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Alaska Migratory Birds Co-Management Council Migratory Bird Subsistence Harvest Survey: Assessment of the Survey Methods and Implementation.

by

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June 2008

Alaska Department of Fish and Game **Division of Subsistence**

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

all commonly-accepted abbreviations e.g., Mr., Mrs., AM, PM, etc.	
all commonly-accepted professional titles e.g., Dr., Ph.D., R.N., etc.	
Alaska Administrative Code	AAC
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures):	first three letters (Jan,...,Dec)
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	E
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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ALASKA MIGRATORY BIRDS CO-MANAGEMENT COUNCIL MIGRATORY BIRDS SUBSISTENCE HARVEST SURVEY: ASSESSMENT OF THE SURVEY METHODS AND IMPLEMENTATION

by

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EXECUTIVE SUMMARY

Monitoring spring and summer subsistence harvests of migratory birds in Alaska is part of the management and conservation efforts required under the Migratory Bird Treaty with Canada and Mexico and their Amendments. The Alaska Migratory Bird Co-Management Council (AMBCC) was created with the mission of involving subsistence users and their communities in a wide variety of migratory bird regulatory and management activities, including the implementation of a statewide subsistence harvest monitoring program. In 2004, the AMBCC implemented the harvest survey protocol developed and recommended by its Harvest Survey Committee in 2003. In a November 2007 meeting of the Harvest Survey Committee, the Alaska Department of Fish and Game (ADF&G) Division of Subsistence presented a white paper raising concerns about the quality of the survey data. The Harvest Survey Committee has struggled annually with significant underfunding of the program as well as with operational problems. The Committee generally concurred with ADF&G concerns and requested an evaluation of the survey design, implementation, and products, and which would include recommendations for improving the program. The AMBCC and its Harvest Survey Committee recognize the need for an effective survey that provides timely and accurate harvest information to member organizations and the national migratory management community, to sustain harvest traditions and migratory bird populations. This report presents 1) an evaluation of the first 3 years of data collection, and 2) recommendations to improve the survey protocol and implementation.

GENERAL RECOMMENDATIONS

The survey administration and protocol should be rescaled so that it is possible to meet the goals under the current funding levels. The program should not rely on unreliable sources of funding from other projects for its basic operational needs. Although many of the issues that the survey program faces result from inadequate funding, improvements to the survey methods and implementation procedures will likely contribute to good quality data.

TASK 1: EVALUATE ADHERENCE TO SAMPLING PROTOCOL

Data collection has not strictly followed the sampling protocol and the sampling goals have not been met. While 123 communities are to be surveyed yearly, the number of communities surveyed decreased from 85 in 2004 to 67 in 2006. For 2006, data from 21% of the communities surveyed could not be used to produce harvest estimates due to major sampling issues; the target survey sample size was met in only 67% of the remaining communities. To address this issue, it is recommended that 1) data collection and survey administrative protocol be simplified and streamlined, 2) that an investment be made in effectively training administrative and field survey personnel, and 3) outreach be developed in the communities.

TASK 2: EVALUATE EFFECTIVENESS OF 3-SEASON SURVEYS

The ability of the communities to complete the sets of 3-season surveys progressively decreased between 2004 and 2006. In 2004, 80% of the communities provided a complete set of seasonal surveys for each of their surveyed households, but in 2006, only 32% of the surveyed communities were able to submit complete sets. Although diverse factors may have contributed to poor compliance with the protocol for seasonal data collection, the steep decrease in the proportion of communities returning complete seasonal survey sets indicates that survey implementation, administrative difficulties, and decreasing standards for personnel training have been a major issue.

Recall periods (the time over which respondents must remember their harvests) longer than established in the survey protocol have occurred in 71% of the household surveys. The high proportion of surveys done with extended recall periods in the 3 years analyzed indicates that complying with the recall periods of the original survey protocol has been a major challenge. Increasing the diligence by which surveys are collected, in order to shorten recall periods, may only alleviate this issue. Because of funding issues and other difficulties in collection of seasonal data, the following are recommended: implementing a 2-recall survey, or a single-recall survey, or limiting the survey period to spring and summer, which are the harvest periods under AMBCC jurisdiction. It is also recommended that the magnitude of potential recall bias be evaluated with the use of hunting diaries.

TASK 3: EVALUATE HOUSEHOLD REFUSAL RATES

Overall refusal rate was 20% for 2004, 2005, and 2006. An examination of the database revealed that refusal rates of 30% or higher occurred in 19 (22%) communities-years out of 88 communities-years. It is recommended that 1) outreach in specific communities and training of survey personnel be implemented to address low response rates, 2) modifications be made to the household permission slip form so that it includes the fields for "community" and "year of harvest;" 3) the permission slips be systematically submitted to the data management agency; 4) the refusal rates be stated in harvest survey annual reports.

TASK 4: CREATE A DATA SYSTEM TO FACILITATE YEARLY SELECTION OF COMMUNITIES TO BE SURVEYED – ROTATION SCHEDULE

Information on communities surveyed in 2004, 2005, and 2006 was compiled to develop a categorical data quality index for each community-year that 1) met the sampling goal; 2) partially met the sampling goal; 3) it was not possible to include the data in harvest estimates. This index will help bridge gaps in the rotation schedule and ensure adequate coverage of sub-regions. Finalization of the data quality index depends on the completion of a review of the stratification information in the database. It is recommended that 1) an automated procedure be developed to select the communities to be surveyed every year based on the rotation schedule and on the quality of data available from previous years. The initial list generated from this procedure may be adjusted to address harvest monitoring priorities, such as tracking species of conservation concern; and 2) a Microsoft Excel spreadsheet containing information on all communities surveyed be readily accessible to the AMBCC Harvest Survey Committee.

TASK 5: EVALUATE COMMUNITY STRATIFICATION IN 3 HARVEST LEVELS (NONE/LOW/HIGH)

Data from the subsistence harvest survey, historical data stored in the ADF&G Community Subsistence Information System, and previous studies of subsistence harvest patterns show that the proportion of households participating in the harvest varies significantly from year to year. Between 74% and 80% of the households were correctly assigned to the "none" harvest stratum. Between 64% and 69% of the households assigned to the "high" harvest stratum indeed harvested more than 10 birds. However, only 17% -25% of the households assigned to the "low" stratum harvested between 1-10 birds. Low success in assigning households to the intermediary harvest level suggests that this stratum does not fit subsistence harvest patterns. When the "low" and "high" strata were aggregated in order to consider a harvester/non-harvester scenario, harvester misclassification averaged 26% and non-harvester misclassification averaged 22% between 2004 and 2006. The current use of household harvest level as the basis for the definition

of sampling strata leads to high rates of misclassification. It is recommended that a 2-level stratification, harvester/non-harvester, be adopted in place of the 3-level stratification (non/low/high). Harvester/non-harvester stratification will likely allow more correct assignment of households to sampling strata, which will produce more accurate harvest estimates and confidence intervals. In addition, 2-strata sampling will significantly simplify data collection, therefore reducing data inconsistencies and encouraging achievement of meaningful sample sizes.

TASK 6: REVIEW STRATIFICATION RULES AND SIMPLIFY IF POSSIBLE

The detection of high rates of misclassification of households to harvest level strata (Task 5) raised the question of whether the field efforts to implement stratified sampling (as opposed to simple random sampling) are justified. Monte Carlo simulations were used to compare the precision and bias of harvest estimates obtained by 2-level stratification (harvester/non-harvester) with those generated by a simple random sample (SRS). The simulations were performed using data collected by ADF&G in 2005 in 5 communities of the Iliamna region by SRS with high sampling proportions. Variation in precision and bias of harvest estimates were assessed for 3 community profiles: 1) similar proportions of harvester and non-harvester households, 2) a larger proportion of harvester households relative to non-harvester, and 3) a smaller proportion of harvester households relative to non-harvester; and for a species heavily harvested (mallard) and a species rarely harvested (tundra swan). The following conclusions apply only generally to the subsistence harvest of birds; analyses of a larger number of species, years, and geographical areas may lead to further understanding of mechanisms affecting precision of harvest estimates. Two-level stratification allowed a gain in precision compared to SRS only if the sample was composed mostly of harvesters. For commonly-harvested species, negative effects of household misclassification on the precision of harvest estimates were stronger in communities composed mainly of non-harvesters. For rarely-harvested species, the negative effects of misclassification were relatively weaker and minimal in communities composed mostly of non-harvesters. Larger gains in precision by use of stratification were observed in the rarely-harvested species. This finding is relevant to the management and conservation of bird populations that require especially accurate harvest estimates, such as species of conservation concern.

Although the survey protocol refers mostly to 3-level stratification, data collection in 20% of communities-years has been done by census and in 15% of the communities-years the sampling method used is unknown. Different sampling methods have been used across communities and deviations from the original survey protocol have been poorly documented. Because of the wide variation in community size and other dynamic components of community composition, it seems difficult to employ a single sampling method that would suit the whole set of communities to be sampled.

It is recommended that 1) standard protocols to generate the list of households to be surveyed and to assign households to harvest level strata should be defined; 2) sampling methods that are cost effective and compatible with community size should be adopted; 3) simple procedures to randomly select households, such as Microsoft Excel spreadsheets should replace the Mylar overlay.

TASK 7: ASSESS GENERATION OF CONFIDENCE INTERVALS

Adequate formulas to calculate variance for the stratified multi-stage cluster sampling used in the migratory bird subsistence harvest survey are presented. Should the overall analytical frame proposed be used, a bootstrap approach is considered a more sophisticated and appropriate method of computing variance and confidence intervals, especially for non-normally distributed data, which is frequently the case of subsistence harvest data. Bootstrap implementation (e.g., SPSS® syntax) is specific to the sampling protocol and should reflect modifications to the survey protocol eventually adopted by the AMBCC.

TASK 8: CLARIFY TARGET SPECIES AND REGIONAL PRIORITIES

All bird species depicted in the Main Form have been reported as harvested. Seven and eleven species depicted on the Interior Alaska and Southern Coastal Alaska forms respectively have never been reported. Since the survey coverage (proportion of communities-years surveyed) has been heterogeneous among regions, data from regions surveyed less intensively may not represent the full spectrum of species harvested for subsistence uses. The database should be reviewed for certain unusual records. Because of funding limitations and the related difficulty in ensuring statewide coverage, the revision of the community rotation schedule is recommended. A revised rotation schedule should address both the rotation of communities and of regions and be based on established species monitoring priorities such as regions with high reliance on bird harvest, birds of conservation concern, threatened and endangered species, and species for which there is little harvest history.

TASK 9: DEVELOP THE TRAINING PLAN

The harvest survey can significantly gain program integrity and data accuracy by investing in a well-designed training program that would optimize standardization in the implementation of the survey across regions and years. Recommendations are for training at 3 instances: 1) an initial, comprehensive, and centralized "train-the-trainer" session for field coordinators and management staff to be administered by the survey coordinator and other support personnel; 2) a centralized train-the-trainer refresher for field coordinators to be administered by the survey coordinator on demand; and 3) annual locally-provided surveyor training administered by field coordinators. Elaboration of standard training materials specifically designed for field coordinators and for surveyors is necessary.

TASK 10: REVIEW SURVEY IMPLEMENTATION

Task 10a: Review of survey handbook

An "in-review" version of the survey handbook is presented. Modifications to the structure and content of the text aimed to 1) define duties of survey coordinator, assistant survey coordinators, field coordinators, and surveyors; 2) facilitate localization of individual topics; and 3) provide instructions on all steps of data collection and completion of all survey-related forms and documents. Modifications to the design of forms and other survey documents aimed to 1) allow enough space to complete fields by hand; 2) make clear which information is being requested in each field; 3) improve spatial distribution of fields so related subjects are grouped; and 4) eliminate unnecessary fields. The current version of the handbook should be considered as a complete technical document for use of survey managers and field coordinators ("operational plan" or survey "methods and procedures"). A simplified guide focusing specifically on

surveyors' tasks and deadlines should be included. Participation of the AMBCC Harvest Survey Committee is necessary to complete this review.

Task 10b: Assess feasibility of developing an alternate system to manage the survey to ensure that improvements such as modifying forms do not cause delays

The U.S. Paperwork Reduction Act of 1995 (PRA) requires agencies to submit survey instruments and implementation methodology, as they apply to the collection of information from the public, to the Office of Management and Budget (OMB) for certification under 5 CFR.1320.8(b)(3) and 5 CFR 1320.9. This process was previously completed for the migratory bird subsistence harvest survey and renewed January 31, 2007, for a 3-year period. With no changes in study procedures or forms, the renewal process should be initiated by spring 2009 to allow sufficient lead time for all review procedures.

It is concluded that a pre-certification consultation with the OMB would be required to discuss any specific changes in the structure of the existing migratory bird subsistence harvest survey, and planning of the timing and implementation of the data collection would be adjusted as necessary.

Task 10c: Potential partners for survey implementation

The funding source for the migratory bird subsistence harvest survey should be stabilized and the amounts increased so that potential opportune partnerships for fieldwork (e.g. halibut and marine mammal surveys) could be considered as a possibility to increase capabilities.

Different assessments of subsistence uses of biological resources could be combined into coordinated, concurrent field surveys. This could be considered one way to leverage funding and reduce respondent and surveyor "burnout," which would eventually improve the quality of the data obtained by the survey. Data collection procedures (survey periods, methods for household selection, and sampling proportions) should be clearly established and will define compatibility criteria that could be used if the fieldwork for different surveys were to occur simultaneously. A strategic activity schedule of annual meetings with representatives of ADF&G, the Federal Subsistence Board, National Park Service (NPS), and others should be established in order to discuss fieldwork schedules and project compatibility. Compatibility should be assessed for specific seasons and regions. The strategic activity schedule should allow enough lead time to coordinate budgets, training, and logistics.

TASK 11: DEVELOP IN-SEASON QUALITY CONTROL

Establishing adequate quality assurance and quality control procedures for all stages of a survey is critical to ensure that data collection is done in a timely manner, that it follows established methods, and that it is standard among surveyors, field coordinators, regions, and years. The following recommendations refer not only to in-season procedures to monitor and troubleshoot data collection, but also to preventative strategies to avoid issues during data collection. 1) effective coordination should be ensured through a central management position in charge of overseeing data collection across all regions; 2) development and implementation of standard procedures should rely on documentation specifically addressing survey methods and procedures, training, and surveyor duties; 3) surveyor and field coordinator performance should be monitored through periodic progress reports and observation of household visits; 4) a system

that rates surveyors and field coordinators based on their productivity, accuracy, cooperation, and dependability should be established; 4) a list of skilled surveyors in each region should be maintained so that they can be contacted as needed; 5) schedule of activities and a timeline to coordinate and monitor the flow of survey forms between field coordinators, surveyors, households, and the data management agency should be developed. A preliminary annual schedule of activities and deadlines is presented for further development by the Harvest Survey Committee.

INTRODUCTION AND BACKGROUND

In 1997, the U.S. Senate ratified amendments to the Migratory Bird Treaty with Canada and Mexico to establish a legal framework for traditional spring and summer harvests of migratory birds in Alaska. Regulations implementing new subsistence hunting seasons went into effect in 2003. As an obligation under the amended treaties, the Alaska Migratory Bird Co-Management Council (AMBCC) formed the Harvest Survey Committee to design a statewide migratory bird subsistence harvest survey to assess the magnitude and composition of traditional bird harvest, as well as to begin monitoring trends under the new regulatory regime. A comprehensive survey protocol was designed by 2003 and has been implemented yearly since 2004. The AMBCC and its Harvest Survey Committee recognize the need to conduct an effective survey that provides timely and accurate harvest information to member organizations and the national migratory bird management community, with the ultimate goals of sustaining both harvest traditions and migratory bird populations.

