet unavailable. It seems fair to say, indeed, that there are high expectations of the usefulness of the data (even if at the same time doubts are expressed about the degree of their reliability), but the data have not yet been tested against these expectations. The likelihood is that as these data become available and the parties (and others) become aware of their potential uses, there will be a growing demand for access to these data as well as for their continued production in some form. While there may be demands for these or similar data, the parties should consider carefully the extent to which the fulfillment of their mandates would be significantly constrained by the absence of these data in their present form, and what other forms of data collection to meet their specific needs might be open to them.

Although respondents by and large considered that the NWHS data will be sufficient and reliable for most desired purposes, this bears further assessment and confirmation when these data become available, for reasons discussed in chapter 3. However, in that chapter we have only identified the issues that need to be addressed in such an assessment. Nothing we have said there, however, should be interpreted as even a preliminary assessment, let alone a definitive one, of the reliability or usefulness of the current survey.

Reviewing chapters 3 and 4, certain key design features emerge from the Canada model (see p.5), which have significant cost implications. Our comments assume that a new survey would be a cooperative venture among, at the least, Inuit harvester organizations, government agencies, with a perceived neutral or arms-length body (such as the NWMB) designated as the survey agency. They also assume that the "core" purpose of a survey is to obtain kill statistics including

geographic location, and that other requirements would be met by adding on questions, not by replacing the existing core questions.

If it is decided to proceed with harvest data collection, here are the things the parties need to consider:

1. More precise reliability criteria to aid in design.

This is an important question because the wildlife agencies tend to believe that harvest survey data are not sufficiently reliable to identify year over year trends (although we think that expectations of a properly designed and conducted survey should be higher). If true, however, it is not obvious why the wildlife agencies would need annual data for all species in all places. The alternative is to develop highly targeted monitoring programs, using a mix of observation, mandatory reporting (as in the case of polar bears), and voluntary survey, to obtain the required data for species or populations of management concern. Whether this would be more costly or less costly than the current arrangement would depend on what criteria are set and what kind of design is required to meet those criteria.

2. Identifying the sampling frame (hunter list).

This requires prior agreement on rules and their consistent application. This in turn requires more oversight by the survey agency, better communication with RWOs, HTOs, and field staff, and the maintenance of an adequate record of decisions at the local level.

3. Sampling strategy

This also requires prior agreement among the parties. Many advocated increasing the number of fieldworkers and seeking full coverage in all communities. Others suggested reducing the sampling rate, but this requires more expert design input and analysis. Added costs could outweigh any savings in fieldworker costs, and would certainly have the effect of relocating employment from the communities to survey headquarters (or beyond).

4. Promoting high response rates (minimizing non-response bias)

This certainly requires enhanced fieldworker effort, reduced fieldworker turnover, more oversight by survey agency, and effective communication among headquarters, field staff, and very importantly, the harvesters themselves. Incentives for participation could be considered. Participants were unanimous in support of ensuring that survey results be reported regularly to the harvesters. Consideration should be given to the possibility of hidden non-response, which if suspected should be tested for by supplementary surveys. If it is suspected that super-harvesters are not reporting to the survey, this should be reported to the survey agency.

5. Managing response error

This requires greater attention to survey design, quality control in survey conduct, better

communication, informed consent, privacy assurances, and better incentives (whether educational or financial) to harvesters to participate.

6. Defining core variables - harvest, species, harvesters, sex and age-class of animal, kill location

This requires expert input, prior agreement on rules, and ongoing oversight by the survey agency to ensure consistency of application. However, adding, subtracting, or modifying the list of variables does not significantly affect costs, and there is little saving to be gained by reducing items (although some suggested reducing the species list).

7. Effort information

Effort information can be helpful but not necessarily essential for wildlife agencies (except for fisheries management which requires more precise information than a survey can provide). This information is important to Inuit for compensation, and to government agencies for economic analysis and program design. However its specific form, and how it is aggregated and analyzed, would be different for each user. It is an add-on that potentially distracts from the core purpose (assuming that core purpose is kill statistics), potentially a long and detailed add-on (although not required monthly, or for all species), to meet the purposes of both compensation and government planning. We recommend that effort information be obtained through a separate although possibly related survey. Obviously this would entail additional costs.

