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RECOMMENDATIONS FOR A STATEWIDE ALASKA MIGRATORY BIRD SUBSISTENCE HARVEST SURVEY

Submitted to the Alaska Migratory Bird Co-management Council by
the Subsistence Harvest Survey Ad-hoc Committee, October 1, 2003

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ABSTRACT

The Alaska Migratory Bird Co-Management Council (Council) recognizes that there is a need to quantify the subsistence harvest of migratory birds and their eggs. To address this issue, the Council formed an ad-hoc committee (Committee) to design a statewide subsistence survey. Due to the geographic extent of Alaska and number of subsistence hunters, a complete census of subsistence hunters is not practical or cost effective. The Committee recommends that 2/3 of the villages within each participating region be surveyed. Households should be sampled by applying a stratified random design with 40% of high, 15% of low and 10% of Anon-hunting@ households surveyed within each village. In regions containing only very small villages, the first two strata may be combined and sampled at a 100% rate. This sampling plan will not adequately survey rare or rarely taken species; examples of more intensive survey protocols that adequately survey such species are presented. Budget, data management, reporting, organizational structure needed to implement the survey, survey instruments, and methods for extrapolating harvest estimates from sample data sets are discussed.

INTRODUCTION

In 1997 the United States Senate ratified Protocols that amended the migratory bird treaties with Canada and Mexico. This action authorized the U.S. Fish and Wildlife Service (Service) to open spring and summer subsistence hunting of migratory birds in Alaska. The Protocol with Canada further mandated that Alaska=s indigenous inhabitants be given a meaningful role in migratory bird conservation by participating on relevant management bodies. As a result of this direction, the Alaska Migratory Bird Co-Management Council (Council), composed of regional, Alaska Department of Fish and Game (ADF&G), and Service representatives, was formed. The Council first met in October 2000 and discussed several topics, among which was the documentation of historic and subsequent spring and summer subsistence harvest. Such data are important for describing historic use of migratory birds and for determining whether use was increasing. The latter was particularly important as the amended treaties specifically stated harvest should not increase relative to the overall population size as a result of these amendments. The Council found the available data to be insufficient to address management issues, and resolved to form a Subsistence Harvest Survey Ad Hoc Committee (Committee). This Committee was charged with developing methods to determine statewide subsistence take of migratory birds.

The Committee held a workshop on 10 and 11 December 2001 to obtain comment on alternative approaches from individuals that were invited by Committee members and known to have harvest survey experience. The Committee also retained peer reviewers Virgene Hanna, Institute of Social and Economic Research, University of Alaska, Anchorage, and Dr. Lyman McDonald, Western EcoSystems Technology, Inc., who have expertise in conducting surveys in rural Alaska and statistics, respectively. Following the workshop, the committee met to discuss methods for conducting a survey and the advice given during the workshop. In addition, the Service contracted with Dr. Joel Reynolds to conduct a special analysis of historical data to evaluate levels of sampling intensity needed to obtain satisfactory harvest estimates. Here, are presented the recommendations of the Committee. The recommended survey design will collect data from all participating villages every two years. The Committee recommends a review of the design and budget after the first two year cycle. Additional provisions for review are presented below.

NEED FOR THE PROJECT

A. Statement of problem

Several surveys have been conducted that describe the nature and extent of subsistence harvest of migratory birds in various regions of Alaska. Some of these surveys were designed to document the harvest and use of a wide array of subsistence resources across the state and throughout the year (e.g., ADF&G Subsistence program). Some surveys focused only on specific resources or certain regions (e.g., Service village bird harvest surveys on the Y-K Delta and in Bristol Bay). As a result, geographic coverage, level of detail in resource use data, and time series information are highly variable. Wolfe et al. (1990) took data from these separate reports to characterize the statewide subsistence take of migratory birds for the mid-1980s, then updated the information for 1995 (Paige and Wolfe 1997) and 1996 (Paige and Wolfe 1998). Wolfe et al.=s estimates have been used and cited extensively as the best or only source of statewide data; however, their estimates utilized data that were collected using differing methodologies during different years. The estimates are also for years prior to passage of the Treaty Protocols and will not meet

management needs of the Council and management agencies during the era of a regulated spring and summer subsistence harvest of migratory birds. It has become necessary to design and conduct a statewide survey that utilizes uniform methodologies.

B. Rationale

A statewide survey that employs uniform methods and samples all areas within the same year where subsistence harvest occurs will provide harvest data that are comparable within regions of the state and across years over the entire state. Collectively the Service, ADF&G, and Native organizations have extensive experience in monitoring the subsistence harvest of migratory birds. Combining the knowledge of these entities through the cooperative effort of the Committee is the most prudent approach to developing an effective and efficient project design that will meet the data needs of the Council.