In a November 2007 meeting with the AMBCC Harvest Survey Committee, the Alaska Department of Fish and Game Division of Subsistence (ADF&G) presented concerns about the quality of information resulting from the migratory bird subsistence harvest survey (Appendix 1). The Harvest Survey Committee has struggled annually with significant underfunding of the program and with operational problems, both of which have prevented the full implementation of the original survey protocol adopted by the AMBCC in 2003. These factors have had major impacts on the quality of data generated by the survey. However, these circumstances provide a timely opportunity to evaluate issues, consider technical improvements to the current survey methods, and collaboratively reformulate an operational plan for the survey program. Indeed, the Committee originally recommended a review of the protocol and budget after the first 2-year cycle (AMBCC 2003: 5). The Harvest Survey Committee concurred with the concerns presented by ADF&G and requested: 1) to assess the efficacy of the current harvest survey protocol, including implementation and products; and 2) to provide recommendations for adjusting and streamlining current data collection methods in order to produce more reliable harvest data comparable across locations, individual surveyors, and time.

DEFINITIONS

Definitions of terms common to survey design, implementation, and analysis, and to the migratory bird subsistence harvest survey as well, are offered here.

Accuracy. Accuracy of harvest estimates refers to how close the estimates are from the true harvest and depends on a series of factors, such as reliability of harvest reports, validity of harvest reports, measurement errors (associated to the surveyor, the respondent, the survey instruments, the sampling method), and random errors.

Bias. The property of a statistical estimator that consistently overestimates or underestimates a population parameter; the discrepancy between the expected value of an estimator and the population parameter being estimated.

Census. A complete survey (enumeration) of a population; 100% sampling.

Cluster. See "Sub-region."

Cluster sampling. An example of multi-stage sampling, where sampling is done at multiple levels. Households are sampled from a stratum, communities are sampled from a sub-region.

Community-year. Data aggregated by year and community, for each year the survey was administered in that community.

Confidence interval. The range of values within which the estimated harvest lies with a defined level of confidence (e.g., 95%), based on sampled data.

Harvest estimate. Harvest estimates are obtained by expanding data from the sampled units to the non-sampled units. The mean harvest reported by the sampled households is expanded to the non-sampled households.

Reliability. Variability or repeatability of responses or of harvest estimates.

Region. Set of sub-regions, or clusters representing a larger geographical area. See also "Sub-region."

Sample size. The total number of households sampled in a harvest-level stratum, in a community, or in a sub-region.

Sampling error. The error caused by observing a sample instead of the whole population.

Sampling frame. The global set of units from which the sampling units can be drawn. Producing harvest estimates means expanding from the sample to the frame. The community household list is the sampling frame; the mean reported harvest from the sampled households is expanded to the non-sampled households in the frame. Households not in the frame have no prospect of being sampled. At a higher level, all communities in a sub-region constitute the frame.

Sampling method. The approach used to select or draw units from a sampling frame. The migratory bird subsistence harvest survey has employed simple random sampling, 3-level stratified random sampling, and census.

Sampling proportion. The number of households sampled in a stratum or a community relative to the total number of households in the stratum or community, expressed as a percentage.

Simple random sampling (*SRS*). In a simple random sample of a given size, all units of the sampling frame have the same probability of being selected.

Stratified sampling. If the population includes different categories of units, the sampling frame can be organized by these categories into non-overlapping groups or strata. The establishment of strata occurs prior to selecting units to be sampled. A sample is then selected from each stratum. In the migratory bird subsistence harvest survey, units are randomly drawn from each stratum with no replacements.

Sub-region (or *cluster*). A group of communities in the same geographical area where the set of bird species available as subsistence resources and the bird harvest patterns are similar. See also "Region".

Validity. The ability of respondents to provide the correct answer; the ability to provide correct harvest estimates.

SCOPE OF THIS ASSESSMENT

This survey assessment presents a comprehensive scope, so as to provide meaningful recommendations and to provide the AMBCC with products according to the timing of the federal budgetary process. Given the limited time available to produce this assessment, ADF&G has based these recommendations primarily on data from the 2006 survey, although comparable data from 2004 and 2005 were used in order to address specific issues.

The "Subsistence Migratory Bird Harvest Survey Handbook" (AMBCC 2007) and the "Recommendations for a Statewide Alaska Migratory Bird Subsistence Harvest Survey" (AMBCC 2003) were the main sources of information about the survey methods and implementation.

This assessment followed the tasks necessary to assess the survey and to provide recommendations in the order they are listed in the work plan proposed to the AMBCC in December 2007 (Appendix 2). A rotation schedule of regions was implemented in 2006 as a budget reduction measure. Information about rotation of regions was unclear at the time of the assessment; therefore, the assessment proceeded without this information. The rotation schedule of regions was provided by the AMBCC Harvest Committee during its June 2008 meeting and was included in the final version of this report (Appendix 3).

Recommendations were based on the assessment of reported harvest of individual birds. However, the adopted methods must also adequately address the survey of egg harvests. The timeframe available for this assessment did not allow for the provision of an analysis of the methods to monitor the harvest of eggs; this must be considered a subject for future review.

Larger tables were presented in an appendix section at the end of this report, and smaller tables were inserted in the body of this assessment.

TASK 1: EVALUATE ADHERENCE TO SAMPLING PROTOCOL

OBJECTIVE

Analyze the relationship between data collection in each community and region and the sampling protocol, primarily using 2006 data.

NUMBER OF COMMUNITIES SAMPLED YEARLY

The migratory bird subsistence harvest survey collects data from a total of 187 communities that are located in areas eligible for subsistence in Alaska according to federal regulations. The current cluster sampling method requires adherence to a 3-year rotational schedule for the selection of communities to be surveyed (Appendix 4). According to the community rotation schedule, two-thirds of the communities in each region are to be surveyed every calendar year (AMBCC 2007: 9). Thus, a total of 123 communities should be surveyed each year (Table 1). Adherence to this aspect of the sampling protocol has not occurred because of funding limitations and the logistics of operating in rural Alaska. The set of communities to be sampled every year has been adjusted to fit into the available funding. Because of funding limitations, a rotation schedule of regions was implemented in 2006. Information about rotation of regions was unclear at the time of the assessment; therefore, the assessment proceeded without this

information. The rotation schedule of regions was provided by the AMBCC Harvest Committee during its June 2008 meeting and was included in the final version of this report (Appendix 3). The Yukon-Kuskokwim Delta Region is one area that has been surveyed every year due to the large number of birds taken in this region, due to the harvest of species of concern, especially emperor geese *Chen canagica*, brants *Branta bernicla*, and spectacled and Steller's eiders *Somateria fischeri* and *Polysticta stelleri* (AMBCC 2007: 9). Most of the other regions have been surveyed on an alternating year schedule, instead of each year. Rotation of regions has precluded yearly state-wide harvest estimates. The total yearly number of communities surveyed across regions progressively decreased between 2004 and 2006 (Table 1). This reduced sample size compromises the reliability of the harvest estimates. Also, by reducing the number of communities surveyed per year, it takes more years to survey all of Alaska.

Data from certain communities surveyed cannot be used to calculate harvest estimates because of major sampling issues. Data from 14 of 67 communities (21%) surveyed in 2006 are unusable mainly due to the absence of a complete household list and other key stratification information. Data from these 14 communities were not included in the 2006 analysis. Data used to produce 2004 and 2005 preliminary harvest estimates include communities for which primary stratification information is inconsistent or lacking. In this case, for these communities-years, assumptions were made to compensate for the lack of basic stratification information, although this procedure should be reconsidered if future versions of 2004 and 2005 harvest estimates are to be produced. A detailed evaluation of 2004 and 2005 data lies outside the scope of this assessment.

Using information from the 2000 census, the 187 communities covered by the survey sum 21,116 households. The data from the 67 communities that the data management unit did receive represented 8,152 households. Of the 2006 harvest report data that the data management agency did receive data from 2,494 households (31%) was unusable. For 2006 data, of the 14 communities with major sampling issues, 5 communities represented a sub-region: the Innoko National Wildlife Refuge (Anvik, Grayling, Holy Cross, Nikolai, and Shageluk). Data from Akhiok, Alakanuk, Bethel, Chevak, Forth Yukon, Hooper Bay, Kiana, Old Harbor, and Stony River were also unusable. Communities in the Koyukuk-Nowitna National Wildlife Refuge (NWR) did not return 2006 surveys (5 communities with a total of 378 households).

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Table 1.-Number of communities surveyed per region, 2004 to 2006.

Region	Total number of communities	Number of communities to be surveyed every year according to the original rotation schedule[a]	Number of communities for which data is available in the database		
			2004	2005	2006
Aleutians-Pribilofs	12	8	1	6	0
Bering Strait	16	11	11	11	0
Bristol Bay	30	20	19	20	4
Chugach-Cook Inlet	5	3	4	1	2
Copper River Basin	8	5	6	0	0
Interior Alaska	41	27	20	10	14
Kodiak	12	8	0	0	4
North Slope	8	5	0	7	0
Northwest Arctic	11	7	0	0	4
Yukon-Kuskokwim Delta	44	29	24	26	25
Total	**187**	**123**	**85**	**81**	**53**[b]

[a] The set of communities to be surveyed each year has been adjusted according to available funds. Data on this table does not refer to adherence to the adjusted set of communities.

[b] A total of 67 communities were surveyed in 2006. However, major sampling issues prevented use of data from 14 communities in harvest estimates. Data from these communities are not currently available in the database.

NUMBER OF HOUSEHOLDS SURVEYED IN 2006

The basic stratification unit used for analysis is community- season-harvest level. For each season, the sampling protocol calls for the survey of 10% of households in the "none" stratum, 15% of households in the "low" stratum, and 40% of households in the "high" stratum. If a stratum has 8 or fewer households, up to one-half of the households in the stratum are to be sampled. A census has been attempted in a number of small communities, even though the survey protocol does not refer to this method (AMBCC 2003, 2007). Based on principles associated with the "Central Limit Theorem" (e.g., Cochran 1977), the standard sampling approach used by ADF&G suggests that a minimum of either 30 households or 50% of the total number of households in a particular stratum are to be sampled. Thus, 30 households or 50% of the total number of households was considered the sampling goal in non-stratified communities where a simple random sampling or census was employed.

Overall, in one-half of the communities surveyed in 2006 and that the data reached the data management unit, the proportion of households to be surveyed in each stratum-season was not met (Table 2). Furthermore, between only 60% and 70% of the communities for which data were usable met these criteria. These data include a number of community-season-harvest level that were not represented in the survey (number of households surveyed = zero) or for which only one household was surveyed in a given season and/or harvest level. In the cluster sampling method, as currently used in the migratory bird subsistence harvest survey, calculations of variance at the sub-region level require the calculation of variance at the harvest level stratum and at the community level. Calculations of variance are compromised or impossible at the sub-

region level if sample sizes at community-season-harvest level are equal to zero or one. Detailed sampling information for each community, season, and harvest level for communities surveyed in 2006 is presented in Appendix 5.

Table 2.-Percentile of community-season-harvest level stratum that met the sampling goal in 2006.

	Spring	Summer	Fall
All communities whose data reached the data management unit (67 communities, or 161 community-season-harvest level)	50%	51%	49%
Only communities for which data can be used (53 communities, or 119 community-season-harvest level)	67%	69%	66%

DIFFICULTIES IN ADHERING TO THE ORIGINAL SURVEY PROTOCOL

1. Insufficient funding is a primary difficulty in producing accurate subsistence harvest estimates for the whole state of Alaska. According to reports of the AMBCC Harvest Survey Committee, the current funding level equals one-half of the estimated cost of the survey protocol adopted in 2003. In addition to preventing coverage of all regions and sub-regions, insufficient funds also curtail much-needed outreach in communities as well as training for field coordinators and surveyors.
2. Lack of clear and standard procedures for some fundamental tasks, such as making and updating household lists and assessing household harvest level, have resulted in missing data, inaccurate data, and heterogeneity in data collection and quality among regions and years.
3. Insufficient documentation on the survey methods and procedures has also been an issue. The survey handbook has provided the basic documentation of sampling methods, management procedures, data collection, and training of field coordinators and surveyors (AMBCC 2007). However, these facets of the survey program require specific documents that differ in structure, content, and target audience (field coordinators, surveyors, and managers). The different users have found the survey methods "too complex." Despite some inherent complexity of the sampling methods, the survey program must supply adequate tools in order to convey its methods and procedures.
4. This assessment also revealed inadequacies in the survey methodology. For instance, the 3 data-collection periods have never been successfully implemented perhaps due to respondent/surveyor "burnout" (Task 2), a 3-level stratification (none/low/high) that is a poor fit to subsistence harvest patterns (Task 5), and a single sampling method that does not seem to apply to the range of community sizes covered by the survey (Task 6). However, these issues are not insurmountable, and can be addressed.
5. Finally, a survey program that involves many organizations and people dispersed over diverse and remote areas must rely on effective coordination and supervision. Contractors and other personnel must be supported, monitored, and held accountable for delivery and quality of products according to established deadlines.

RECOMMENDATIONS

The following recommendations are of a general nature, and apply to the harvest monitoring program as a whole. Recommendations that address specific issues are presented in the following tasks.

1. Data collection protocol should be streamlined and simplified in order to facilitate fieldwork.
2. Administrative protocol should be streamlined and simplified so it does not interfere with data collection.
3. Adequate personnel training at all levels (survey managers, field coordinators, surveyors) should be ensured so that people fully understand their duties and know where to look or call for technical assistance.
4. Outreach in communities should be developed in order to increase understanding of the survey objectives, the candidate pool of potential surveyors, and the number of households participating in the survey.

TASK 2: EVALUATE EFFECTIVENESS OF 3-SEASON SURVEYS

OBJECTIVES

1. Identify communities that failed to return survey instruments for each survey season in 2004, 2005, and 2006.
2. Determine, by community, the proportion of participating households that provided incomplete data in each of the 3 seasons by analyzing variation in the number of survey instruments returned for each community.
3. Identify apparent causes for which communities fail to return any survey instrument for an entire season or return only a reduced number of survey instruments (e.g., no harvest, pursuit of other harvest activities, surveyor or respondent fatigue). Synthesize analysis of seasonal problems with information from other historical surveys and community studies addressing bird harvest.

ABILITY TO OBTAIN COMPLETE SETS OF SEASONAL SURVEYS

Survey "periods" refers to the timing and frequency of collection of harvest data. The migratory bird subsistence harvest survey is divided into 3 seasonal periods: spring, summer, and fall. The survey instrument is composed of 3 pages, one for each season. As in the original survey protocol the surveyors make 4 visits to each participating household during a survey year (AMBCC 2007). A complete household survey form includes all 3 seasonal pages. In April, surveyors distribute survey forms to participating households. At the end of each survey season, the surveyor visits the participating household to collect the appropriate page of the survey form. Harvest estimates are calculated for each season and the annual estimate is calculated as the sum of seasonal harvests.

The ability to produce complete annual sets of survey data progressively decreased between 2004 and 2006. In 2004, 80% of the communities provided a complete set of seasonal survey forms for all their surveyed households, while in 2006 only 32% of the surveyed communities provided them (Table 3). These data can be used as indicators of the success with which the survey was implemented in each community-year.