8. Socio-economic information

This information is by and large not needed by wildlife agencies. It is important to government for economic analysis and program design. Tombstone data do not require much extra effort to obtain. This can be done through a one-time add on at the beginning of the survey and possibly each survey year. However, variable social characteristics, even though not required on a monthly basis, potentially add a significant response burden with a risk of reduced harvester participation. Record linkage increases this risk.

9. Inuit Qaujimagatuqangit

Inuit knowledge of environment and resources was identified by some participants as providing very important contextual information and perspective to assist in drawing conclusions and working with kill data. As with effort and socio-economic information, it is difficult and time-consuming to collect systematically. We must also point out that working with Inuit Qaujimagatuqangit is very much part of the mandates and organizational philosophy of the Inuit organizations, the Government of Nunavut, and the NWMB. This is particularly important because future surveys will be geared more towards providing data for wildlife management and related program development.

10. Household or individual approach

On balance it would appear that harvest data and effort data are most reliably obtained through individual reporting, although proxy reporting is probably appropriate for other socio-economic data. If it is commonly agreed that basic tombstone data should be part

of a new survey, this would impose a new but not necessarily costly requirement on the maintenance of the hunter list, involving mainly clear design and agreed rules at the outset.

11. Reporting cycle and survey contact

The choice of reporting cycle has major implications for survey infrastructure and costs. A monthly cycle requires permanent and continuous part-time employment of fieldworkers in each community, probably for this dedicated purpose. Lengthening the cycle to an annual or seasonal basis might require a more mobile fieldworker unit, not necessarily resident in the community.

12. Duration/frequency

It is impossible to recommend the appropriate duration or frequency of a new survey until the existing data are assessed. However some suggested reducing frequency either by doing the whole thing only every few years or by doing only some communities each year. There are major implications for survey infrastructure and employment.

13. Continuous and detailed record of decisions

This is essential for producing a proper methods statement and for ongoing quality control and adjustment, especially with respect to items 4, 6, and 10 of this list. It requires more work by the survey agency and especially the management committee.

14. Validation procedures, quality assurance and control

Maximum use should be made of comparable error free information, or information whose error is reliably measurable, as well as of appropriate and cost-effective methods of error estimation and minimization.

15. Need for management structure and technical oversight

There is a need for clear reporting lines, policies, procedures, protocols, no matter what model is chosen. It is our strong recommendation that social science expertise and harvesters themselves be brought into the process starting at the design stage.

16. Communications

There are two aspects to communication that need constant attention by the survey agency. One is communication with harvesters about the objectives and results of the survey, which requires at least annual feedback and discussion of information. The other is effective two-way communication between field staff and headquarters about the ongoing conduct of the survey, and ensuring that field staff have adequate input into decisions that affect the conduct of their work in the communities.

17. Data analysis

There is a need for systematic and ongoing analysis of survey data and procedures, and the periodic use of independent data as a cross-check, in order to recalibrate and improve

the survey as required, and to communicate survey results.

18. Data products

If a Canada model survey is adopted, the priority products should be:

- record level data files available under data-sharing agreements with sponsoring agencies
- annual data and methods reports
- non-technical or layman's products primarily for Inuit harvesters
- custom tabulations for private parties to be done by the survey agency, to be provided by established protocol and possibly on a cost-recovery basis.

All of these should be made available according to a public release policy that is agreed to among the parties prior to survey start-up.

19. Data access and control

Key issues to be addressed are:

- informed consent, and how it is appropriately obtained
- security and retention of data
- privacy protection
- access to personal information
- data sharing agreements
- record linkage

Informed consent must be based on participants' awareness of the survey agency's policies on the other five issues.

Any likely candidate agency to manage the survey should be assessed for its capacity to provide for adequate security and retention, privacy protection, and data sharing agreements, as well as analytic capabilities.

We believe that efforts to link NHS records with other data bases risks creating mistrust among harvesters, and that security breaches may occur despite the best of intentions. Record linkage involves complex consent and data sharing arrangements, which may diminish harvester participation. This can create problems of non-response bias which may already be border-line in some cases, and is a special concern because there is such variance in both harvest quantities and species specialization by harvesters. The parties may wish to consider conducting a privacy assessment of whatever models are selected for future surveys.