C. Goal and Objectives

Goal: Estimate annual subsistence harvest of migratory birds: by species, statewide, regionally, and seasonally.

Objectives:

1. Be able to compare migratory bird population trends with harvest trends by species.
2. Harvest Survey results, at a minimum, should be comparable to the national Harvest Information Program (HIP) with similar or better accuracy and precision.
3. Design a consistent statewide survey based on coordinated existing regional interests and ongoing information gathering programs, utilizing local expertise and resources.
4. Design a survey to minimize response burden.
5. Ensure quality control in all aspects of harvest survey.
6. Develop a database and criteria for its management.
7. Develop approaches to determine the harvest of species with small populations, limited distribution, or other conservation concerns.

D. Application of Data

The collected data are intended to facilitate the development of migratory bird management recommendations by the Council. Reliable harvest data are needed to guide the management of migratory birds both within and outside of Alaska. We anticipate that subsistence harvest data ultimately will be used for several specific applications. The Protocol which amended the 1916 Migratory Bird Treaty states, Athat it is not the intent of this Protocol to cause significant increases in the take of species of migratory birds relative to their continental population sizes, compared to the take that is occurring at present.@ Accordingly, an important use of the initial statewide harvest surveys may be to quantify the proportion of subsistence harvest occurring in Alaska relative to the continental population size for each harvested species as well as better document the extent and importance of these resources to the economy and culture of subsistence communities.

Subsequently, accumulated subsistence harvest data will be valuable in detecting changes in the magnitude and composition of harvests, and evaluating the effects of regional harvests in relation to seasonal life cycles of birds. Ultimately, Alaska subsistence data should be complementary to HIP that estimates migratory bird harvest by hunters throughout the United States. Together, data from these surveys will improve the basis for management of particular bird populations, rangewide, by assessing the effects of all harvests in relation to the status and trends of bird populations,

measured annually by state and federal surveys. Expanded harvest information will support improved cooperation among the AMBCC, the Flyway Councils, and the Service to develop effective harvest strategies and hunting regulations. The utility and success of the harvest survey will strongly depend on the development of specific and clearly articulated management questions that can be used to implement a relevant and adaptive survey program.

E. Completion Date

Final recommendations for a statewide migratory bird harvest survey are due to the Council by fall of 2003. The committee recognizes that the 2004 survey will employ an interim design constrained by instruments that were approved by the U. S. Office of Management and Budget (OMB) on October 2, 2003, and by available budgets. The design presented here, however, is for a full performance statewide survey that will incorporate improvements and, hopefully, additional funding in 2005. The Committee and Council expect that statewide subsistence bird harvest surveys will become an annual operational program.

F. Products

The harvest survey should develop annual reports that give statewide and regional accounting of the harvest, and are accessible to managers and the public. Because these data will either be collected by or under contract to the Service, most products will become part of the public domain and freely available. In order to protect the privacy of participating households, however, their anonymity must be maintained during all stages of the survey process. Trust between those conducting the survey and those surveyed is essential in obtaining accurate data and maintaining mutual respect. Protection of individual privacy and cultural sensitivity must be incorporated into the survey design and the methods for recording data.

Annual products of the statewide survey will be available at several levels: (1) general summaries of harvest by species and region will be freely accessible and distributed; (2) community-level data will be accessible to authorized users, as necessary, for purposes of additional analyses of harvest data or the effectiveness of the survey program; but (3) household-level harvest data (anonymously coded) will only be accessible at initial data entry and to survey program supervisors. An archive database will serve as a repository for accumulating annual information that will be accessible for future analyses. Appropriate archive data and summaries of current year data will be available through a website with security features that will allow general access for data summaries and controlled access to other data layers by designated individuals.

COMMUNITY INVOLVEMENT

Community participation is a crucial part of local support, and includes local hire of data collection technicians. Most previous surveys have been conducted by using local hires who have been trained in survey methodology. This has been a successful approach and should be continued in a statewide program. The survey will be conducted in a manner consistent with AEthical Principles for the Conduct of Research in the North@ (ACUNS 1997). In general, this requires obtaining informed consent by participating communities and individuals prior to the survey, respecting participants and consulting with them during the survey, and providing communities the results of the survey and opportunity to comment on findings. Full involvement of local people in the

harvest survey will promote appreciation of the survey in villages, as well as support the work of regional co-management committees and the AMBCC.