Many households have failed to return one or more seasonal pages and entire communities have failed to return surveys for one or more seasons (Appendix 6). Consequently, the total number of households surveyed in a community varies among seasons and the set of sampled households may also differ (Appendix 5). This missing data at household and community levels makes it difficult to distinguish between non-harvest and non-surveyed seasons, consequently affecting the accuracy of harvest estimates. Missing data also increases costs of data analysis because of the extra work required to track data inconsistencies and to account for missing data in analyses. Missing data requires such computational maneuvers as mean replacement which compromises the accuracy of harvest estimates and confidence intervals. Complete seasonal data will result in more accurate seasonal and annual harvest estimates.

Table 3.-Number and proportion of communities that returned all and each of the seasonal survey pages.

		Number and proportion of communities			
Year	Communities surveyed at each year	All households returned all 3 seasonal survey pages	All households returned spring survey page	All households returned summer surveys page	All households returned fall survey page
2004	85	68 (80%)	79 (93%)	71 (84%)	71 (84%)
2005	81	48 (59%)	53 (65%)	58 (72%)	53 [a] (72%)
2006	53	17 (32%)	32 (60%)	24 (45%)	21 (40%)

[a] North Slope communities usually are not surveyed in fall. Seven North Slope communities were surveyed in 2005.

BARRIERS TO OBTAINING COMPLETE SETS OF SEASONAL SURVEYS

The lack of compliance with the seasonal protocol may be related to non-exclusive factors:

1. The surveyor is required to visit each household 4 times during the survey, which is likely to be a burden for both surveyors and respondents. Respondent and surveyor fatigue may be compromising the completion of the survey.
2. In those communities where the surveyor is not a community resident, seasonal survey forms may be missing due to a lack of funds available to travel to communities in order to collect completed forms.
3. Entire communities, as well as individual households, may fail to return seasonal surveys because of the difficulties of implementing a complex survey protocol, inadequate training at multiple levels (survey managers, field coordinators, and surveyors), lack of support to surveyors, and deficient supervision. These combined factors lead to a lack of understanding of the importance of the survey seasons as the basic components for annual harvest estimates and the inability to manage a variety of survey instruments.
4. The 3 seasonal periods may not fit the availability of the resource nor the customary harvest patterns in certain communities. For example, some communities harvest birds primarily during the spring migration, some have access primarily during the fall migration, and some harvest wintering birds; not all communities actively harvest in all seasons. Therefore, communities may manifest poor interest in the survey during their non-harvest seasons.

5. It may be difficult to contact households when they are intensively harvesting birds or other resources because they may have moved to their hunting or fishing camps.
6. Although there may be other factors contributing to poor compliance with the protocol for seasonal data collection, the steep decrease in the proportion of communities returning complete seasonal surveys indicates that survey implementation, administrative difficulties, and decreasing standards for personnel training have been a major issue.

SEASONAL DATA COLLECTION AND RECALL BIAS

Although openings and closures of the harvest period vary among areas according to the yearly federal regulations published in the Code of Federal Regulations (CFR), for the migratory bird subsistence harvest survey, the "survey year" is April 1-October 31 in most regions, except Southern Coastal Alaska, Aleutian-Pribilof Islands, Kodiak, and Chugach-Cook Inlet, where the survey year ends on March 9. The survey protocol calls for data to be collected within 2 weeks of the end of each of 3 survey periods (Table 4). Increasing the length of the recall period may increase recall bias (Westat Inc. 1989). The intent of designing 3 survey recall periods was to help respondents accurately recall the number and species of birds and eggs they harvested, given the large number of species included on the survey. Although there are limited periods of recall for the spring, summer, and fall periods, and these recall periods vary only slightly among seasons (2-3 months), the recall period is much longer (7 months) in regions where the survey collects fall and winter harvest data (Table 4).

Table 4.-Length of seasonal recall period**.**

Survey period	First day of the harvest survey period	Last day of the harvest survey period	Recall period
Spring	April 1	June 30	3 months
Summer	July 1	August 31	2 months
Fall	September 1	October 31	2 months
Fall and winter[a]	September 1	March 9	7 months

[a] Southern Coastal Alaska, Aleutian-Pribilof Islands, Kodiak, and Chugach-Cook Inlet.

"Recall bias" refers to respondents' inaccurate recollection of particular events and is related to "memory bias" (the inability to precisely remember events), "prestige bias" (upgrading actual hunting success), and "digit preference" (preferring numbers that end either in zero or 5) (Tarrant and Manfredo 1993). Recall bias tends to be more prominent in respondents that have many events to recall. These sources of bias may lead to response errors that cannot be reduced by increasing sample sizes and most commonly lead to overestimation of harvest (Atwood 1956, Tarrant and Manfredo 1993).

Personal communications and administrative documents indicate that recall periods for the migratory bird subsistence harvest survey are longer than established in the survey protocol. Longer recall periods may compromise accuracy of data, and the variation in recall periods between communities and years may compromise the evaluation of geographical and temporal trends in harvest. The first step in addressing this issue was to define the proportion of surveys

done with a recall period greater than that directed in the survey methods. For this purpose, household permission slip dates were analyzed, since the permission slip is to be completed during the first household visit, thus marking the onset of the survey at the household. Extended recall periods were defined to have occurred if 1) the household permission slip was filled out between September 1 and December 31, or 2) if the year that the permission slip was filled out was later than the year of harvest. This second criterion most often applied to the data collected from households whose permission slips were completed in January, February, or March. Since "year of harvest" is not a field on the permission slip, additional information provided with permission slips, such as field office notes, administrative paperwork, and harvest instruments were used to identify the year of harvest.

The analysis of the household permission slip dates indicates that extended recall periods occurred in 71% (2,285 of 3,199) of the household surveys (Figure 1). This high proportion indicates that complying with the recall periods established in the survey protocol has been a major challenge since the protocol was first implemented (Table 5).

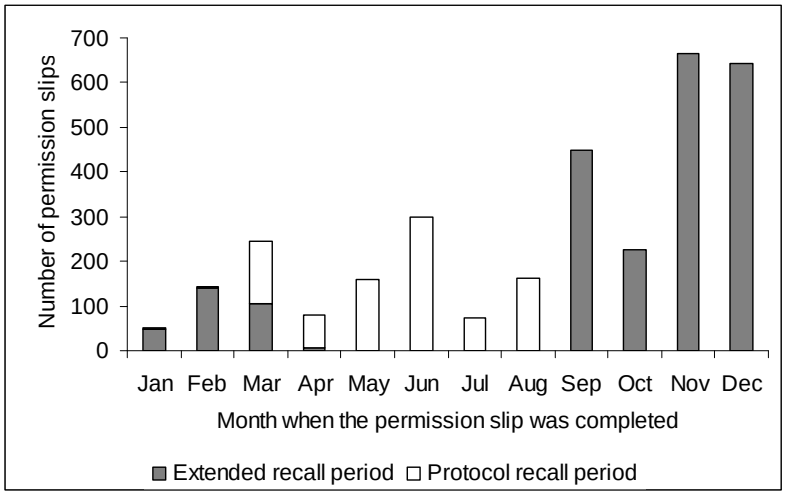


Figure 1.-Household permission slips date analysis and proportion of extended recall periods.

Table 5.-Yearly occurrence of surveys done with extended recall period.

Year	Total number of permission slips in the database	Number of surveys done with extended recall period n (%)
2004	731	544 (74%)
2005	1,296	1,116 (86%)
2006	1,172	625 (53%)
Total	**3,199**	**2,285 (71%)**

RECOMMENDATIONS

1. Compliance with Original Recall Periods

For the 3 survey years analyzed, the large proportion of surveys that include data from extended recall periods indicates that complying with the recall periods established in the original survey protocol has been a major challenge. Increasing the diligence by which data are collected after the 3 recall periods may only alleviate this issue. The level of funding and field effort necessary for successful implementation of 3-recall surveys is not compatible with funding currently available. Furthermore, surveyor and respondent burden likely plays a role in the difficulties that this harvest monitoring program currently faces. Keeping a 3-recall survey design should be considered an option until an alternative approach can be implemented.

2. Alternative Approaches for Seasonal Data Collection

The number of seasonal surveys should be reduced, which would facilitate administrative and field protocol and reduce costs, occurrence of missing seasonal data, and respondent and surveyor burden. Three scenarios are suggested to achieve this reduction.

2.1 TWO-RECALL SURVEY

Administer one survey at the end of the season of most harvest and one at the end of the 2 seasons of least harvest combined. The length of the recall period for the season of most harvest would not differ from current survey protocol. Since studies suggest that the magnitude of recall bias is proportional to the number of events to recall, harvest estimates for seasons of less harvest would be less affected by longer recall periods (Atwood 1956; Tarrant and Manfredo 1993). The season of most harvest for each region can be defined based on previous studies and on further analysis of the harvest survey data (Wolfe et al. 1990, Paige et al. 1996, Andersen and Jennings 2001a, Andersen and Jennings 2001b; Appendix 7).

In addition to reducing field effort, a 2-recall survey may reduce survey costs by distributing administrative and training costs throughout the year, since survey activities would not occur at the same time in all regions. However, close coordination would be necessary to meet region-specific timelines. In addition, the adoption of a seasonal supplemental hunting diary is an option to assess recall bias (see below).

2.2 SINGLE-RECALL SURVEY

Administer one survey at the end of the season of most harvest in each region. Adoption of a seasonal supplemental hunting diary (see below) is an option to assess the magnitude of potential recall bias. Since harvest reports for all seasons would be collected at a single time, a single-recall survey could solve the problem of missing seasonal data at the household and community levels.

SEASONAL SUPPLEMENTAL HUNTING DIARY

In order to assess the magnitude of recall bias in future harvest estimates, the administration of a hunting diary to a small proportion of the households surveyed is an option and could be implemented even if the AMBCC opts to keep the current 3-recall periods.

The harvest reported in the hunting diary would be compared to seasonal hunting reports. Once the magnitude of bias, if any, is known, it would be possible to devise and apply formulae that

adjust harvest estimates. The hunting diary could have a calendar format, on which hunters report their daily harvest (EPA 1998). Whatever the format, the hunting diary should include a chart illustrated with bird species, as in the current survey instruments, and enough space so that respondents may write the species of birds harvested, if the harvest was of birds or eggs, and the number of birds/eggs taken. In addition to providing a tool to evaluate survey recall bias, hunting diaries would also provide harvest data arranged by month, which would provide a better understanding of regional patterns of harvest (Wolfe et al. 1990: 52).

Although assessment of bias is an option as part of a single-recall survey or a 2-recall survey, administrative protocol, personnel training, and field efforts should be adjusted to address the difficulties of administering a hunting diary. Hunting diaries require respondent literacy and motivation to keep harvest records. Some length of recall period is inevitable because some people will forget to record their data until reminded. Despite minimal recall bias, other sources of error or alterations in recordkeeping may also occur with the use of a hunting diary.

2.3 LIMIT SURVEY PERIODS TO SPRING AND SUMMER

Independent of defining recall periods for spring and summer, not surveying fall harvests is an option to optimize allocation of the slim funding available for the migratory bird subsistence harvest survey. Indeed, AMBCC management authority refers to spring and summer harvests only. Management of fall harvests is generally attributed to be the purview of the sport Harvest Information Program (HIP, see below). However, dropping the survey of fall harvests risks losing a complete record of bird harvests in the surveyed communities.

3. Increase Ability to Obtain Complete Sets of Seasonal Surveys

Although diverse factors may have contributed to difficulties in obtaining complete sets of seasonal surveys, the sharp decrease in the proportion of communities returning complete seasonal surveys indicates that survey implementation, administrative difficulties, and decreasing standards for personnel training have been a major issue. The high proportion of communities that returned complete sets of seasonal surveys in 2004 (80%) suggests that it is possible to avoid returning surveys with missing data at the household and community levels. Adoption of a 2-recall or a single-recall survey should minimize such data gaps. The following general recommendations apply to any protocol eventually adopted by the AMBCC for collection of seasonal data.

3.1 DEFINITION OF OBJECTIVES

It is recommended that the AMBCC Harvest Survey Committee clearly characterize how seasonal data are used in the management strategies of the AMBCC, U.S. Fish and Wildlife Service (USFWS), the Pacific Flyway Council, and other stakeholders.

3.2 TRAINING

Adequate staff training at all levels (survey managers, field coordinators, surveyors) should be ensured so that people fully understand their duties and know where to find assistance.

3.3 QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance protocol should be implemented before the onset of the survey and quality control protocol during and after data collection. 1) Deadlines for all administrative procedures and field preparations should be established and observed so that timely onset of data collection

occurs. To shorten recall periods, administrative protocol and fieldwork preparation should be completed at least a few days before the end of the first survey period. A timeline is presented as part of a quality assurance and quality control protocol in Task 11. 2) In-season quality control protocol should be implemented in order to ensure timely data collection and submission of completed survey instruments. A staff position should be assigned in order to effectively oversee data collection in all regions. 3) Administrative mechanisms should be implemented to condition payment to completion of specific tasks. Specific recommendations on quality assurance and quality control protocol are the subject of Task 11 (below).

TASK 3: EVALUATE HOUSEHOLD REFUSAL RATES

OBJECTIVE

Analyze household refusal rates in all communities for which permission slips were made available to ADF&G Information Management. This will identify problems, optimize outreach efforts, and assist in the selection of communities to be surveyed.

HOUSEHOLD CONSENT TO CONDUCT THE SURVEY – PERMISSION SLIPS

The survey is only conducted in communities and households that have agreed to participate. After community consent has been obtained from the village council, each household is free to decide whether to participate in the survey. During the first household visit, the surveyor requests household consent to conduct the survey. The surveyor completes a permission slip for each household visited whether the household agrees or not to participate in the survey.

Household refusal rates at the community level were calculated as the number of households that declined to participate in the survey divided by the total number of households contacted. The completion of a permission slip for every contacted household is necessary because the federal Office of Management and Budget (OMB) requires an evaluation of refusal rates in order to approve the administration of the survey. High refusal rates indicate issues in the survey implementation that must be addressed through community outreach and training of survey personnel. Furthermore, high refusal rates are sources of "non-response bias" if the harvest patterns of households unwilling to participate in the survey significantly differ from the patterns of the households that do agree to participate.

HOUSEHOLD REFUSAL RATE 2004, 2005, AND 2006

ADF&G did not receive completed permission slips in 2004 and 2005, but did receive permission slips for 27 out of 67 communities surveyed in 2006. Permission slips for certain communities surveyed in 2004, 2005, and 2006 were transferred to ADF&G in July 2007. Data available at ADF&G for this analysis included 88 out of 219 communities-years surveyed in 2004, 2005, and 2006.

Overall refusal rate was 20% for 2004, 2005, and 2006 (559, 1296, 1171 permission slips respectively). Refusal rates varied among communities (Appendix 8). Refusal rates of 30% or higher occurred in 19 (22%) communities-years out of 88 communities-years in the database (Appendix 8). These refusal rates seem slightly higher than generally observed in other surveys conducted by ADF&G. For instance, overall refusal rates of 20%, 14%, and 16% occurred in 3 consecutive years of a multi-community study developed to assess consequences of development along Alaska's outer continental shelf (Fall and Utermohle 1995: I12). As a general trend, higher refusal rates occur in large communities with primarily non-native populations.