On balance, to make a new survey along the lines of the old model work, there will have to be more attention to design, methods, communication, and analysis, and this will require more money not less. The Canada model yields high quality data if properly conducted, but at a significant cost. These costs are associated with the core requirements of design and implementation, and cannot be significantly reduced by tinkering with the variables (survey content). An important question that will remain unanswered until the data and methods from

the current survey are available, is how useful these high quality data really are to the participating agencies.

The current hiatus in data gathering provides an excellent opportunity for the NWMB, with the support of interested parties, to examine data integrity and robustness, and to analyze the data in order to assess future needs. We recommend strongly that every advantage be taken of this opportunity, as a means of ensuring that any future harvest survey, whatever its specific form, is designed for maximum effectiveness and efficiency.

Is a new survey along the lines of the old model really needed?

The problem in answering this question is that we still don't know what the first five years told us. It is hard to determine whether the current Study has been useful to the participating agencies, beyond the obvious requirement of establishing BNLs, because no one has yet seen the full results of the Study, including a clear description of its methods. The main points arising out of chapters 3 and 4 are ones that people need to keep in mind when they are looking at the output of the current Study, in order to figure out whether they might need a new survey. The NWMB's planned exit survey will also be a helpful source of information, as will its final methods statement.

Another question is whether kill data alone can explain very much, without contextual information, which the current model does not supply. The prevailing view of the parties (with which we concur) is that more contextual data, whether IQ or socio-economic, would help. The problem is how to obtain this contextual information, and indeed whether it can or should be obtained directly through the Canada model.

So it is still not entirely clear what people are really looking for, and what kind of survey is really required to get this information. What does seem to emerge is that it will be difficult to get all of the answers by means of a common survey, without jeopardizing the core requirement of kill statistics and geographic location, which are central to wildlife agency and Inuit requirements. A lot of questions would have to be added, and more complex informed consent and data sharing agreements required, could jeopardize participation and trust.

We believe that, given the stated and foreseeable requirements of the various parties, it is neither conducive to good results nor cost-effective to expand the existing model to try to meet all of those objectives.

What else might be done to meet the parties needs?

Options

The range of options appears to be as follows:

Option 1: The existing model plus add-ons for, at least, socio-economic and effort information. We recommend against this. This approach is untested, costly, and entails many complications and risks. These are associated chiefly with privacy and consent issues, the collection of some information at excessive detail, increased response burden, and hence the risk of increasing the incidence of non-response and reducing the reliability of the results. While the Canada model, which is essentially a kill survey, is tried, tested and true, adding on significant elements to it is not. We do know, however, that overburdening a survey is a well-established means of killing it.

Option 2 - the existing model, essentially limited to a kill survey, but improved, streamlined, and tailored to specific needs based on a review of current data. This is well-assured of success, so long as it meets the basic requirements of design and implementation. The result should be not only good data but data that are effectively used. The Canada model can be made more cost effective, if the key elements for improving design and content identified above are adopted, but not necessarily much cheaper. It requires both more attention to field workers, who are the key to success particularly for ensuring high response rates, and to survey methods and data analysis skills in headquarters. This option could be more explicitly linked to other harvest data collection systems associated with existing tag and monitoring programs for certain fish and wildlife species.

Option 3 - occasional annual surveys, along the lines of the Alaska model. This type of survey could include other contextual information, especially basic socio-economic characteristics of harvesters. Good results can be expected as long as basic design and implementation criteria are met. This model is significantly cheaper because it doesn't need to be done every year in every community, and can rely on annual rather than monthly reporting. There is obviously a tradeoff in the detail of the kill statistics, perhaps especially with respect to time and place of kill. Using a reduced frequency, for example every ten years, raises the question of the representativeness of the year in which the survey occurs, although over time there should be sufficient accumulation of results to reduce this problem (see e.g. Wolfe et al. 1990:5-17). But if the wildlife agencies themselves are not convinced of the reliability of the data, does this matter?

On the other hand, the Alaska model can serve a wider variety of interests (especially those of DSD-CED and NBS), especially once the baseline conditions are established in the initial survey. The model is more amenable to periodic add-ons and changes in survey variables. The identification of significant changes over time is still possible. The published record of the Division of Subsistence (Alaska Department of Fish and Game), consisting of nearly 300 published reports over 20 years, along with that of the U.S. Minerals Management Service for the purposes of impact assessment, provides far more comprehensive and inclusive documentation and analysis of subsistence in Alaska than exists for any part of the Canadian North, far more so than a simple kill survey, however reliable and thorough, can ever provide.