SURVEY ADMINISTRATION

The statewide survey will be administered and funded by the Service and conducted locally by a combination of the Service, Alaska Department of Fish and Game, local governments, and Native organizations. The organizational chart depicts the administrative structure for the survey (Figure 1). The survey will be headed by the Harvest Survey Coordinator, who will have an assistant. Both of these will be Service employees, and will have Service support as depicted on the chart. The Harvest Survey Coordinator and assistant will work directly with ADF&G=s Alaska Subsistence Data Program Coordinator, who will be in charge of Data Management/Analysis and Support. Three Assistant Survey Coordinators will oversee data collection in the field. These will be ADF&G=s Southcentral, Interior/Western/Arctic, and Southeast Regional Subsistence Supervisors or their designees. These three Assistant Survey Coordinators will provide the consistency and standardization across regions of Alaska that is essential to providing consistently-gathered data to the Data Management Coordinator.

Surveys will be conducted in the 12 AMBCC regions by the survey field coordinators, who will be trained by the three Assistant Coordinators with oversight by the Harvest Survey Coordinator. These survey field coordinators will be Service National Wildlife Refuge System employees (Refuge Information Technicians); ADF&G Division of Subsistence employees, and Native organization employees. A standardized harvest survey handbook will be used, with directions on how to properly fill out OMB Forms 7-FW 100, 101, 102, and 103 and how to carry out other survey procedures. The three Assistant Survey Coordinators will work with these survey field coordinators in their respective regions of Alaska, as follows:

Assistant Survey Coordinator, South central Region

1) Aleutian/Pribilof Islands Assocation
   Aleutian/Pribilofs Harvest Survey

2) Bristol Bay Native Association
   Togiak NWR Harvest Survey
   Alaska Peninsula/Becharof NWR Harvest Survey
   Bristol Bay Native Association Harvest Survey

3) Chugach Regional Resources Commission
   Harvest Surveys for Chenega, Tatitlek, Port Graham, and Nanwalek

4) Cook Inlet
   Tyonek Harvest Survey

5) Copper River Basin
   Copper River Native Association Harvest Survey
   Chistochina, Chitina and Mentasta Harvest Surveys

6) Kodiak Area Native Association
Kodiak Village Harvest Survey
Kodiak City and Road Connected Harvest Survey

Assistant Coordinator, Interior/Western/Arctic Region

7) Kawerak, Inc.
Kawerak, Inc. Harvest Survey

8) Maniilaq Association
Maniilaq/Selawik NWR Harvest Survey

9) North Slope Borough
North Slope Borough Harvest Survey
(Arctic NWR for Kaktovik)

10) Tanana Chiefs Conference
Innoko NWR Harvest Survey
Kanuti NWR Harvest Survey
Koyukuk/Nowitna NWR Harvest Survey
Upper Tanana-Tetlin NWR Harvest Survey
Yukon Flats Harvest Survey (Yukon Flats and Arctic NWRs)
Other Tanana Chiefs Conference villages

11) Association of Village Council Presidents
Yukon Delta NWR Harvest Survey
Upper Kuskokwim Harvest Survey

Assistant Coordinator, Southeast Region

12) Central Council of Tlingit and Haida Indian Tribes
Hoonah Egg Harvest Survey

The Service will contract with ADF&G Division of Subsistence for the services of the Data Management Coordinator (Data Program Coordinator), the three Assistant Survey Coordinators (Regional Supervisors) and for some of the surveys. The Service will also contract with Native organizations, and will have Memorandums of Understanding (MOU=s) with individual National Wildlife Refuges (NWRs) for some of the surveys, depending upon available personnel, interest and experience within each region. ADF&G Assistant Coordinators can choose to designate their Subsistence Resource Specialists in their respective areas to perform their duties, or may choose to subcontract these duties to Native organization representatives who are already performing harvest surveys of other species for the Division of Subsistence. This use of onsite personnel, many of whom are already doing subsistence harvest surveys of fish, marine mammals, and big game, will

result in travel, training, and other monetary savings for the Service, which will allow more areas to be surveyed for the same amount of money.

Specific duties of the Harvest Survey Coordinator, the Assistant Survey Coordinators, and the Field Coordinators are listed on the organizational chart. The contracts that the Service has with ADF&G and Native organizations, and the MOUs that the Service has with each Refuge, will spell out the following survey-related tasks:

Working with the regional assistant survey coordinator, train the trainers (contractors and Refuge Information Technicians) in survey procedures, which are as follows:

1) inform hunters about the survey
2) get commitments from villages to participate in the survey
3) obtain permission from each village for participation in the survey
4) advertise for survey participation and select local village surveyor
5) contract with local village surveyor
6) train local village surveyor in how to fill out the survey forms accurately, and in when to pick up and turn in the survey forms with the appropriate paperwork for payment. Specifically, train the surveyor how to correctly complete OMB Form 7-FW 100 List of All Occupied Households; Form 7-FW 101 Households Separated by Hunting Category; Form 7-FW-102 Permission Slip; and Form 7-FW-103 Household Survey Form.
7) Give field assistance to surveyor in beginning and continuing the survey. This means assisting the surveyor in correctly completing Forms 7-FW 100 and 101. Then it means actually going house to house with new surveyors to help them get household permission for the survey (Form 7-FW 102), help the household fill out the survey form correctly (Form 7-FW-103), and tell the household when each form will be picked up. It also means continuing oversight and supervision of surveyor, traveling to the village if the surveyor has problems and/or forms are not being returned as scheduled.
8) Quality control. Review forms for accurate numbering and completion as they come into the Refuge, Native organization or ADF&G field office. Work with village surveyor to correct mistakes as soon as possible after the forms arrive in the office. Travel to the village to help the surveyor if necessary. If you wait months to try to fix mistakes in numbering or incomplete survey forms, etc., it may be too late!
9) Pay the surveyor according to the number of forms that have been submitted.
10) Audit the data using more than one person to check it. Then have the data submitted through the assistant survey coordinators and data management coordinator.

BUDGET

Table 1 shows the proposed project budget for the harvest survey data collection as $346,000. You will note that each project is listed under Western/Arctic/Interior, Southcentral, or Southeast, and in one of the 12 Native Regions of the State.

In addition to the project budget, the following is the proposed administrative budget:

Harvest Survey Coordinator (full time)	$100,000
Harvest Survey Assistant (part time)	35,000

Harvest Survey Statistician (part time)	20,000	
Travel, Coordinator & Assistant	3,000	
Subtotal, USFWS	$158,000	
ADF&G Support		
Assistant Survey Coordinators (3 part time)	80,000	
Data Mgmt./Analysis/Support	85,070	
Travel	5,000	
Subtotal, ADF&G	$188,270	
Total USFWS & ADF&G		$346,190
Total Data Collection (table 1)		$346,000
Total Project annual cost		$692,190

PROJECT DESIGN

Overview

Approximately 90,000 people live in the migratory bird subsistence eligible areas of Alaska. An exhaustive census on the use of migratory birds within subsistence areas would be impractical and cost prohibitive. It will be necessary to subsample the population of subsistence households and then apply statistical methods to estimate the harvest. Here, we present methods, which are consistent with our goal and objectives, for conducting a statewide harvest survey.

Methods - Statewide Design

Sample Unit and Sample Frame: The Committee recommends AAll Households in Migratory Bird Subsistence Areas of Alaska@ as the sample frame. Current Federal regulations allow the Council to recommend changes to add or remove communities eligible to participate in the spring/summer harvest, therefore the sample frame may change as frequently as annually.

We recommend the continued use of the household as the primary sampling unit, the village as the secondary unit, and Aclusters@ of villages, where a relatively high density of villages exist, as a method for extrapolating survey results to unsampled villages (Wentworth 1998). This contrasts with HIP, which uses the individual hunter as the sample unit. Since the mid-1980s, villages have been combined into clusters (i.e., subregions) on the Yukon Delta because of geographic proximity and an intuitive assumption that villages near one another should have similar harvest patterns. This assumption allows an estimate of take to be made for villages within the cluster that were not sampled. This approach may be preferable to extrapolating from regional mean values if the variance among villages within clusters is less than among all villages within the region. Currently clustering schemes have been established for Bristol Bay, the Yukon Delta, and the Seward Peninsula - Bering Straits regions. Additional clustering schemes will be developed by the Committee in cooperation with other subsistence regions in the state. The Committee recommends that in future years that the efficacy of the clustering scheme be determined through statistical analysis.

Power analysis: Power analyses were conducted by Dr. Joel Reynolds using data collected on the Yukon Delta and Bristol Bay and focused on examining how variability or precision of harvest estimates for various species changes as the number of villages and households surveyed was altered (Appendix 1). The results of the analysis were utilized in developing the recommendations given below.

Sampling design - Village Selection: Power analysis of data collected on the Yukon Delta and Bristol Bay indicated that the variance surrounding the estimate harvest level asymptotes as sampling effort exceeds two-thirds of the villages (see Appendix 1). Historical data were insufficient to conduct similar analysis throughout the remainder of the state. In response to this analysis, the Committee recommends sampling two-thirds of the villages within any region during each year. The Committee is aware that data from other regions may differ from those tested and therefore suggests conducting a statewide power analysis when data become available.

Villages need not be selected randomly. Rather, the Committee suggests establishing permanent regional village groupings that consist of one-third of the sample effort. Assignments to groups may be based upon village size to maintain consistent sampling effort and budget among years. Assignments may also be made so that communities with similar harvest patterns are placed into different groups or to keep sampling effort within clusters consistent among years. As a result of the two-third approach, each village will be sampled two out of every three years. The power analysis assumed that regional hubs would be sampled each year. The Committee recommends sampling the hubs (Bethel, Dillingham, Kotzebue, Barrow, Nome, Kodiak, Unalaska, and Tok) each year, as these hubs have different harvest patternhs (fewer hunters and lower harvests per hunter) than the villages they serve. Then the Committee recommends conducting further analysis when sufficient data have been acquired, to determine whether this effort can be reduced.