RECOMMENDATIONS

1. Low response rates in specific communities (Appendix 8) should be addressed through community outreach and training of survey staff.
2. A field for community identification should be included in each permission slip form to allow community identification if the group of returned permission slips is not accompanied by or is later separated from other paperwork related to the community's survey. Also, according to the survey handbook, although there are 3 permission slips on each 8.5" x 11" page, surveyors are asked to write the community name at the top of each page, not each permission slip; and even this protocol has not been systematically followed (AMBCC 2007). A "community" field in each permission slip form, therefore, should be implemented as a definitive solution to help identify the community of origin for each permission slip.
3. A field to record "year of harvest" should be included on each permission slip. Because many surveys have been completed after a prolonged recall period, the year of harvest does not always match the year in which the permission slip was completed.
4. An updated design of the permission slip form, including "community" and "year of harvest" fields, is presented in Appendix 9. Further modifications may be necessary if the AMBCC adopts modifications to the survey protocol. Modifications to the permission slip may require OMB approval.
5. Some completed permission slips have included the signature of a household member. It is unclear, however, if a household member needs to sign the permission slip. This should be clarified. If signature is required, it should be required only for those who agree to participate in the survey. There is no need to ask people who say "no" to sign the form. If a household member must sign the permission slip, a "signature" field should be included in the form. Since it is unclear whether this is a requirement, the signature field is not included in the new design of the permission slip presented in Appendix 9. Surveyors must be clearly informed on whether or not a household member must sign the permission slip.
6. Permission slips should be systematically sent to the data management agency for data entry and analysis, if this does not breach confidentiality requirements.
7. Completed permission slips should be compared to the list of households to be surveyed and to the harvest surveys before being sent to ADF&G for data entry and analysis. This will ensure that a permission slip is available for each surveyed household.
8. Response rate tables per community should be included in yearly survey reports.

TASK 4: CREATE A DATA SYSTEM TO FACILITATE YEARLY SELECTION OF COMMUNITIES TO BE SURVEYED – ROTATION SCHEDULE

OBJECTIVE

Design a data system to allow easy tracking of the communities that were surveyed. This will improve implementation of a rotation schedule and adequately cover the different regions surveyed.

SELECTION OF COMMUNITIES TO BE SURVEYED

Annual selection of communities to be surveyed must take into account that some communities selected in previous years opted to not participate and that data from some surveyed communities did not meet minimum requirements for analysis. It is unclear how the rotation schedule has been adjusted to compensate for these irregularities. Furthermore, according to the current federal regulations, the AMBCC may make recommendations that add or remove communities eligible to participate in the spring and summer harvest; thus the complete set of communities may vary between years and the rotation schedule should accommodate such modifications (AMBCC 2003: 11). Lack of documentation on deviations from the rotation schedule and on gaps in historical data may prevent optimization of survey efforts and adequate coverage of sub-regions.

DATA CURRENTLY AVAILABLE: COMMUNITIES SURVEYED IN 2004, 2005, AND 2006

In the context of this assessment, information on communities surveyed in 2004, 2005, and 2006 was compiled in order to develop a categorical data quality index for each community-year. The categories are 1) met sampling goal, 2) partially met sampling goal, 3) unable to include data in harvest estimates (Appendix 10). Final implementation of the data quality index depends on completion of the database review (see Recommendation number 1, below). This index will help to cover gaps in the rotation schedule and to ensure adequate coverage of sub-regions.

RECOMMENDATIONS

1. Stratification information in the database should be thoroughly reviewed for inconsistencies in stratification information (stratum and community size). Such inconsistencies preclude the identification of the sampling method used in 15% of the communities-years (see Task 6, Table 9). This survey assessment was the first opportunity to analyze multi-year data across regions. In this process, ADF&G has had the opportunity to detect and sometimes correct data entries. Because of the limited timeframe available for this assessment, ADF&G was not able to address all potential discrepancies in stratification information provided with the surveys. Completion of this review is necessary to implement the data quality index.

2. An automated procedure in SPSS® (a software program used for statistical analysis) should be developed to select communities to be surveyed during any given year, and should be based on the rotation schedule and on the quality of data available from previous survey years. This initial list of communities to be surveyed would be submitted to the AMBCC Harvest Committee and may be adjusted to address harvest monitoring priorities, such as monitoring the harvest of species of conservation concern.

   The information necessary to automatically select communities to be surveyed following the rotation schedule and accounting for irregularities in previous survey years is presented in Table 6 as the structure of an SPSS® file. A Microsoft Excel worksheet containing information on all communities surveyed in previous years should be readily accessible to the AMBCC Harvest Survey Committee. An updated version of such a worksheet should be provided by the data management agency together with yearly harvest estimates.

Table 6.-SPSS metadata for automated community selection file.

Variable name	SPSS® data type	Description
Studyear	Smallint	4-digit survey year.
Subregionkey	Tinyint	Unique numeric code for each of the 32 sub-regions.
Communty	Smallint	Unique numeric code for each of the 188 communities surveyed.
Commname	Varchar(50)	Full-spelled community name.
Rotation	Tinyint	Code for community grouping (1, 2, 3) to select 2/3 of communities in each subregion.
Quality	Tinyint	Index of the quality of data obtained: met sampling goal (1), sampling goal partially met (2), unable to include in analysis (3).
Commhh_sum	Smallint	Yearly total number of households in each community.
Sprformfl	Tinyint	Number of households surveyed in spring.
Sumformfl	Tinyint	Number of households surveyed in summer.
Falformfl	Tinyint	Number of households surveyed in fall.
Method	Tinyint	Sampling method employed: 3-harvest level stratification, census attempted, random sampling.
Coord		Unique numeric code for field coordinator (create a ref file with contact info).
Comments	Ntext	

TASK 5: EVALUATE COMMUNITY STRATIFICATION IN 3 HARVEST LEVELS (NONE/LOW/HIGH)

OBJECTIVES

1. For each community-year, calculate the proportion of households for which the reported harvest fit the harvest level stratum assigned before the onset of the survey. This will provide an evaluation of the use of a household's previous harvest level to forecast future harvests and of how well surveyors can informally assess a household's harvest level.
2. Calculate the proportion of "harvest" and "non-harvest" households based on reported harvest as a step to considering alternative sampling methods, such as 2-level stratification and random sampling.

ASSUMPTIONS FOR HARVEST LEVEL STRATIFICATION

Previous Household Harvest can be used to Forecast Future Harvest

The current 3-level stratification ("none" = zero birds; "low" = 1-10 birds; and "high" = $\geq$10 birds) relies on the assumption that the harvest patterns of the households are consistent over a time scale of a few years, and therefore, previous harvests can be used as an indicator of future harvests. However, household hunting activities vary significantly between years (Wolfe et al. 1990; Paige et al. 1996; Andersen and Jennings 2001a; Andersen and Jennings 2001b). The actual household harvest amount in a given year may not correspond to the harvest level strata assigned beforehand. Incorrect assignment of households to harvest level strata may not significantly impact harvest estimates if the mean and standard deviation are still significantly

different between strata and if the sample size in each stratum is large enough to correctly represent the stratum (Deming 1950: 241; USFWS 2006).

Field Personnel can Informally Assess a Household's Harvest Level

The current survey protocol relies on the assumption that field personnel know the harvest level of each household. The survey protocol does not include a formal process to generate the household list nor to assess a household's harvest level. According to the survey handbook, surveyors are instructed to visit each household and inquire about its past harvest patterns. However, Form 7-FW-100 instructs surveyors to "… use his or her own knowledge, or ask a household member, or ask someone else" (AMBCC 2007). Consequently, the protocol to assess a household's harvest level is likely heterogeneous between communities. Furthermore, it is unlikely that surveyors know the harvest level of each household, especially in large and dynamic communities such as Bethel.

SUBSISTENCE HARVEST SURVEY AND THE NATIONAL HIP HUNTING SURVEY

The harvest level stratification adopted in the migratory bird subsistence harvest survey was largely based on the federal Harvest Information Program (HIP) nationwide survey of sport bird hunters (USFWS 2006). However, some key aspects of the HIP survey methods could not be implemented in the migratory bird subsistence harvest survey. Following is a discussion of some significant differences between the 2 surveys offered as part of the process of developing a protocol to monitor subsistence harvests of birds and eggs in rural Alaska.

Screening Questions

Every calendar year, migratory bird sport hunters are required to enroll in the HIP, usually when they purchase their duck stamp, which is the basic system of recording migratory bird hunters for the HIP. When they enroll, hunters are asked a series of screening questions concerning their hunting activities in the previous year. The screening questions are the basis for assigning hunters to specific harvest level strata. The migratory bird subsistence harvest survey does not have mechanisms to keep records of harvesting households and does not have a formal protocol to assess a household's harvest activity in previous years. The lack of standard protocol likely results in heterogeneity of stratification implementation across communities and may contribute to higher misclassification of subsistence hunters to specific harvest level strata.

Adjustment of Sampling Proportions based on Expected Number of Hunters

HIP stratum-specific sampling proportions are defined yearly based on the number of expected hunters per state. This is possible because yearly hunter licensing data is processed in-season. This way, higher sampling proportions can be defined for states or species (or species categories) that have low numbers of expected hunters. For example, for duck and goose hunters that DID HUNT the previous year, the HIP survey typically samples 0.5% of hunters in the "no harvest" stratum, 7.5% of hunters in the "harvest 1-10" stratum, and 10% of hunters that harvest $\geq$10 birds. Hunters harvesting species of special interest, such as sea ducks and sandhill cranes may be sampled at a rate of 50% or more. Conversely, strata-specific sampling proportions are always the same in the migratory bird subsistence harvest survey (10% = none"; 15% = "low"; 40% = "high") independent of the number of hunting households, which may result in stratum sample sizes that are too small, especially if the stratum is small.

Sample Size

The HIP sport hunting survey is a nationwide direct mail survey, which allows relatively large sample sizes. The HIP survey harvest estimates are reported at state, flyway, and country levels. On the other hand, insufficient funding and technical difficulties in implementing the migratory bird subsistence harvest survey have resulted in very small sample sizes. This issue is likely aggravated by incorrect assignment of households to harvest level strata since harvest expansions applied to small sample sizes magnify consequences of incorrect assignment of households. This most likely results in overestimation of harvest in the "none" and "low" strata, which are usually sampled at low proportions. The impact of this mechanism on overall harvest estimates will depend on the contribution of the amount of harvest in the "none" and "low" strata to the total harvest.

Harvest Patterns

For the HIP survey, individual hunters are the basic sampling unit, while households (which may include multiple hunters) are the sampling unit for the migratory bird subsistence harvest survey. This may contribute to important differences in data patterns between sport and subsistence hunting.

In addition, harvest patterns of subsistence hunters and sport hunters are likely different. In subsistence economies, the product of harvest is often shared in kinship lines, with hunters providing for people unable to harvest. Consequently, a relatively small proportion of harvesting households contribute a large proportion of the harvest (Wolfe 1987; Coiley-Kenner et al. 2003). The stratification protocol developed for the HIP survey (USFWS 2006) to capture sport hunting patterns may not adequately address subsistence harvest patterns. During the first 4 years of HIP surveys in Alaska, about 60% of enrolled hunters harvested no ducks, 20% harvested up to 10 ducks, and 20% harvested more than 10 ducks (USFWS 2006; 2007). Although the highest proportions of both sport hunter and subsistence hunters are in the low and non-harvest categories, it is likely that higher individual harvest reports are more common among subsistence hunters.

PREVIOUS HOUSEHOLD HARVEST LEVEL AS A RELIABLE FORECAST OF FUTURE HARVEST LEVEL

Distribution of Households in the 3 Harvest Level Strata

Based on the survey data, there are no means to assess whether the harvest patterns of households were consistent across years because the identification of each household is confidential information kept by the surveyor. As an alternative, the proportion of households in each stratum was analyzed to assess if it was consistent across years at the community level. If so, a household's previous harvest level may be an adequate basis for harvest level stratification.

In 45% (n = 24) out of 54 communities for which stratification information was available for 2 or more years, the proportion of households assigned to each harvest level stratum varied considerably between years (Appendix 11). This suggests that hunting effort varies significantly between years and that accuracy in forecasting future harvest level based on the previous household harvest level is limited. The observed variation may be a true phenomenon if 1) hunting habits of households frequently change between years, or 2) if people leaving and moving into the community modify the community hunting contingent. On the other hand, this

variation may be just apparent because 1) field staff cannot accurately assess the harvest level of a significant proportion of households, or 2) if the stratification protocol was not correctly implemented.

Does Reported Harvest fit the Harvest Level Stratum Assigned Beforehand?

The percentage of households whose yearly reported harvest fit the harvest level stratum assigned beforehand was fairly constant across the 3 years of data available (Table 7). Between 74% and 80% of the households were correctly assigned to the "none" harvest stratum. Between 64% and 69% of the households assigned to the "high" stratum indeed harvested >10 birds. However, only 17%-25% of the households assigned to the "low" stratum harvested between 1 and 10 birds. See Appendix 12 for information on how household harvest fit the assigned harvest level stratum for each community-year. Low success in assigning households to the intermediary harvest level suggests that this stratum (1-10 birds) does not fit subsistence harvest patterns.

Table 7.-Fit of yearly household harvest to harvest level stratification, survey years 2004, 2005, and 2006.

	2004		2005		2006	
Harvest level assigned	HH[a] surveyed: number and percentage	Percentage of HH fitting the assigned harvest level	HH surveyed: number and percentage	Percentage of HH fitting the assigned harvest level	HH surveyed: number and percentage	Percentage of HH fitting the assigned harvest level
None (no harvest)	502 (27%)	74%	811 (32%)	80%	196 (22%)	80%
Low (1-10 birds)	565 (30%)	25%	617 (24%)	23%	239 (27%)	17%
High (more than 10 birds)	799 (43%)	69%	1,091 (43%)	64%	451 (51%)	68%

[a] HH = Households.

Distribution of harvesters and non-harvester in the 3 strata was such that 1) on average, 22% of households assigned to the "none" stratum actually harvested birds, 2) on average, 37% of households assigned to the "low" did not harvest birds, and that 3) on average, 20% of households assigned to the "high" did not harvest birds (Table 8). Since only 10% and 15% of households assigned to the "none" and "low" strata respectively are selected for sampling, incorrect assignment of households to these strata may compromise accuracy of harvest estimates, at least at the stratum level. The impact of this mechanism on overall harvest estimates will depend on the contribution of the "none" and "low" strata to the total harvest.

When the "low" and "high" strata were aggregated in order to consider misclassification in a harvester/non-harvester scenario, harvester misclassification averaged 26% and non-harvester misclassification averaged 22% between 2004 and 2006 (Table 8).

Table 8.-Number (and percentage) of harvester and non-harvester households in each harvest level stratum in survey years 2004, 2005, and 2006.

Year	None (0 birds)		Low (1-10 birds)		High (10+ birds)	
	Harvesters	Non-harvesters	Harvesters	Non-harvesters	Harvesters	Non-harvesters
2004	133 (26%)	369 (74%)	387 (68%)	178 (32%)	665 (83%)	134 (17%)
2005	160 (20%)	651 (80%)	360 (58%)	257 (42%)	845 (77%)	246 (23%)
2006	39 (20%)	157 (80%)	149 (62%)	90 (38%)	356 (79%)	95 (21%)

"HARVESTER" AND "NON-HARVESTER" HOUSEHOLDS

The idea that overall hunting effort in communities significantly varies between years has been developed in previous studies of the subsistence harvest of migratory birds in Alaska (Wolfe et al. 1990; Paige et al. 1996; Andersen and Jennings 2001a; Andersen and Jennings 2001b). Proportions of households harvesting migratory birds in Alaska rural communities between 1980 and 2003 were obtained from the ADF&G Community Subsistence Information System (CSIS) (Appendix 13) (ADF&G 2008). Weather conditions, water levels, and deviations in bird migratory routes affect the yearly availability of birds in an area. A householder's health, family economics, and other subsistence activities affect his or her efforts to harvest migratory birds. A proportion of harvesting households in year t will not harvest in year t+1 and vice-versa. The accuracy of using the household's previous harvest level to forecast their future harvest level is somewhat limited.