The Alaska model requires more research. One problem is how well the annual recall of an entire year's harvest (and other information) actually works. Another is the extent and manner of geographic referencing of kill data. Yet another is cost and infrastructure. These matters are not

clear from the documentation available to us. We suggest that this model be investigated further and considered seriously as an option, but we do not have a sufficient basis to recommend it in preference to the other options.

Option 4 is of course to do nothing, to conduct no surveys at all on subsistence harvesting. This is impractical as important needs will not be met, and we do not recommend this.

One reason that many participants seem to favour a continuation of the existing model is that it maintains survey infrastructure and community employment. But the Alaska model could also do this, and in fact make greater and more diverse use of community survey skills than the existing model does. Survey skills need to be seen as more than just the ability to get information door to door every month, they involve communications, basic knowledge of how surveys work and how to identify, record, and communicate problems so they can be fixed as they arise. The Alaska model probably implies the use of survey skills at a regional level, requiring an experience corps of field workers who would be expected to do surveys beyond their home communities.

The Alaska model appears to provide an effective solution to the problem of obtaining and linking socio-economic, effort, and harvest information through the same survey or system of surveys, and so meet both government planning needs and Inuit compensation needs.

The best approach may be a mix of options 2 and 3. Advantages would include:

- reduced response burden,
- avoiding record linkage,
- enhanced privacy guarantees,
- maintaining adequate geographical referencing, and
- greater cost-effectiveness.

Whatever approach is taken, there should be more emphasis on conducting formal tests and evaluations on data quality and survey effectiveness, rather than just doing them routinely. There also needs to be greater attention to the frequently overlooked matters of communication, privacy, and data sharing agreements. Consequently, while cost savings can be achieved in some areas, these may be outweighed by the need for greater investment in effective communication, improved survey design, enhanced support for field staff, and ensuring that the survey agency qualifies as a competent agency for the purpose of data security, privacy protection, quality assurance and control, data base management and data release, and analysis.

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Appendix 1

Planning for Harvest Data Collection in Nunavut

Interview Guide

For interviews in Nunavut, June 2001
To be conducted by Peter Usher and Lorraine Brooke
(P.J. Usher Consulting Services)
on behalf of
Nunavummit Kiglisiniartiit

This interview guide lists the questions we would like to ask you when we meet. Please take the opportunity to think about these questions with anyone else in your organization who may be interested. If you don't know the answers to some questions, or have no opinion about them, you do not need to answer them. We will take detailed notes of the interview and send them to you for your verification. You can also provide us with written answers to any or all of these questions, if you like.

Respondent identification

Name

Date

Contact for follow-up if necessary (phone, fax, email)

Representing what agency?

Brief description of role and responsibility in agency

Length of time in current role

Previous roles and responsibilities relevant to interest in harvest data

Part 1: Expectations of the Current Harvest Study

1. What is your interest in the NWHS? What objectives of your organization are or might be served by the results?

2. Do you or will you use the results for:

- a) establishing basic needs levels or other harvest allocation issues
- b) wildlife/fisheries management

- c) wildlife compensation (NLCA article 6)
- d) conservation education/comanagement participation
- e) economic statistics/planning/evaluation
- f) harvester support or other program development
- g) impact assessment/screening and review/other environmental management
- h) policy development

Explain in each case.

3. What will NWHS data (in the format available to you) enable your organization to do that would not otherwise be possible? Explain how your decision-making, or the fulfillment of your obligations, will be improved.
4. Would the data be more useful to you in another format? If so, explain.
5. Have there been any unanticipated or unintended effects of the NWHS, either positive or negative?
7. Are there data needs that are unmet, but that could feasibly be met through program modification? What are they? What modifications would be required?
8. Are there unrealized potential uses of existing data, and of the program for obtaining them?

Part 2: Building a Strategy for Future Data Collection

Based on your knowledge of

- the design of the NWHS
- how the NWHS has been conducted to date
- available data output of the NWHS
- other harvest surveys

We would like to ask you about your views on the quality and reliability of the results of the NWHS and how they could be improved in a future survey.

1. Sampling frame:

- a) How harvesters were defined and categorized for the NWHS? (E.g. age, sex, status, activity level).
- b) Responding individually or on behalf of a household.

Please comment on any problems that arose, and how you would recommend the sampling frame be identified in a future survey.