Sampling Design - Household Selection: The Service=s subsistence harvest survey program has been conducting stratified sampling of households in several regions of the state for two years. These initial trials had mixed results. It is believed that the problems are administrative rather than due to flaws in the sampling design (C. Wentworth, pers. comm.). The trial surveys used three strata: high, low, and no expected harvest, sampled at a minimum 40%, 15%, and 10% rate, respectively. Surveys conducted on the Yukon Delta using these rates were similar to the overall 25% rate identified by the power analysis as being a sufficient proportion of households to sample within each village. However, sampling rates with this method vary with level of participation in the harvest. The use of three strata is also consistent with the stratification design used by HIP, and closely reflects the large variation in hunting present among villagers (R. Stehn, pers. comm.). Many households take few or no birds and others take many. These data are indicative of the Native culture that is typified by sharing of resources among households. A few hunters collect many birds and give them to other members of their community. The data further suggested that variance of estimated total harvest for communities could be reduced by a stratification of households within communities by either expected take or the previous years= take (R. Stehn, pers. comm.).

The ad-hoc Committee recommends applying the same stratified random approach throughout the state and conducting future power analysis, when sufficient statewide data have accumulated. The stratification process will require the community surveyor to assign each household to a

stratum and then randomly select a sufficient number of households to reach the desired 40, 15 and 10 percent levels. Assignment to stratum can be based upon the surveyor=s knowledge of the community, the previous year=s take, asking the household, or a combination of these. The Committee also recognizes that some regions are characterized by very small villages (e.g., < 20 households). Here the Committee recommends a two strata sampling approach (hunting and non-hunting households). In very small villages only a few households may harvest and it is not efficient to further subdivide the harvesters, nor is there a cost saving by randomly selecting among harvesters. In these regions, the Committee recommends that the high and low harvest strata be combined and sampled at a 100% rate and the non-harvester class sampled at 10%.

Precision: The ad-hoc Committee recommends that harvest survey results, at a minimum, be comparable to HIP with similar or better precision. Currently the HIP program does not report the precision of its harvest estimates; however, the program=s goal is to have a 95 % confidence interval within 10 % of the estimated harvest. It is not possible to predict precision prior to conducting a statewide survey; therefore, adjustments may be necessary in order to reach the survey goals.

Reporting errors: We anticipate that errors will be introduced into the data by inaccurate reporting by households, non-reporting of households, and non-participation by villages. The committee suggests that if reporting errors become a major concern, the Council, regional committees, and the Harvest Survey Committee develop outreach efforts and survey improvements to increase participation.

Inaccurate data from the household level must be addressed through adequate training of surveyors, effective survey forms and bird identification tools, and crosschecking data at each step of the process. Poor participation by households or individual communities may be remedied through further outreach and consultation with community leaders, as well as applied effort by survey coordinators and the regional comanagement committee. In any case, community and regional harvest estimates will be developed with the best available data. Estimates of harvest from regions with non-participating communities may be generated using: (1) extrapolated data from similar communities within a subregional cluster; (2) the regional average community harvest; or (3) the most recent annual estimate or some other historical measure of harvest. Further discussion on this topic is needed.

Survey periods: Survey period refers to the timing and frequency of the collection of harvest data within the harvest season. Although memory bias by respondents increases during longer survey periods, the number and length of survey periods should be determined considering the seasonal resource and harvest patterns of regions and communities, management needs for seasonal harvest data, and efficiency of survey effort and costs. For example, where there is a need to document harvest chronology among areas or by life stages of birds, data collections may be made over 3 biologically meaningful periods. If most harvest is confined to shorter periods (e.g., North Slope harvest in spring and mid-summer) two survey periods may effectively capture reliable annual estimates. In cases where community harvests are small or narrowly focused in time (e.g., harvest of seabird eggs), reliable annual estimates may be efficiently obtained with a single survey period.