RECOMMENDATION

Adopt a 2-level stratification, harvester/non-harvester, instead of the 3-level stratification. Indeed, the Harvest Survey Committee has recommended that 2-level stratification be used in communities with fewer than 20 households (AMBCC 2003: 13). However, there is no evidence that 2-level stratification was ever implemented in the migratory bird subsistence harvest survey (see "Sampling methods currently used", Task 6). Two-level stratification has been successfully used in a number of other subsistence harvest monitoring programs conducted by ADF&G over many years in both large and small communities (e.g., Simon et al. 2007). Harvester/non-harvester stratification will likely allow more correct assignment of households to harvest level stratum, which will produce more accurate harvest estimates and smaller confidence intervals. Two-strata sampling will also significantly simplify data collection, thus reducing data inconsistencies and encouraging achievement of meaningful sample sizes.

TASK 6: REVIEW STRATIFICATION RULES AND SIMPLIFY IF POSSIBLE

OBJECTIVES

1. According to the distribution of households in each harvest level (Task 5), review and simplify, if possible, the set of stratification rules. Re-evaluate the minimum community size (number of households) below which stratification is not recommended.
2. Define optimal sampling methods (stratification, simple random sampling, census, etc.) for each community based on community size and patterns of harvest.

3. Develop alternate procedures to select households in each stratum, which would replace the current transparent overlay.

STRATIFICATION METHOD CURRENTLY USED: 3-LEVEL STRATIFICATION

The definition of the 3 sampling strata adopted in the subsistence harvest survey was based on the national HIP hunting survey. The implementation of the 3-level stratification follows these steps and their accessory rules.

1. At the beginning of a survey year, field personnel list all households in the community and assign each household to a harvest level stratum based on their best knowledge of the household's harvest level.
2. A random sample of households is drawn from each harvest level stratum so that a minimum of 40%, 15%, and 10% of households in the high, low, and none stratum are sampled.
3. Regardless of the above sampling proportions, a minimum of 5 households must be selected in each stratum.
4. If fewer than 8 households have been assigned to a stratum, one-half, at most, of the listed households should be surveyed.

OTHER SAMPLING METHODS

Other sampling methods have been used in the subsistence harvest survey. The Harvest Survey Committee has also recommended that very small communities (< 20 households) are assigned to a 2-level stratification (harvester/non-harvester), with sampling proportions of 100% for harvesters and 10% for non-harvesters (AMBCC 2003: 13). However, no reference to this method was found in the survey handbook (AMBCC 2007), it is likely that this protocol has not been included in personnel training.

Data from 2004-2006 surveys and sampling information provided by field personnel indicate that census (100% sampling) have been attempted in smaller communities. Mention of this method was not found in the survey handbook or in the AMBCC recommendations (AMBCC 2007; AMBCC 2003). Some of these cases occurred when the migratory bird subsistence harvest survey was coupled with other ADF&G surveys which had a census as the sampling goal. It also seems that there was an attempt to implement a self-reporting system to in order survey large communities, although documentation on this procedure is scarce.

Stratification information was compiled for all communities surveyed between 2004 and 2006 so as to assess the extent of the use of different sampling methods (Appendix 14). The sampling method used in each community-year was inferred by contrasting 1) the total number of households in a community, 2) the number of households assigned to each harvest level stratum, and 3) the yearly mean number of households sampled in each stratum (the number of households sampled commonly varied between survey seasons). It was inferred that 3-level stratification was used if the proportion of sampled households varied among strata and if the number of households assigned to each stratum was available. It was inferred that a census was attempted if the number of households sampled was about equal to the total number of households in each stratum. In some communities in which it was highly probable that a census was attempted, information on the number of households in each stratum was also provided by field personnel, which suggests that there was an attempt to implement stratification.

Three-level stratification was used in 65% of the communities-years and a census was attempted in 20% of the communities-years (Table 9). Most of the communities-years in which a census was attempted had 55 or fewer households (Figure 2). It was not possible to infer the sampling method used in 15% of communities-years, mostly the larger communities, but also the smaller communities in which the number of households sampled was very small. There was no evidence that 2-level stratification was ever used (Appendix 14).

Table 9.-Use of 3-level stratification and census in the migratory bird subsistence harvest survey (number of communities-years).

	Sampling method		
Year	Three-level stratification	Census attempted	Unknown
2004	66	9	10
2005	53	18	10
2006	32	20	1 (+14[a])
Total	**151**	**47**	**35**

[a] Stratification information was absent for 14 communities, which were not included in 2006 preliminary harvest estimates.

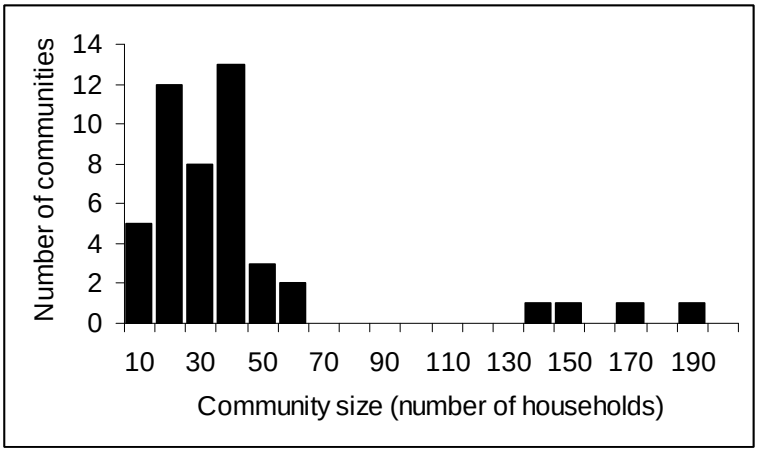


Figure 2.-Distribution of size for communities-years surveyed by census in the migratory bird subsistence harvest survey, 2004, 2005, and 2006 survey years.

These results show that different sampling methods have been used across communities and deviations from the original survey protocol have been poorly documented. Sampling methods that are simple, compatible with community size, and clearly defined would improve performance in collection of harvest data.

PRECISION AND BIAS OF HARVEST ESTIMATES OBTAINED BY SIMPLE RANDOM SAMPLING AND 2-LEVEL STRATIFICATION (HARVESTERS/NON-HARVESTERS) – MONTE CARLO SIMULATIONS

Simple random sampling (SRS) may not adequately quantify subsistence harvests unless a relevant proportion of households are sampled. Because a small proportion of households provide a large proportion of a community's harvest (Wolfe 1987), SRS should include a large enough sample size in order to correctly represent the high harvest households.

Stratification may allow more accurate (and perhaps more cost-effective) sampling by addressing specific categories of households. In stratified sampling, sampling proportions are specific to categories of households based on their previous harvest level. Higher sampling proportions of harvesting households compared to non-harvesting households will ensure that the sample size adequately represents high harvesters. In most cases, for a given sample size (total number of households sampled), stratification will allow the generation of more precise harvest estimates than would SRS. Complementarily, for a given a level of precision, stratification requires a smaller sample size than does SRS.

The detection of high rates of misclassification of households to harvest level strata (Task 5) raised the question of whether the field efforts required to implement stratified sampling (as opposed to simple random sampling) are justified. The objective of the following simulations is to compare the precision and bias of harvest estimates obtained by 2-level stratification (harvester/non-harvester) with those generated by simple random sampling. Given the timeframe available for this assessment, this analysis did not aim to be a comprehensive assessment of accuracy of harvest estimates for all bird species and eggs taken in the subsistence harvest. These analyses aimed to provide an understanding of the effects of overall sampling proportions on the representation of harvesters and non-harvesters in the sample, and the effects of community composition on the precision and bias of harvest estimates for commonly- and rarely-harvested species.

Methods

Monte Carlo simulations, which involve repeated re-sampling of a dataset, were used to assess precision and bias of harvest estimates obtained by SRS and 2-level stratified sampling. A measure of "precision" defines how tightly the harvest estimates obtained by the simulations are distributed. However, it is possible to have very precise harvest estimates that are "biased" (inaccurate), since the harvest estimates may be very similar, but far from the true amounts harvested. Bias is most often the result of systematic sampling errors. Harvest estimates of any harvest monitoring program should be both precise and unbiased.

In an SRS scenario, an assessment of how precision of and bias in harvest estimates change with increasing sampling proportions was produced. A threshold sampling proportion beyond which there was not much gain in precision was then defined. The sample size (n) associated with this threshold sampling proportion was used to determine the precision and bias of harvest estimates obtained by 2-level stratified sampling with different combinations of sampling proportions for harvesters and non-harvesters ($n = n_1 + n_2$, where n_1 is sample size in stratum 1 and n_2 is sample size in stratum 2).

For each simulation, precision was calculated as the average of the standard error associated with each harvest estimate obtained by re-sampling. Estimates of true standard error were calculated

as the standard deviation of the harvest estimates. Comparison of precision and true standard error allows detection of bias in estimates of precision. Bias related to harvest estimates was calculated as the difference between the actual harvest amount (Table 10) and the average of the harvest estimates obtained for each simulation scenario. Formulas to calculate standard error and variance of means and of estimates followed Cochran (1977:27 for SRS, 95 for stratified sampling).

Variation in precision and bias was compared in 3 community profiles: 1) the proportions of harvester and non-harvester households were relatively similar, 2) the proportion of harvester households was much larger than the proportion of non-harvester households, and 3) the proportion of harvester households was much smaller than the proportion of non-harvester households. Because precision and bias of harvest estimates may differ between commonly- and rarely-harvested species, we performed simulations for one species heavily harvested (mallard *Anas platyrhynchos*) and one species rarely harvested *(*tundra swan *Cygnus columbianus).*

The simulations were performed using data collected by ADF&G in 2005 in 5 communities of the Iliamna region where sampling proportions obtained by simple random sampling were Igiugig (92%), Kokhanok (83%), Koliganek (67%), Levelock (74%), and New Stuyahok (51%). Altogether, the 5 communities represent a total of 138 households. "Harvester" households were those that reported the harvest of at least one bird, all species considered. "Non-harvester" households did not report any bird harvest. Data from the 5 communities were combined in such a way that created 3 different communities in terms of their proportions of harvesters and non-harvesters (Table 10). Community "A" represents the complete original dataset. Community "B" was created by randomly excluding 50% of the non-harvester households. Community "C" was created by randomly excluding 75% of the harvester households. Data were analyzed for mallard, the most-harvested species in this dataset, accounting for 30% of the total number of birds reported, and for tundra swan, among the least-harvested species in this dataset, accounting for 0.75% of the total number of birds reported.

Sampling proportions used in SRS simulations were set as 5%, 10%, 15%, …, 100%. For SRS, each scenario, including bird species, community profile, and sampling proportion, was re-sampled 1,000 times.

A previous assessment of the use of SRS to monitor subsistence harvest of migratory birds in Alaska has shown that the gain in precision with increased sample size is minor for sampling proportions larger than 20%-30%, although this pattern did not hold for species rarely harvested (Reynolds 2003). Based on Reynolds (2003) and the results of these SRS simulations (see "Results," below), a sampling proportion of 30% was established for analysis of precision and bias of harvest estimates obtained with 2-level stratification. An overall sample size equaling 30% of total households in the community was built from complementary sampling proportions of harvester and non-harvester households (10%-90%, 20%-80%, 30%-70%, …, 90%-10%).

For the 2-level stratification, the effect that misclassification of households into specific harvest level stratum had on the precision and bias of harvest estimates was analyzed. For this purpose, households were randomly swapped between the harvester and non-harvester strata. Based on misclassification rates for harvesters and non-harvesters of the survey from 2004 to 2006 (Task 5, "Can previous household harvest forecast future harvest?"), the number of households swapped equaled 20% of the total households in the smaller stratum (Table 10). For the 2-level stratification, each scenario, including bird species, community profile, presence or absence of

household misclassification, and the combination of sampling proportion as harvester or non-harvester was re-sampled 1,000 times.

Table 10.-Scenarios for assessing variation in precision and bias of harvest estimates obtained by simple random sampling and 2-level stratified sampling.

Community attributes	Community A	Community B	Community C
Total number of HH	138	114	71
Harvesters [N (%)][a]	89 (64%)	89 (78%)	22 (31%)
Non-harvesters [N (%)][a]	49 (36%)	25 (22%)	49 (69%)
Number of misclassified households	10	5	4
Mallard: actual[b] amount harvested by harvesters (no misclassification)	520	520	178
Mallard: actual[b] amount harvested by non-harvesters (no misclassification)	0	0	0
Mallard: actual[b] amount harvested by harvesters (misclassification)	474	477	156
Mallard: actual[b] amount harvested by non-harvesters (misclassification)	46	43	22
Tundra swan: actual[b] amount harvested by harvesters (no misclassification)	21	21	6
Tundra swan: actual[b] amount harvested by non-harvesters (no misclassification)	0	0	0
Tundra swan: actual[b] amount harvested by harvesters (misclassification)	21	19	6
Tundra swan: actual[b] amount harvested by non-harvesters (misclassification)	0	2	0

HH = household.

[a] N = total number of households in the stratum.

[b] The reported harvest was considered as "actual" harvest for the purposed of these analysis.

Results and discussion

Precision of harvest estimates [average standard deviation (SD) and true standard error (SE)] decreased with increasing sample sizes for both mallard and tundra swan (Figures 3 and 4). In agreement with Reynolds (2003), the most significant gain in precision occurred at sampling proportions smaller than 30%. Average SD was consistently lower than true SE, indicating that precision of harvest estimates tends to be slightly overestimated (Figures 3*i* and 3*ii*, 4*i* and 4*ii*). Erratic variation of bias percentage indicates that there was no tendency to systematically overestimate or underestimate harvest because of flaws in the sampling method (Figures 3*iii* and 4*iii*).

When using an overall sampling proportion of 30% of community size to compare harvest estimates obtained by SRS and 2-level stratification, gains in precision associated with the use of stratification were observed mostly when harvesters comprised most of the total sample size (harvester/non-harvester proportions of 80%-20% and 90%-10%) (Figures 5 and 6). This is

because a larger sample size at the stratum level is necessary in order to capture a larger variance of harvest reports in the harvester stratum (despite a certain degree of misclassification, harvest reports in the non-harvester stratum are frequently "zero"). In community C, which was composed mainly of non-harvesters, a gain in precision by use of stratification was observed over a larger number of combinations of harvesters and non-harvesters sampling proportions (Figures 5 and 6).

Misclassification of households to strata at rates comparable to that observed in the subsistence harvest survey data (Task 5) resulted in a slightly reduced precision of harvest estimates (Figures 5 and 6). At the sampling proportion 90% harvester-10% non-harvester, misclassification of households resulted in loss of precision of 13% to 24% for mallard and of 0% to 8% for tundra swan (Tables 11 and 12). The effects of misclassification on the precision of harvest estimates are more pronounced in commonly-harvested species than in rarely-harvested species because classification of households as harvester or non-harvester is based on the harvest of "all bird species". High harvesters are more likely to have a lower chance of being misclassified as non-harvesters, and high harvesters have a greater chance of harvesting uncommon species than low harvesters.