2. Sampling strategy:

In some communities, different sampling rates were used for different classes of hunters. In others, the NWHS tried to interview as many hunters as possible.

In your opinion, was the sample in each case a random or probability sample, or was it biased? Please comment on the utility and/or problems of these strategies, and how you would recommend this be done in a future survey.

3. Response rate: Please comment on response rates to the survey (if you are aware of them) in terms of adequacy and consistency.

4. Non-response (who is not responding to the survey and why?):

- a) were there people who refused to participate in the survey, and do you think this affected the quality of the results (e.g. by biasing the sample)?
- b) are you aware of, or do you think there might have been, cases where people effectively avoided responding to the survey by stating that they did not hunt during the reporting period, when in fact they did? Do you think this happened often enough to affect the quality of the results? Please comment on where and why this occurred.
- c) are you aware of situations in which the field workers either did not or could not contact a significant number of persons on the hunter list?

If any of the above was a problem, how do you think it affects the results of the NWHS? How should it be fixed in a future survey?

5. Response bias:

- a) do you think that most people responded as truthfully and accurately as they could to the survey?
- b) if not, do you think they report their harvests too high or too low? If you think this varies by species or place, be specific.
- c) if not, is it because of loss of memory (recall failure) or is it intentional.
- d) if people intentionally misreport, what are the possible reasons? [list]
- e) do you think response bias was important enough to affect the results of the survey?
- f) how would you reduce response bias in a future survey?

6. Considering all of the above factors, do you feel that NWHS results are (will be) sufficiently reliable for your purposes with respect to:

- large mammals (big game)
- small game
- marine mammals
- migratory birds

- fish?

Please comment on any variation among species groups, or on variation by place (e.g. large communities, small communities)

7. Considering all of the possible sources of bias or error in harvest statistics, how reliable do you expect the results to be in order to be useful to you? Can you express this in terms of acceptable margin of error and confidence interval? How would this compare to the reliability of other key data you work with (e.g. fish and wildlife population data, other harvest data, social and economic data).

8. Is it important to have independent sources of harvest data that can be used to verify or cross-check the reliability of NWHS or other harvest survey data? What data sources would you suggest, and how reliable are they? Do any of these already exist? (E.g. tag data, sales data). Who maintains these records?

Part 3: Expanding or Modifying Survey Content

1. For what species (or species groups) do you need harvest information? Why? Can you prioritize on the basis of "need to know" and "nice to know"?

2. Do you need to be able to identify the stock/herd/population from which harvests are being taken? Why? If so, is the current method of kill location satisfactory for this purpose?

3. Do you need to know the sex and/or age-class of animals killed? For which species? Why? If so, comment on appropriate methods of obtaining this information, within a harvest survey or otherwise.

4. Do you need information on harvesting effort? Why (e.g. compensation, economic analysis). What indicators do you require (e.g. time, gear, expenditures). In your opinion, what would be the best way of getting this information (e.g. as part of a harvest survey or separately)?

5. Harvest location (geography)

a) Do you need to know the location of harvests?

b) If so, at what level of detail?

c) was the manner in which kill location was recorded in the NWHS satisfactory for your purposes?

d) if not, how would you change it for a future survey?

6. Does all (or any) of the above information need to be collected every year? If not, how often? Please explain in each case.

7. Thinking about all of the questions we have asked in part 2 and part 3, what major changes

would you make to a future survey that would reduce costs, or improve cost-effectiveness, without inappropriate sacrifice of data quality?

Part 4: How the Data are made Available and Used

Different users require harvest information in varying formats. We would like your views on how the data should be reported to meet your needs.

1. At what level of detail do you require harvest data?

- record level
- micro-data file
- custom tabulations
- monthly/annual report by species by community
- geography included?
- other

Explain

2. Ideally, how often do you need access to the data or receive reports? Is once a year sufficient? If so, at what time of the year? Does it depend on the species (e.g. at the end of a char run or a caribou migration)?

3. If a harvest survey were to be undertaken in future, what other products should be produced?

- Inuit versions
- layman versions
- maps, e.g. showing location and season of harvests
- information posters
- other media

Explain

Part 5: Conduct of Surveys

We would like to ask you about your views on the effectiveness, and efficiency of the conduct of the NWHS in the communities (to the extent that you are aware of this). Please comment on the following with respect to the objectives of the current NWHS, and any future harvest survey that you believe should be conducted.