The OMB has approved the following three survey periods with the following dates (OMB Forms 7-FW-103, 103a, and 103b):

Form 7-FW-103
Spring (April 1 B June 30)
Summer (July 1 B Aug. 31)
Fall (Sept. 1 B Oct. 31)

Form 7-FW-103a Interior Alaska
Spring (April 1 B June 30)
Summer (July 1 B Aug. 31)
Fall (Sept. 1 B Oct. 31)

Form 7-FW-103b Southern Coastal Alaska
Spring (April 1 B June 30)
Summer (July 1 B Aug. 31)
Fall B Winter (Sept. 1 B March 9)

Survey forms and their distribution: Past subsistence harvest surveys have used different survey forms and administered those forms differently throughout the state. Inconsistent forms and variation in the distribution and collection of those forms introduces error and bias. A statewide survey needs to have greater consistency in its use of survey instruments and their administration to produce data that are comparable among regions. The Committee recommends the use of standard survey forms throughout the state. These forms, listed above, have been designed, created and were approved by OMB on October 2, 2003. The three forms that have been created focus on Arctic and Western Alaska, Interior Alaska, and Southern Coastal Alaskan birds. Color drawings taken from the National Geographic Society *Field Guide to the Birds of North America* were printed on survey forms to aid in the identification of birds. Space next to each drawing was provided to record how birds and eggs of each species, or identifiable subspecies, were harvested within the sampling period. The Committee recommends that forms be personally delivered to each household that has been selected and agrees to participate in the survey. Distribution and collection of forms should occur at the beginning and end of each sampling period, respectively. Forms, approved by OMB on October 2, 2003, are presented in appendix 2. Survey forms and procedures should be reviewed annually to determine whether the collected data are appropriate or additional information should be solicited on the survey to address management needs.

Species list: Past subsistence harvest surveys focused primarily on waterfowl. Other groups, such as seabirds and shorebirds were more general. Broad groupings such as gulls, and large or small shorebirds were commonly used in surveys. Table 2 is the list of migratory birds that may be taken during spring and summer for subsistence in Alaska. The harvest survey form, while not spelling out all these species and subspecies by name, is designed to accommodate all the species on the bird list. Following the publishing of regulations, which established the first recognized subsistence hunt, there has been greater interest in the subsistence take of Anon-game@ birds by the public

and resource managers. Special studies will be required to determine the take of species that have small populations or limited distributions.

Methods - Special studies designs

The statewide survey will not provide adequate harvest data to address all the management concerns of the Council and other interested entities. Some harvested species have small populations, limited distribution, declining numbers, or are taken in low numbers. Variance associated with harvest estimates for such species may be unacceptably high using the general statewide survey design. Other species (e.g., small shorebirds or auklets) have been grouped together on previous survey forms making harvest estimates by species impossible to determine. The Committee recommends that special studies be initiated, with separate funding, to address questions on harvest issues that cannot be answered through the statewide survey. Special studies fall into three general categories:

1. Survey data are re-analyzed to improve accuracy and reduce variance of the harvest estimate. For example, one could determine which communities have historically taken the species of concern or are within the species range. Only data from those identified villages would then be included in special analyses for that species.

2. Increase sample size by surveying more villages or households within villages that are either~~,~~ within the range of or are known to take the species of interest. Alternatively, sample size may be increased by sampling both more communities and more households within those communities. Survey intensity may be increased until a complete census of the affected area occurs. Under this scenario, standard methods of conducting household surveys are simply applied at a higher sampling intensity.

3. Design different methods for determining harvest or related information such as: specialized survey forms to address species not on the standard forms, interviews of hunters and elders, examination of harvested birds, and the collection of bird parts. Some special survey methods may require approval by OMB. The current OMB approval will be good for three years. A new OMB submission proposing a new survey method, usually requires several months for approval.

Examples of Special Studies:

Type 1, Gull and tern egg harvest: Harvest of gull and tern eggs can be described more thoroughly by compiling information from existing databases. This information can be used to assess the levels of harvest in communities that are currently included under spring and summer regulations, and to evaluate potential effects on species of concern (e.g., Aleutian terns).

Type 2, Spectacled and Steller=s Eider Surveys: Spectacled and Steller=s eiders occur seasonally on the North Slope, along the northwest Alaska coast and St. Lawrence Island, on the Y-K Delta, and along the Bristol Bay and Alaska Peninsula coasts. Steller=s eiders also winter in the Aleutian Islands, Kodiak, and a few in Lower Cook Inlet. A special harvest study could be designed to more intensively sample villages and households in these regions.

Type 3, Emperor Goose - Traditional Knowledge: The population of Emperor Geese underwent a dramatic decline by the mid-1980s and rates of recruitment remain low. Subsistence

hunters have stopped harvesting emperors throughout most of the bird=s range; however, the population has failed to rebound. The population decline occurred prior to the establishment of annual surveys and intensive field studies, and is not well understood. Native elders that harvested prior to, during, and after the decline may be able to provide insight into when the decline occurred, what factors may have contributed, and how harvest and use of the birds has changed. Data in this project is gathered by conducting interviews of elders throughout the range of emperors. Comparisons of the interviews should provide a broad picture of when the decline occurred and what factors were associated. Cost of the special survey is $50,000 per year, for three years.