The relative performance of SRS and 2-level stratification varied according to the proportion of harvesters and non-harvesters in the community. Harvest estimates for mallard in community A were 17% more precise when using 2-level stratification and when the sample was mostly composed of harvesters (Table 11). In community B, which was composed mostly of harvesters, the use of stratification allowed only a 4% gain in precision when compared to SRS. In community C, which was composed mainly of non-harvesters, the use of stratification allowed harvest estimates to be 54% more precise than if obtained by SRS when the total sample size was composed mostly of harvesters. Stratification allowed higher gains in the precision of the harvest estimates of tundra swan, a rarely-harvested species. Gains in precision for tundra swan were 22%, 4%, and 73% in communities A, B, and C.

Table 11.-Precision and bias of mallard harvest estimates obtained by simple random sampling and 2-level stratification.

Sampling method	Proportion harv -non-harv %	Sampled HH[d]	Mean estimated harvest[b]	Average SD	Gain in precision by use of stratification[c]	True SE
Community A (64% harvester, 36% non-harvester), community size = 138 HH						
SRS[a]	–	41	519.24	114.02	–	119.38
2-level stratification without misclassification	90-10	41	519.15	79.70	30%	78.71
2-level stratification with misclassification	90-10	41	513.26	94.61	17%	97.07
Community B (71% harvester, 29% non-harvester), community size = 114 HH						
SRS	–	34	524.04	111.55	–	111.84
2-level stratification without misclassification	90-10	34	523.37	92.52	17%	92.64
2-level stratification with misclassification	90-10	34	524.49	107.37	4%	109.17
Community C (21% harvester, 79% non-harvester), community size = 71 HH						
SRS	–	21	182.25	77.51	–	83.49
2-level stratification without misclassification	60-40	21	178.63	17.25	78%	16.88
2-level stratification with misclassification	60-40	21	179.29	35.73	54%	59.63

[a] SRS = Simple random sampling.

[b] Actual reported harvest amount was 520 birds for communities A and B, and 178 birds for community C (see Table 10).

[c] Gain in precision was calculated as a percentile related to precision obtained by SRS.

[d] HH = household.

Note: Overall sampling proportion = 30% for both SRS and 2-level stratification.

Table 12.-Precision and bias of tundra swan harvest estimates obtained by simple random sampling and 2-level stratification.

Sampling method	Proportion harv -non-harv %	Sampled HH[d]	Mean estimated harvest[b]	Average SD	Gain in precision by use of stratification[c]	True SE
Community A (64% harvester, 36% non-harvester), community size = 138 HH						
SRS	–	41	20.60	8.03	–	8.48
2-level stratification without misclassification	90-10	41	21.01	6.16	23%	6.08
2-level stratification with misclassification	90-10	41	21.17	6.24	22%	6.39
Community B (71% harvester, 29% non-harvester), community size = 114 HH						
SRS	–	34	20.69	7.97	–	8.08
2-level stratification without misclassification	90-10	34	20.69	6.96	13%	7.55
2-level stratification with misclassification	90-10	34	20.52	7.61	4%	7.80
Community C (21% harvester, 79% non-harvester), community size = 71 HH						
SRS	–	21	6.07	3.74	–	4.32
2-level stratification without misclassification	60-40	21	6.00	1.02	73%	1.04
2-level stratification with misclassification	60-40	21	5.99	1.02	73%	1.06

[a] SRS = Simple random sampling.

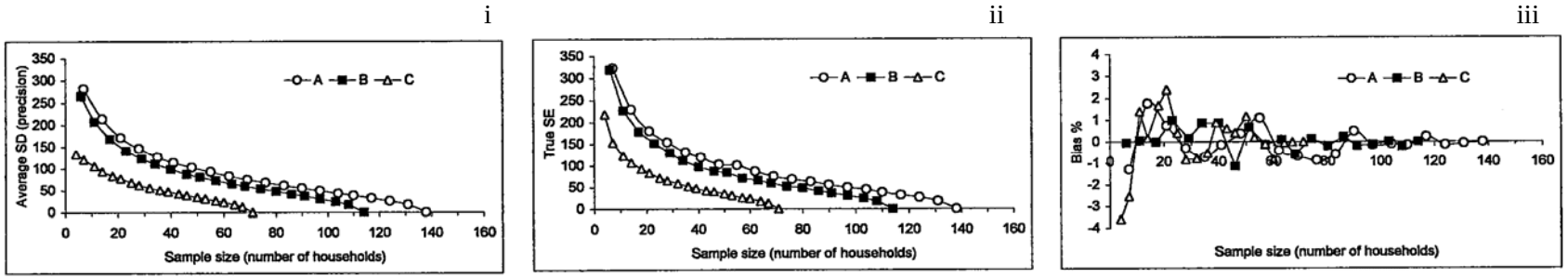
[b] Actual reported amount of harvest was 21 birds for communities A and B, and 6 birds for community C (see Table 10).

[c] Gain in precision was calculated as a percentile related to precision obtained by SRS.

[d] HH = household.

Note: Overall sampling proportion = 30% for both SRS and 2-level stratification.

Figure 3.-Average standard deviation, true standard error, and bias percentage for mallard harvest estimates obtained by simple random sampling with increasing sampling proportions.



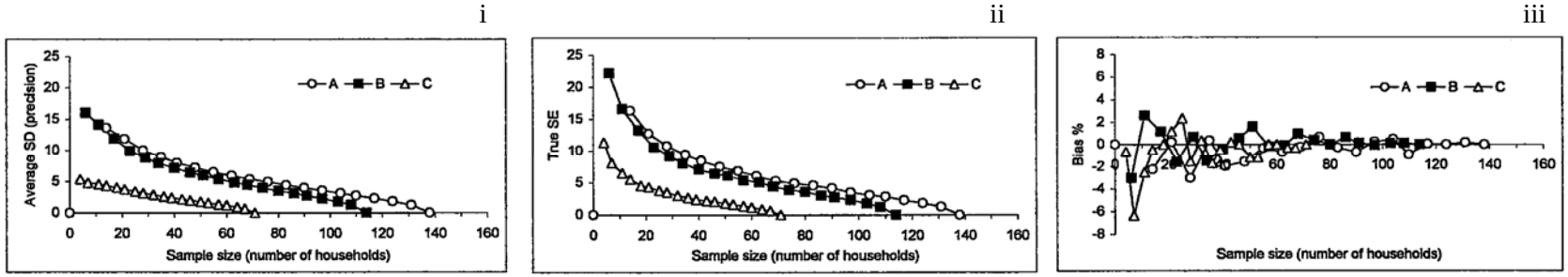
Each symbol corresponds to a 5% step in the sampling proportion.

Community A (circles): 64% harvester, 36% non-harvester, community size = 138 households.

Community B (squares): 71% harvester, 29% non-harvester, community size = 114 households.

Community C (triangles): 21% harvester, 79% non-harvester, community size = 71 households.

Figure 4.-Average standard deviation, true standard error, and bias percentage for tundra swan harvest estimates obtained by simple random sampling with increasing sampling proportions.



Each symbol corresponds to a 5% step in the sampling proportion.

Community A (circles): 64% harvester, 36% non-harvester, community size = 138 households.

Community B (squares): 71% harvester, 29% non-harvester, community size = 114 households.

Community C (triangles): 21% harvester, 79% non-harvester, community size = 71 households.

Figure 5.-Average standard deviation, true standard error, and bias percent for mallard harvest estimates obtained by simple random sampling and 2-level stratification without and with misclassification.

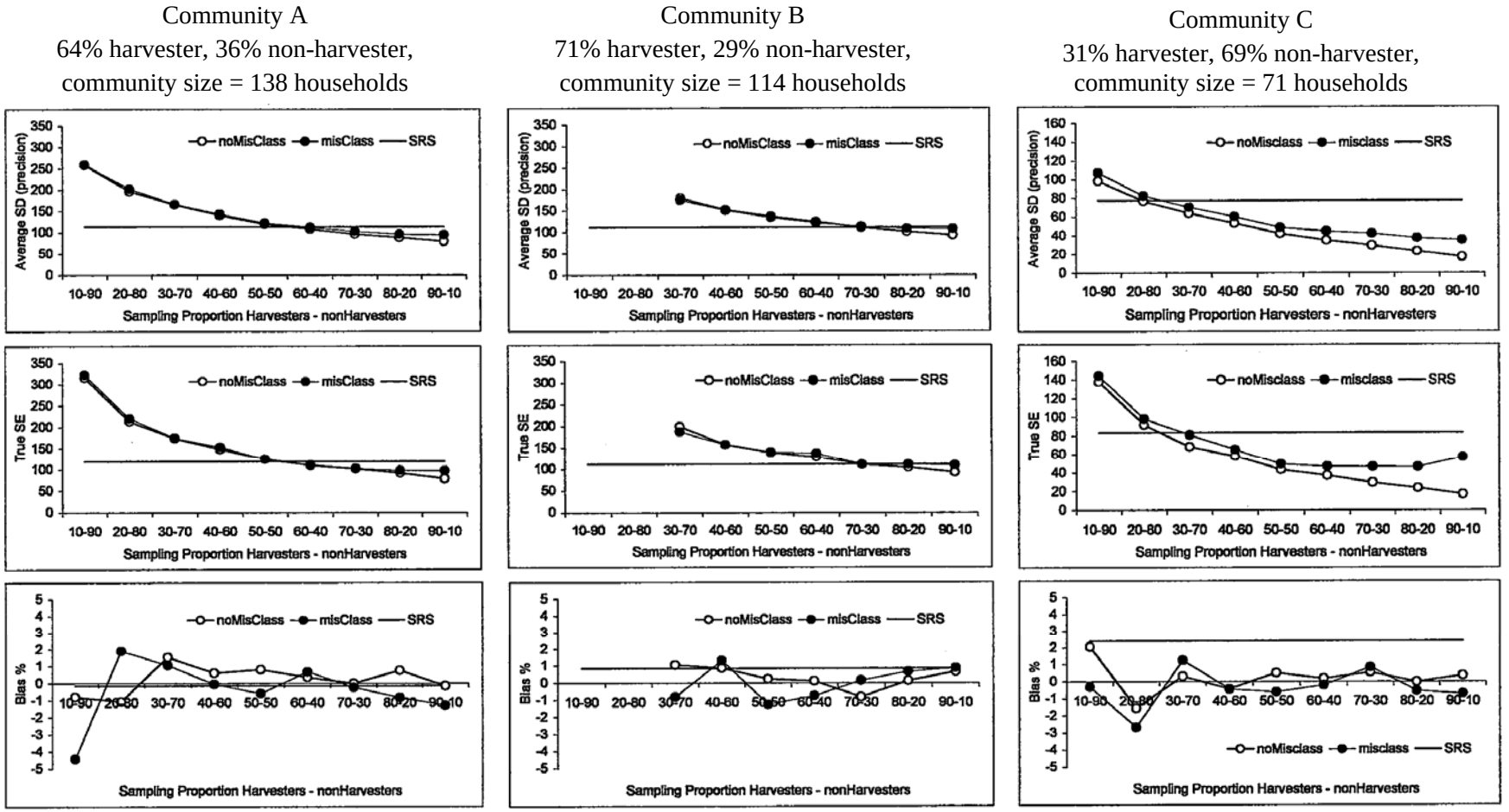
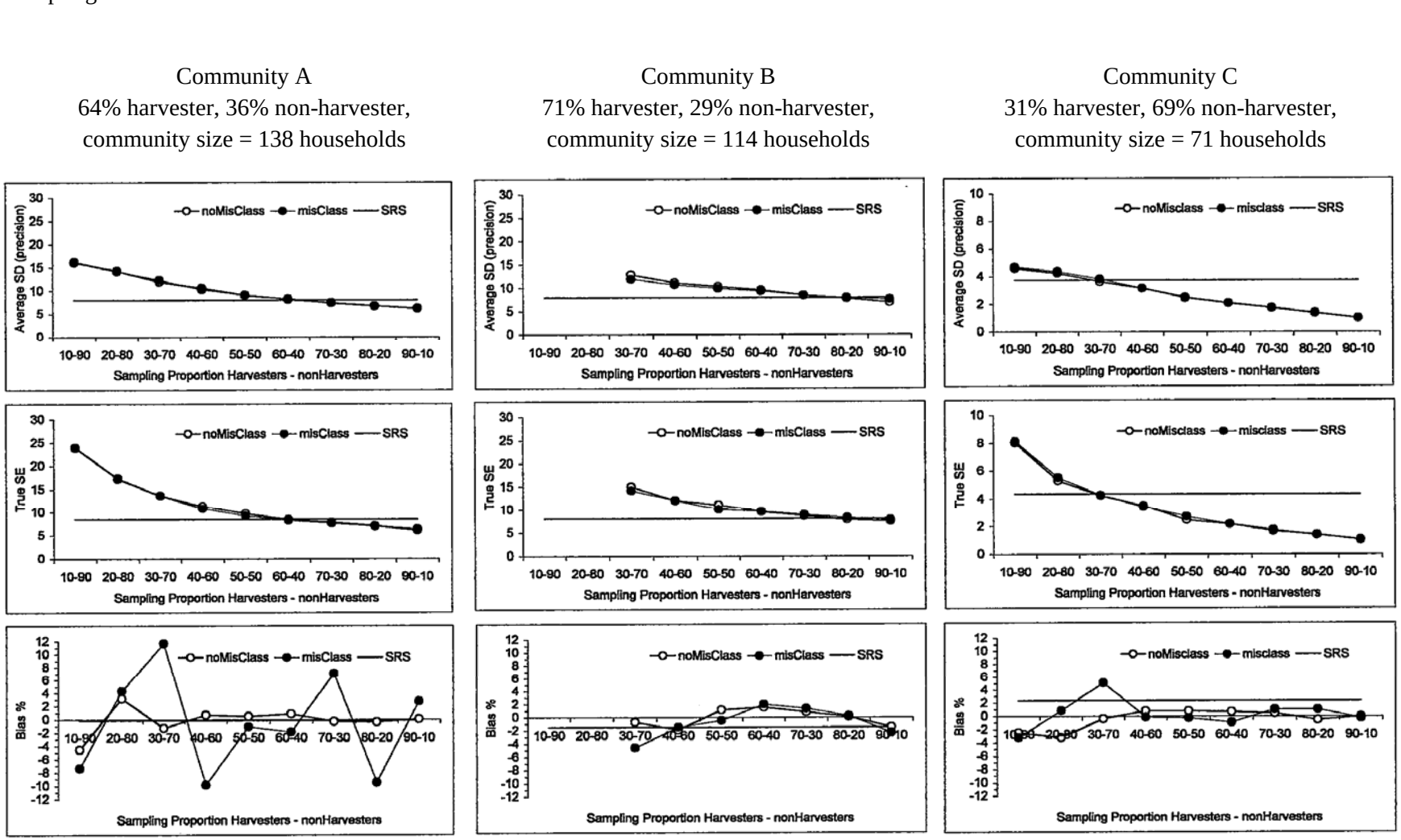


Figure 6.-Average standard deviation, true standard error, and bias percent for tundra swan harvest estimates obtained by simple random sampling and 2-level stratification without and with misclassification.



Conclusions

Although the purpose of these analyses was to understand general patterns applicable to other species, geographic areas, and years, it is important to keep in mind that these analyses addressed only 2 of about 90 bird species that may be harvested for subsistence. These analyses also represented only one year in one relatively small region of the state of Alaska. For these reasons, the dataset used may not fully represent characteristics of data obtained in the migratory bird subsistence harvest survey. The following conclusions were thus likely to apply only generally to the subsistence harvest of migratory birds, although analyses of a larger number of species, years, and geographical areas may lead to further understanding of mechanisms affecting precision of harvest estimates.