1. Hiring, training, and employment of field workers

2. Information to harvesters about why they should participate, progress and interim results of survey.

3. Relationship between local field workers and HTOs

4. Use of recording aids, calendars etc.
5. Reporting cycle (monthly as at present, or some other interval).
6. Do you consider that harvesters continue to be willing to participate in the NWHS, or are they getting tired of it? If the latter, what could be done to encourage their participation in a future survey?
7. Is it necessary to for field workers to interview hunters door to door, or might some other reporting system work?
8. In your opinion, how receptive were harvesters and field workers to the conduct of the survey?
9. Appropriateness of NWHS demands on time and resources of other agencies.

Part 6: Data access, Control, Privacy

1. What should be the system of obtaining informed consent of harvesters?
2. Who should control the data?
3. What should be the public release policies, who should authorize release and on what basis?
4. Who should have access to record level or similarly disaggregated data, and under what conditions? If you would like to enter into a data access agreement with the controlling agency, what should the basic elements of that agreement be?
5. What assurances of privacy and confidentiality can and should be given to harvesters? (Please comment with respect to existing ATIP legislation and policies, if you are aware of these).
6. What conditions should govern access to personal information by harvesters themselves?
7. What conditions should govern record linkage with other data bases?
8. Are you aware of any problems with regard to these issues arising from the current NWHS? Explain

Part 7. Roles and Responsibilities in Future Surveys

If you consider it necessary to conduct harvest surveys in the future, please comment on the following:

1. Survey management:

- a) who should manage the survey?
- b) should there be an overseeing body responsible for technical and management decisions? If so, who needs to be represented on it, and on what basis?
- c) what local controls should there be on technical and management decisions?
- d) does there need to be a regional management structure as well as an overall one? How should this work?
- e) please comment on the effectiveness of the existing relationship between headquarters, regional offices, field workers, and HTOs, and how these might be modified in a future survey.
- f) on what basis should field workers be engaged? (E.g. regular part-time salary, fee per interview). What training do they require? What level of supervision do they require? Is it necessary to have periodic workshops to ensure consistency and best practice?

2. Is it important to collect social and economic information along with harvest data? What kind of information would be important (e.g. age, sex, employment, sources of income, harvesting expenditures). Should these be obtained through harvest surveys or separately by some other means? How would you use these data? How important is it to be able to link harvesting and socio-economic data by individual? Provide some examples of the tabulations or analysis you desire.

3. Did you or do you intend to, as part of the NWHS or in relation to it, obtain:

- a) any socio-economic information on participating hunters?
- b) information on hunter effort?
- c) was this successful and how did it affect the administration of the NWHS itself?

4. Funding and costs:

- a) who should pay? On what basis?
- b) roughly, what would be an appropriate overall level of funding?
- c) roughly, how much would your organization be willing to contribute?
- d) do you think the original budget of the NWHS was realistic? If not, why? Were there effective cost controls? If not, what would you suggest?
- e) what criteria would you use to determine the cost-effectiveness of a harvest study?
- f) what controls would you like to see in place to ensure that the data you need are obtained on a reliable and timely basis?

Finally,

5. If you do not believe a harvest survey is necessary in future, how do you intend to obtain whatever harvest data you need?

Appendix B

List of persons interviewed

Person	Agency	Interviewer	Date	Place
Todd Roche	KHTA/NWMB	LB	31/05	Cambridge Bay (phone)
Stephen Atkinson	DSD	PJU/LB	18/06	Iqaluit
Mark Mallory	CWS	PJU/LB	19/06	Iqaluit
Karen Ditz	DFO	PJU/LB	19/06	Iqaluit
Leesee Papatsie				
Michelle Wheatley	NWMB	PJU/LB	19/06	Iqaluit
Heather Priest				
Tom Demcheson	NWMB	PJU/LB	19/06	Iqaluit
Joe Tigullaraq	QWB	PJU/LB	20/06	Iqaluit
Glenn Williams	NTI	PJU/LB	20/06	Iqaluit
Alison Rogan	DSD	PJU/LB	20/06	Iqaluit
Jack Hicks	NSB	PJU/LB	21/06	Iqaluit
Laurie-Anne White				
Janet Akat	KWB	LB	23/07	Rankin Inlet (phone)