Data management

A critical feature of this project will be development of effective and efficient processes for information management. Information management will involve survey data entry and editing, statistical estimation and analysis, reporting, distribution of results, and development of a data archive for securing data for future access and use. The committee recommends that the Division of Subsistence, Alaska Department of Fish and Game develop and submit a formal proposal to address the information management needs of the project. The Division has informal proposed an information management system. Key features of the proposed system include that it (1) be web-based to allow for access to agency staff, participating organizations, and the public, but with different degrees of secure access to confidential information; (2) allow for remote and local data entry in order to take advantage of existing staff located in field locations, but also use centralized staff for double data entry of information; (3) use non-PC database software (e.g., MS SQL Server) which will enhance data security and integrity; (4) have dedicated biometric and programmatic personnel (approximately 4.5 months total) to ensure quality of the information management program and statistically valid results; (5) have sufficient data entry staff for double data entry. All supporting programs and data sets will not be proprietary and could be transferred to the Service at any time. The budget for the proposed system included purchase of a web server and electronic scanner for imagining survey forms into an archive. The budget did not include purchase of a database server or associated software, but did include sufficient funds to offset the incremental costs (due to this project) to existing ADF&G database facilities. The estimated cost of an information management program is approximately $100,000 per year.

Calculation of the subsistence harvest

Subsistence harvest estimates may be calculated based upon the application of weighted means (Cochran 1977). These calculations are standardized methods for extrapolating subsampled data.

The estimated sample mean take per village is

$$\bar{y}_s = \sum_{i=1}^{K} N_i \bar{y}_i / N \qquad (1)$$

Where:

i = strata variable
1 - K = the numbered designation of strata i
N_i = strata i population

$\bar{y}_i$ = mean harvest per household within strata i
N = village population

The estimated village sample variance is

$$\mathrm{Var}(\bar{y}_s) = \sum_{i=1}^{K} N_i^2 \mathrm{Var}(\bar{y}_i)((N_i - n_i)/(N_i - 1)) \; / \; N^2 \qquad (2)$$

Where:
n_i=sampled households in strata i
Var = variance

The estimated standard error (SE) of $\bar{y}_s$ is the square root of Var ($\bar{y}_s$).

The village harvest can be estimated by

$$T_s = N \bar{y}_s \qquad (3)$$

with estimated standard error

$$SE(T) = N \; SE(\bar{y}_s) \qquad (4)$$

The regional and statewide harvest values may be estimated using the same approach of weighting mean values by population values. For example, to use formula (1) to determine the mean regional harvest:

$\bar{y}_s$ = mean harvest for all households within the region
i represents villages
1 - K = the numbered designation of village i
$\bar{y}_i$ = average harvest for village i
N_i = the village i population
N = the region population

If all villages are not sampled and the household is used as the sample unit to determine the regional take, then in formula (1):

$\bar{y}_s$ = mean harvest for all households within the region
i represents the sampling strata
1 - K = the numbered designation of strata i
N_i = strata i population
$\bar{y}_i$ = mean harvest per households within strata i
N = region population

Alternatives to the above classic formulas are bootstrapping techniques which may work well with more complex data sets. In this approach individual household harvest values are randomly selected, with replacement, from the survey data set of strata (i = 1) and placed into a dummy data set. This process continues until the size of the dummy data set equals the sample size of the

strata (n_i). The process is repeated with all strata (i = 2...K) and all selected values are added to the same dummy data set. The mean of the dummy data set is calculated and stored. The processes of producing dummy data sets and calculating means is repeated many times, e.g. 1000. The mean and variance of the stored means is then the estimated village mean and variance of the means.

Estimates of harvest (and their associated confidence intervals) will be determined for species commonly harvested within a region. We recommend that the AMBCC review this list and determine additional species for which they wish to have detailed harvest data

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Figure 1. Proposed organizational chart for conducting a statewide migratory bird subsistence harvest survey.

Table 1. Projected costs for conducting a statewide subsistence harvest survey. These estimates do not include administration and data management.

Table 2. List of migratory birds open to harvest by subsistence users.