Two-level stratification allowed a gain in precision compared to SRS only if the sample was composed mainly of harvesters. The optimal composition of the sample was 80% harvester/20% non-harvester.

The effect of misclassification of households into harvest level strata on the precision of harvest estimates varied depending on the proportion of harvesters and non-harvesters in the community and between the commonly- and the rarely-harvested species (mallard and tundra swan). For the commonly-harvested species, negative effects of household misclassification on the precision of harvest estimates were stronger in those communities composed mainly of non-harvesters. For the rarely-harvested species, the negative effects of misclassification were relatively weaker, and minimal in those communities composed mostly of non-harvesters.

The gain in precision by the use of stratification varied depending on the proportions of harvesters and non-harvesters in the community and between the commonly- and the rarely-harvested species. Larger gains in precision by use of stratification were observed in the rarely-harvested species. This finding is relevant to the management and conservation of bird populations that require especially accurate harvest estimates, such as rarely-harvested species, non-game species, and species of conservation concern.

APPROACHES TO SAMPLE HARVESTER AND NON-HARVESTER STRATA

The Monte Carlo simulations contrasting SRS and 2-level stratification were based on an overall sampling proportion of 30% of community size. The first step in devising a sample size for each stratum was to determine the total sample size, which was based on community size ($n = n_{harvester} + n_{non\text{-}harvester}$). Next, a combination of harvesters and non-harvesters was randomly selected to represent the community. According to the results of the Monte Carlo simulations, the community sample should be composed of 80% harvesters and 20% non-harvesters. This approach differed from that currently used on the migratory bird subsistence survey, where sampling proportion refers directly to stratum size (“none” = 10%; “low” = 15%; “high” = 40%). Following is a discussion of the advantages and costs of these 2 approaches.

Sample Size Directly Related to Community Size

The use of an overall 30% sampling proportion at the community level is supported by these results and by Reynolds (2003), which shows that the gains in precision due to increased sample size are still considerable for sampling proportions of up to 20-30%. Reynolds’ (2003) results refer to simple random sampling at the regional level, while the analyses presented in this assessment refer to sampling at the community level. If the sampling proportion in each

community were 30%, since the set of communities to be surveyed in a region varies from year to year according to the rotation schedule, there would be significant variance in the overall sampling proportion at the regional level if communities of different sizes were sampled in different years. If an overall sampling proportion of 30% was defined at the regional level, then the sampling proportions of each community should be adjusted to meet the sampling goal. An analysis of the relationship between the sample sizes currently obtained in the survey and the precision of estimates obtained by 3-level stratification were outside the scope and timeframe of this assessment (Appendix 2).

Sample Size Directly Related to Strata Size

Similar to the 3-level stratification currently used, the total sample size could be directly relational to strata size by sampling 40% of harvesters and 15% of non-harvesters in the community. The total sample size at the community level would depend on the distribution of households between strata. Communities with a higher proportion of harvesters would have a larger sample size than communities with a higher proportion of non-harvesters. At the regional level, communities with a higher proportion of harvesters would be sampled more intensively than communities with a higher proportion of non-harvesters. This could be a desirable feature of a sampling protocol because communities that account for a high proportion of the total harvest are likely to also account for a high proportion of the variance of regional harvest estimates.

Sample size at Community Level and Sampling Proportions at Strata Level

The overall sample size and the proportion of harvesters to non-harvesters in the sample depend on the approach used to compose the sample and the proportion of harvesters and non-harvesters in each community (Table 13). For communities with a high proportion of non-harvesters, sampling proportions relative to community size would result in a larger overall sample size (positive "Difference $n_{30\%}$ - $n_{40\%-15\%}$" in Table 13). For communities with a high proportion of harvesters, sampling proportions relative to community size would result in a smaller overall sample size (negative "Difference $n_{30\%}$ - $n_{40\%-15\%}$" in Table 13). If the sampling proportion is to be relative to community size, a combination of 80% harvesters and 20% non-harvesters ensures the best gains in precision by the use of stratification. If sampling proportions are based on strata size (40% harvesters, 15% non-harvesters), the relative proportion between harvesters and non-harvesters may largely differ from the optimal combination of harvesters/non-harvesters that would result in the highest precision of harvest estimates. Under this scenario, lower proportions of harvesters may be selected in communities composed mainly of non-harvesters. However, the Monte Carlo simulations indicated that the gains in precision by the use of stratification in communities that are composed of a majority of non-harvesters extended over a larger number of combinations of harvesters and non-harvesters (community C in Figures 5 and 6). Therefore, basing sampling proportions directly on strata size would result in smaller sample sizes and perhaps reduced precision.

Table 13.-Sample size and sampling proportions at community and stratum levels for two-level stratification, sampling proportion based on strata size and community size.

Community composition		Sampling proportion relative to strata size (40 % harv, 15% non-harv)					Sampling proportion relative to comm size (30% of community size)			
N[a] harv	N non-harv	n[b] harv	N non-harv	% Harv[a]	% Non-harv[a]	$n_{40\%-15\%}$[c]	% Harv[a]	% Non-harv[d]	$n_{30\%}$[e]	Difference $n_{30\%} - n_{40\%-15\%}$
Community size = 100 households										
10	90	4	13.5	0.2	0.8	18	0.8	0.2	30	13
20	80	8	12	0.4	0.6	20	0.8	0.2	30	10
30	70	12	10.5	0.5	0.5	23	0.8	0.2	30	8
40	60	16	9	0.6	0.4	25	0.8	0.2	30	5
50	50	20	7.5	0.7	0.3	28	0.8	0.2	30	3
60	40	24	6	0.8	0.2	30	0.8	0.2	30	0
70	30	28	4.5	0.9	0.1	33	0.8	0.2	30	-3
80	20	32	3	0.9	0.1	35	0.8	0.2	30	-5
90	10	36	1.5	1.0	0.0	38	0.8	0.2	30	-8
Community size = 300 households										
30	270	12	40.5	0.2	0.8	53	0.8	0.2	90	38
60	240	24	36	0.4	0.6	60	0.8	0.2	90	30
90	210	36	31.5	0.5	0.5	68	0.8	0.2	90	23
120	180	48	27	0.6	0.4	75	0.8	0.2	90	15
150	150	60	22.5	0.7	0.3	83	0.8	0.2	90	8
180	120	72	18	0.8	0.2	90	0.8	0.2	90	0
210	90	84	13.5	0.9	0.1	98	0.8	0.2	90	-8
240	60	96	9	0.9	0.1	105	0.8	0.2	90	-15
270	30	108	4.5	1.0	0.0	113	0.8	0.2	90	-23
Community size = 1,000 households										
100	900	40	135	0.2	0.8	175	0.8	0.2	300	125
200	800	80	120	0.4	0.6	200	0.8	0.2	300	100
300	700	120	105	0.5	0.5	225	0.8	0.2	300	75
400	600	160	90	0.6	0.4	250	0.8	0.2	300	50
500	500	200	75	0.7	0.3	275	0.8	0.2	300	25
600	400	240	60	0.8	0.2	300	0.8	0.2	300	0
700	300	280	45	0.9	0.1	325	0.8	0.2	300	-25
800	200	320	30	0.9	0.1	350	0.8	0.2	300	-50
900	100	360	15	1.0	0.0	375	0.8	0.2	300	-75

[a] N = total number of households in a stratum.

[b] n = number of households sampled in a stratum.

[c] n40%-15% = sample size at community level if sampling proportions are directly related to strata size (40% of all harvesters and 15% of all non-harvesters in the community).

[d] Strata contribution to overall sample size.

[e] n30% = sample size at community level if sampling proportion is directly related to community size (30% of all households in the community, sample size composed by 80% of harvesters and 20% of non-harvesters).

SAMPLING METHODS AND COMMUNITY SIZE

Community size (total number of households) in areas open to the subsistence harvest of migratory birds varies between 6 (Coldfoot) and 1,996 households (city of Kodiak) (Appendix 4). In SRS, sampling proportions refer directly to community size, which tends to be relatively stable between years. In stratified sampling, sampling proportions refer to stratum size, which is not always correlated to community size and which can vary significantly between years. A number of studies on the subsistence harvest of migratory birds in Alaskan rural communities support that the proportion of harvesting households is highly variable between years (Wolfe et al. 1990; Paige et al. 1996; Andersen and Jennings 2001a; Andersen and Jennings 2001b). Because of the wide variation in community size and other dynamic components of community composition, it seems difficult to employ a single sampling method that would suit the whole set of communities to be sampled.

Stratification does not suit small communities because the sample size in each stratum is often too small, which compromises harvest estimates and confidence intervals. In very small communities, implementing sampling proportions close to 100% ("census") may be feasible in terms of effort and costs. The sizes of communities surveyed by census in 2004-2006 indicate that implementation of stratification may be difficult in communities with fewer than 60 households (Figure 2). Therefore, 60 households can be considered the threshold below which stratification should not be used. Census and SRS are adequate methods to survey those small communities.

It has also been difficult to implement stratification in large rural Alaska communities because 1) the absolute number of households, 2) the lack of a standard protocol to identify a household's harvest level, and 3) high mobility (moving into, out of, and within) in the population. Keeping household lists updated with harvest levels of the larger communities has been proven to be very time-consuming and expensive. Based on other ADF&G subsistence harvest surveys, "large" communities are defined as those with 300 or more households that are occupied year-round. In large communities, simpler and less labor-intensive field procedures of SRS may be more cost-effective and yield better data than stratification. However, implementation of stratification in large communities may be successful if standard protocols are adopted to generate household lists with information on a household's harvest level (see below).

Finally, implementation of 2-level stratification finds its largest chance of success in communities of intermediate size because 1) the number of households in each stratum may be sufficient for calculation of realistic harvest estimates and confidence intervals, and 2) the extent of social networks relative to the community size may facilitate the generation of household lists with information on the households' harvest patterns.

RECOMMENDATIONS

1. One clear and standard protocol to generate the complete list of households should be defined.

   The first step in generating a complete household list should be inventorying all year-long occupied residential structures (buildings) in the community (commercial and administrative buildings, schools, and health clinics are not residential structures). The Tribal Council may have a list of all occupied residential structures, in which case, field personnel may just need to update this list. Regional native organizations and ADF&G have administered surveys in many communities and may also be able to provide preliminary household lists. If a

previously-generated list is not available, the survey field personnel should generate a preliminary list. For large communities, field personnel may need to obtain plat maps from the city or borough, assign a household code to each occupied residential structure, then generate the preliminary list. This preliminary list should be validated by checking whether the homes are indeed occupied year-round. Surveyors can walk, ride a bicycle, or drive around the community to check which structures are indeed occupied year-round and how many units are occupied in apartment buildings.

Although it is likely that similar protocols have been used in the migratory bird subsistence harvest survey, the establishment of a clear and standard protocol will ensure homogeneity in data collection across communities, regions, and years.

2. One clear and standard protocol to assign households to harvest level strata should be defined.

   Based on ADF&G experience in surveying subsistence activities in rural Alaska, in communities larger than 100 households, even one knowledgeable person cannot know about all other households' harvest activities, so multiple key respondents need to be consulted.

   Once a validated list of all year-round occupied households is available, the harvest level of each household should be identified. Locally-hired surveyors are likely to know the household harvest patterns in smaller communities, so in communities of up to 100 households, locally-hired surveyors should use their own knowledge or ask others about the household's harvest level. In communities with more than 100 households, however, surveyors should consult with tribal council members, community elders, and/or other knowledgeable people in the community in order to identify knowledgeable key respondents who know which households harvest birds and which do not. The number of key respondents to be interviewed should increase with the size of the community (Table 14). Each key respondent should assign each household in the complete household list to a harvest level (harvester/non-harvester) and the surveyor cross-check these assignments in order to generate the final stratification. In case of disagreement between key respondents, the surveyor should opt for the assignment given by the larger number of key respondents.

Table 14.-Protocol to assess a household's harvest level.

Community size	Protocol to identify household harvest level	Minimum number of key respondents to inform household harvest level
61-100 households[a]	Local field personnel	–
101-300 households	Local field personnel and key respondents	3
301-1,000 households	Local field personnel and key respondents	5
>1,001 households	Local field personnel and key respondents	7

[a] According to recommendations in Table 15, harvest level stratification should not be implemented in communities with fewer than 61 households.

3. Sampling methods that are compatible with community size should be adopted and the sampling method to be used in each community should be clearly defined.

   3.1. Harvest monitoring of communities with 30 or fewer households should be done by census (100% sampling) and communities with 31-60 households should be surveyed by SRS, with a sampling proportion of 75%.

   3.2. Two-level stratification (harvesters/non-harvesters) should be used to sample communities of intermediate size (61-300 households) and perhaps large communities (>301 households). The AMBCC Harvest Survey Committee should decide between the advantages and costs of implementation of 2-level stratification or SRS. The Monte Carlo simulations developed in Task 6 aimed to provide guidance on the gains in the precision of harvest estimates obtained by the use of 2-level stratification. An eventual decision for adopting 2-level stratification should also consider the 2 approaches discussed on drawing samples based on community size or on strata size.

   3.3. The Committee should also assess the costs of implementing each sampling method in the different regions.

   3.4. Adoption of 2-level stratification in large communities should rely on the use of a standard protocol to generate complete lists of households occupied year-round and to identify a household's harvest level, such as the proposed consultation with key respondents. Alternatively, simple random sampling could be adopted in large communities, as long as sampling proportions were adjusted to keep sample sizes up to 300 households. The alternative sampling methods proposed are summarized in Table 15.

Table 15.-Proposed sampling methods for the subsistence harvest survey based on community size.

Community size	Sampling methods and sampling proportions
≤30 HH[a]	Census (100% sampling).
31-60 HH	75% simple random sampling.
61-300 HH	Two-level stratification. Overall sampling proportion of 30% of households. Total sample size composed of 80% of harvesters and 20% of non-harvesters. If a stratum has 10 or fewer HH, sample 100% of HH in that stratum.
	Alternatively:
	Two-level stratification. Sampling proportion refers directly to strata size: 40% of all harvesters and 15% of all non-harvesters in the community. If a stratum has 10 HH or fewer, sample 100% of HH in that stratum.
301-1,000 HH	25% simple random sampling.
1,000-1,500 HH	20% simple random sampling.
1,500-1,800 HH	17% simple random sampling.
1,800-2,000 HH	15% simple random sampling.
Alternatively:	
61-2,000 HH	Two-level stratification, with the 2 proposed scenarios to draw samples from strata. Implementation of stratification for large communities should rely on a standard protocol of generating household lists, such as consultation with key respondents. If a stratum has 10 or fewer HH, sample 100% of HH in that stratum.

[a] HH = household.

4. The costs of administering the household survey in all regions or sub-regions should be assessed, and should include specific costs associated with the implementation of stratification, such as the collection of additional information on a household's harvest level.
5. Modifications to the sampling protocol may require modifications to OMB-controlled forms. The AMBCC Harvest Survey Committee should consider the adoption of specific data collection forms for simple random sampling and stratified sampling in order to avoid confusion on how to fill out stratification forms.
6. All materials should avoid the use of unclear statements, such as "at most," to define sample sizes and sampling proportions.
7. Project managers should review other studies, compare the accuracy of harvest estimates obtained by the migratory bird subsistence survey data with these studies, and determine which levels of accuracy are necessary for the management and conservation of commonly- and rarely-harvested species.
8. Consider replacing the clear Mylar overlay with procedures to randomly select households in stratum or community. Random samples can be selected using Microsoft Excel, which some field coordinators have already done, or simply a "hat."