Family Gaviidae
Red-throated Loon (Gavia stellata)
Arctic Loon (Gavia arctica)
Pacific Loon (Gavia pacifica)
Common Loon (Gavia immer)
Family Podicipedidae
Horned Grebe (Podiceps auritus)
Red-necked Grebe (Podiceps grisegena)
Family Procellariidae
Northern Fulmar (Fulmarus glacialis)
Family Phalacrocoracidae
Double-crested Cormorant (Phalacrocorax auritus)
Red-faced Cormorant (Phalacrocorax urile)
Pelagic Cormorant (Phalacrocorax pelagicus)
Family Anatidae
Greater White-fronted Goose (Anser albifrons)
Snow Goose (Chen caerulescens)
Lesser Canada Goose (Branta canadensis parvipes)
Taverner=s Canada Goose (Branta canadensis taverneri)
Aleutian Canada Goose (Branta canadensis leucopareia) - except in the Semidi Islands
Cackling Canada Goose (Branta canadensis minima) - except no egg gathering is permitted
Black Brant (Branta bernicla nigricans) - except no egg gathering is permitted in the Yukon/Kuskokwim Delta and the North Slope regions
Tundra Swan (Cygnus columbianus)
Gadwall (Anas strepera)
Eurasian Wigeon (Anas penelope)
American Wigeon (Anas americana)
Mallard (Anas platyrhynchos)
Blue-winged Teal (Anas discors)
Northern Shoveler (Anas clypeata)
Northern Pintail (Anas acuta)
Green-winged Teal (Anas crecca)
Canvasback (Aythya valisineria)
Redhead (Aythya americana)
Ring-necked Duck (Aythya collaris)
Greater Scaup (Aythya marila)
Lesser Scaup (Aythya affinis)
King Eider (Somateria spectabilis)
Common Eider (Somateria mollissima)
Harlequin Duck (Histrionicus histrionicus)
Surf Scoter (Melanitta perspicillata)
White-winged Scoter (Melanitta fusca)
Black Scoter (Melanitta nigra)

Long-tailed Duck (Clangula hyemalis)
Bufflehead (Bucephala albeola)
Common Goldeneye (Bucephala clangula)
Barrow=s Goldeneye (Bucephala islandica)
Hooded Merganser (Lophodytes cucullatus)
Common Merganser (Mergus merganser)
Red-breasted Merganser (Mergus serrator)

Family Gruidae

Sandhill Crane (Grus canadensis)

Family Charadriidae

Black-bellied Plover (Pluvialis squatarola)
Common Ringed Plover (Charadrius hiaticula)

Family Haematopodidae

Black Oystercatcher (Haematopus bachmani)

Family Scolopacidae

Greater Yellowlegs (Tringa melanoleuca)
Lesser Yellowlegs (Tringa flavipes)
Solitary Sandpiper (Tringa solitaria)
Wandering Tattler (Heteroscelus incanus)
Spotted Sandpiper (Actitis macularia)
Upland Sandpiper (Bartramia longicauda)
Bar-tailed Godwit (Limosa lapponica)
Ruddy Turnstone *(*Arenaria interpres)
Black Turnstone (Arenaria melanocephala)
Red Knot (Calidris canutus)
Semipalmated Sandpiper (Calidris pusilla)
Western Sandpiper (Calidris mauri)
Least Sandpiper (Calidris minutilla)
Baird=s Sandpiper (Calidris bairdii)
Sharp-tailed Sandpiper (Calidris acuminata)
Dunlin (Calidris alpina)
Long-billed Dowitcher (Limnodromus scolopaceus)
Common Snipe (Gallinago gallinago)
Red-necked phalarope (Phalaropus lobatus)
Red phalarope (Phalaropus fulicaria)

Family Laridae

Pomarine Jaeger (Stercorarius pomarinus)
Parasitic Jaeger (Stercorarius parasiticus)
Long-tailed Jaeger (Stercorarius longicaudus)
Bonaparte=s Gull (Larus philadelphia)
Mew Gull (Larus canus)
Herring Gull (Larus argentatus)
Slaty-backed Gull (Larus schistisagus)
Glaucous-winged Gull (Larus glaucescens)
Glaucous Gull (Larus hyperboreus)

Sabine=s Gull (Xema sabini)
Black-legged Kittiwake (Rissa tridactyla)
Red-legged Kittiwake (Rissa brevirostris)
Ivory Gull (Pagophila eburnea)
Arctic Tern (Sterna paradisaea)
Aleutian Tern (Sterna aleutica)

Family Alcidae

Common Murre (Uria aalge)
Thick-billed Murre (Uria lomvia)
Black Guillemot (Cepphus grylle)
Pigeon Guillemot (Cepphus columba)
Cassin=s Auklet (Ptychoramphus aleuticus)
Parakeet Auklet (Aethia psittacula)
Least Auklet (Aethia pusilla)
Whiskered Auklet (Aethia pygmaea)
Crested Auklet (Aethia cristatella)
Rhinoceros Auklet (Cerorhinca monocerata)
Horned Puffin (Fratercula corniculata)
Tufted Puffin (Fratercula cirrhata)

Family Strigidae

Great Horned Owl (Bubo virginianus)
Snowy Owl (Nyctea scandiaca)
Short-eared Owl (Asio flammeus)

APPENDIX 1. Power Analysis

APPENDIX 2. Survey Forms