TASK 7: ASSESS GENERATION OF CONFIDENCE INTERVALS

OBJECTIVE

Assess the method for calculating confidence intervals around harvest estimates to ensure that it is adequate to the cluster-stratified sampling and that it can accommodate the use of other sampling methods.

INTRODUCTION

The migratory bird subsistence harvest survey uses stratified multi-stage cluster sampling. While this is a suitable method for producing harvest estimates, it requires a comprehensive approach to the computation of variance and confidence intervals. The formulas to compute variance described in AMBCC (2003) do not account for between-cluster variance and for this reason they are not compatible with the sampling method adopted. The lack of clarification about the appropriate analytical approach to compute variance has made data analysis difficult. Since 2004, ADF&G has made efforts to develop an adequate analytical approach for the computation of variance; different approaches were used to produce 2004, 2005, and 2006 preliminary results. This section presents the final development of these efforts and adequate formulas to calculate variance for the stratified multi-stage cluster sampling used in the migratory bird subsistence harvest survey.

VARIANCE COMPUTATION FOR STRATIFIED 3-STAGE CLUSTER SAMPLING

In multi-stage cluster-sampling, each sampling stage refers to specific sampling units. There are 3 sampling stages in the subsistence harvest survey 1) the communities sampled in a sub-region, 2) the harvest level strata sampled in each community (none/low/high), and 3) the households sampled in each harvest level stratum. The clusters or sub-regions are groups of communities in a geographic area (Appendix 4). The sub-regions may include a small number of communities, but community size (total number of households) varies significantly within sub-regions. Despite community-specific harvest patterns, the amount of harvest in each community tends to be directly proportional to the size of the community. Consequently, mean community harvest within sub-regions is also related to the size of the community.

The formulas presented below were developed based on Bernard et al. (1998). In order to account for within-cluster variation in community size in the migratory bird subsistence harvest survey, each stage of the variance calculation was modified to reflect the respective number of households, which were

1. First stage: the total number of households in the sampled communities;
2. Second stage: the total number of households in sampled strata;
3. Third stage: the number of households sampled in each stratum.

These formulas allow the generation of estimates of variance at the sub-region level. If all sub-regions in a region had been sampled, the variance in the region may be obtained as the sum of the variances of the sub-regions. If not all sub-regions were sampled, the

variance in the region must be calculated as a stratified 4-stage cluster sampling by including a fourth term in the formula below.

This approach applies to stratified multi-stage cluster sampling regardless of the number of strata defined (3-level stratification: none/low/high; or 2-level stratification: harvester/non-harvester) as well as to simple random sampling, in which case the number of strata equals one. Finite Population Correction is incorporated in the formulas.

Sub-region Estimated Harvest, Variance, and Confidence Interval

$$X_r = \frac{N_{1r}}{n_{1r}}\left[\sum_{i=1}^{h}\frac{N_{2ri}}{n_{2ri}}\left[\sum_{j=1}^{h_i}\frac{N_{3rij}}{n_{3rij}}\left[\sum_{k=1}^{n_{3rij}}x_{rijk}\right]\right]\right]$$

$$\mathrm{var}(X_r) = N_{1r}^2\left(1-\frac{n_{1r}}{N_{1r}}\right)\frac{s_{1r}^2}{n_{1r}} + \frac{N_{1r}}{n_{1r}}\left[\sum_{i=1}^{h}N_{2ri}^2\left(1-\frac{n_{2ri}}{N_{2ri}}\right)\frac{s_{2ri}^2}{n_{2ri}}\right] + \frac{N_{1r}}{n_{1r}}\left[\sum_{i=1}^{h}\frac{N_{2ri}}{n_{2ri}}\left[\sum_{j=1}^{h_i}N_{3rij}^2\left(1-\frac{n_{3rij}}{N_{3rij}}\right)\frac{s_{3rij}^2}{n_{3rij}}\right]\right]$$

Where:

$$s_{1r}^2 = \frac{\sum_{i=1}^{h}\left[\sum_{j=1}^{h_i}\left[\left[\sum_{k=1}^{n_{3rij}}\left(x_{rijk}-\bar{x}_r\right)^2\right]+\left(\bar{x}_{rij}-\bar{x}_r\right)^2 p_{3rij}\right]\right]}{n_{1r}}$$

$$p_{3rij} = N_{3rij} - n_{3rij}$$

$$s_{2ri}^2 = \frac{\sum_{j=1}^{h_i}\left[\left[\sum_{k=1}^{n_{3rij}}\left(x_{rijk}-\bar{x}_{ri}\right)^2\right]+\left(\bar{x}_{rij}-\bar{x}_{ri}\right)^2 p_{3rij}\right]}{n_{2ri}}$$

$$s_{3rij}^2 = \frac{\left[\sum_{k=1}^{n_{3rij}}\left(x_{rijk}-\bar{x}_{rij}\right)^2\right]}{n_{3rij}}$$

$$\bar{x}_r = \frac{\frac{N_{1r}}{n_{1r}}\left[\sum_{i=1}^{h}\frac{N_{2ri}}{n_{2ri}}\left[\sum_{j=1}^{h_i}\frac{N_{3rij}}{n_{3rij}}\left[\sum_{k=1}^{n_{3rij}}x_{rijk}\right]\right]\right]}{N_{1r}}$$

$$\bar{x}_{ri} = \frac{\frac{N_{2ri}}{n_{2ri}}\left[\sum_{j=1}^{h_i}\frac{N_{3rij}}{n_{3rij}}\left[\sum_{k=1}^{n_{3rij}}x_{rijk}\right]\right]}{N_{2ri}}$$

$$\bar{x}_{rij} = \frac{\frac{N_{3rij}}{n_{3rij}}\left[\sum_{k=1}^{n_{3rij}}x_{rijk}\right]}{N_{2ri}}$$

$$CI(X_r) = t_{1/\alpha} \times \sqrt{\text{var}(X)} \qquad CIP(X_r) = t_{1/\alpha} \times \sqrt{\text{var}(X)} \frac{1}{X_r}$$

r = Subscript that denotes a specific first-stage unit (total sub-region).

i = Subscript that denotes a specific second-stage unit (sampled communities).

j = Subscript that denotes a specific third-stage unit (sampled strata).

k = Subscript that denotes individual households.

h = Total number of sampled households in a sub-region.

h_i = Total number of sampled households for a stratum in the sub-region.

X_r = Sub-region estimated harvest.

N_{1r} = Total number of households in sub-region r.

n_{1r} = Total number of households in sampled communities in sub-region r.

N_{2r} = Total number of households in each stratum of each sampled community in sub-region r.

n_{2r} = Total number of households in each sampled stratum of each sampled community in sub-region r.

N_{3r} = Total number of households in each stratum of each community in sub-region r.

n_{3r} = Number of households sampled in each stratum of each community in sub-region r.

x = Individual household reported harvest.

var = Variance of sub-region harvest estimate.

s_1^2 = First-stage sample variance.

s_2^2 = Second-stage sample variance.

s_3^2 = Third-stage sample variance.

$\bar{x}$ = Weighted household harvest mean.

P_{3rij} = Factor to account for variance of non-sampled households for which a mean harvest was applied.

CI = Confidence interval.

CIP = Confidence interval percentile.

$t_{1/\alpha}$ = Student's t distribution value with tail area probability α.

Note: The term "N_{2ri}/n_{2r}" accounts for missing stratum at the community level; this term equals one if all strata in the community have been surveyed.

RECOMMENDATIONS

1. The presented formulas should be used to calculate estimated harvest, variance, and confidence intervals at the sub-region level.
2. Should the overall analytical frame proposed in this survey assessment be used, a bootstrap[1] approach is considered a more sophisticated and appropriate method for computing variance and confidence intervals, especially on non-normally distributed data, which is frequently the case with subsistence harvest data. Bootstrap

[1] "Bootstrapping" is a computer-generated repetitive re-sampling of the original data.

implementation (e.g., SPSS® syntax) is specific to the sampling protocol and should reflect modifications to the survey protocol eventually adopted by the AMBCC.

3. The inconsistent use of different sampling methods (simple random sampling, stratification) and inconsistent sampling (missing data) should cease, as they are likely to result in the generation of inaccurate confidence intervals. The adoption of sampling methods that are compatible with community size (see Task 6) and the adherence to the sampling protocol would contribute to accurate estimates of confidence intervals that also may be tighter around the harvest estimates.

TASK 8: CLARIFY TARGET SPECIES AND REGION PRIORITIES

OBJECTIVES

1. Identify those species that have never been reported as harvested in a region in order to simplify choices on the survey instruments; cross-check with bird biologists to be sure non-reported species occur in regions and communities.
2. Work with bird specialists to identify priority species, such as threatened and endangered species, species of management concern, and species for which there is little harvest history.

BIRD SPECIES ADDRESSED BY THE SURVEY

The subsistence harvest is recorded on survey forms upon which a set of bird species or categories of species is depicted. Since bird species occur in different geographical regions of Alaska, there are 3 versions of the survey form, each with slightly different sets of species, so that respondents will not report species as harvested in areas where they normally do not occur.

1. Form 7-FW-103 (Main Form): North Slope, Northwest Arctic, Bering Strait, Yukon-Kuskokwim Delta, and Bristol Bay, except the southern side of the Alaska Peninsula.
2. Form 7-FW-103a (Interior Alaska): Tanana Chiefs Conference and Copper River regions.
3. Form 7-FW-103b (Southern Coastal Alaska): Alaska Peninsula, Aleutian Islands, Kodiak, and Chugach-Cook Inlet regions.

The Main Form and the Southern Coastal Alaska Form include 49 bird species/species categories and the Interior Alaska survey form includes 38 bird species/species categories (Appendix 15). All 3 versions of the survey form also include the fields “unidentified ducks” and “other bird.” However, the federal harvest regulations list about 90 bird species open to harvest. Not all species open to harvest are represented on the survey instruments, because:

1. The survey forms were designed to capture the harvests of only those birds that are important to the respective regional subsistence economies, rather than the harvest of all species and subspecies open to harvest.
2. The federal harvest regulations include species and subspecies. However, field identification of many subspecies and species is difficult, and their presence on the survey form could lead to misidentification.

3. Representing all species open to harvest on the survey form would result in a very long form, and people could become discouraged or intimidated to respond to the survey.

Certain species closed for hunting or gathering of eggs are represented on the survey forms. By doing so, the USFWS does not intend to encourage the take of these species; rather, the Service needs harvest estimates.

BIRD SPECIES REPORTED AS HARVESTED IN 2004-2006 SURVEYS

Appendices 16 and 17 list bird species and species categories, and eggs, reported as harvested in the years 2004, 2005, and 2006, by region. The communities in the South Alaska Peninsula region (Chignik, Chignik Lagoon, Chignik Lake, Ivanof Bay, and Perryville) are considered to belong to the Bristol Bay region (Appendix 4). However, communities in the South Alaska Peninsula have been surveyed with the Southern Coastal Alaska form, while Bristol Bay communities have been surveyed with the Main Form. For the purpose of these analyses, the South Alaska Peninsula was considered an independent region.

All bird species depicted in the Main Form have been reported as harvested. Seven species depicted on the Interior Alaska survey form have never been reported: Arctic tern *Sterna paradisaea* American golden plover *Pluvialis dominica*, herring gull *Larus argentatus*, mew gull *L. canus*, Pacific loon *Gavia pacifica*, red-throated loon *G. stellata*, and whimbrel *Numenius phaeopus*. Eleven species depicted on the Southern Coastal Alaska form have never been reported: Arctic tern, bristle-thighed curlew *N. tahitiensis*, godwit *Limosa* spp., guillemot *Cepphus* spp., lesser snow goose *Chen caerulescens caerulescens*, murre *Uria* spp., Pacific loon, red-throated loon, Sabine's gull *Xema sabini*, spectacled eider *Somateria fischeri*, and yellow-billed loon *G. adamsii*.

Six species/species categories of bird eggs depicted on the Main Form have never been reported: common merganser *Mergus merganser*, goldeneye *Bucephala* spp., harlequin duck *Histrionicus histrionicus*, red-breasted merganser *M. serrator*, spruce grouse *Dendragapus canadensis*, and surf scoter *Melanitta perspicillata* (Appendix 17). However, these 6 species of birds have been reported as harvested. Eggs of 14 and 36 species on the Interior Alaska form and the Southern Coastal Alaska form, respectively, have not been reported as harvested (Appendix 17).

Black-legged kittiwake *Rissa tridactyla* is not included on the Main Form and glaucous gull *L. hyperboreus* is not on the Southern Coastal Alaska form (Appendix 15). Harvest reports of these species in corresponding regions may refer to kittiwake *Rissa* spp. and glaucous-winged gull *L. glaucenscens*, which are in the forms (Appendix 16). These unusual reports likely resulted from systematic errors in the data entry phase and these entries in the database need review.

Cackling geese *Branta hutchinsii* have been reported as harvested in Interior Alaska (one fall record from the community of Grayling in the Innoko NWR) although this species does not regularly occur in Interior Alaska and it is not on the survey form used in the region. Eggs of the herring gull have been reported as harvested in the Bristol Bay area (2 records at Pilot Point and one record at Port Heiden), although this species is not on the survey form used in the region, and although the species is considered of rare occurrence

in southwestern Alaska all year long (Denlinger 2006). The original completed survey forms for these records also must be checked for accuracy in data entry.

Harvest reports in the catch-all categories of "other bird species," "eggs of other bird species," "unidentified duck," and "eggs of unidentified duck" have occurred sporadically in most regions (Appendix 18). The total number of records for each region depends on the total number of households in the region, the survey coverage, and the incidence of bird and egg harvest. Records of "other bird species" and "unidentified duck" have represented between 0.2% and 1.0% of the total number of records in a region, except for the Copper River region, where this proportion was 10%. This suggests that, in general, hunters know and remember the species they harvest, at least to the level of detail represented in the survey forms.

Since the survey coverage (proportion of communities-years surveyed) has been heterogeneous among regions, data from regions surveyed less intensively may not represent the full spectrum of species harvested for subsistence uses (Table 16). The higher number of non-harvested species reported from regions surveyed with the Southern Coastal Alaska form may be related to the relatively low number of communities (Chugach-Cook Inlet and South Alaska Peninsula) and less extensive coverage of some these regions (Aleutian-Pribilofs and Kodiak) (Table 16).

Table 16.-Sampling coverage of each region, survey years 2004, 2005, and 2006.

Region	Total number of communities in the region	Number of communities to be sampled each year	Number of communities to be sampled in 3 years of survey	Communities-year actually sampled in 2004-2006	Proportion of communities actually sampled relative to communities to be sampled in 3 years
Yukon-Kuskokwim Delta	44	29	87	75	86%
Bristol Bay	26	17	51	39	76%
Chugach-Cook Inlet	5	3	9	7	78%
Bering Strait	16	11	33	22	67%
Interior Alaska	41	27	81	44	54%
South Alaska Peninsula	4	3	9	4	44%
North Slope	8	5	15	7	47%
Copper River Basin	8	5	15	6	40%
Aleutians-Pribilofs	12	8	24	7	29%
Northwest Arctic	11	7	21	4	19%
Kodiak	12	8	24	4	17%

RECOMMENDATIONS

1. The database should be reviewed for unusual records, especially of the harvest of black-legged kittiwakes, glaucous gulls, cackling and Canada geese, and herring gull

eggs. This survey assessment was the first opportunity to analyze multi-year data across regions. Through this process, ADF&G has had the opportunity to detect and sometimes correct minor data inconsistencies in the database. Because of the limited timeframe available for this assessment, not all identified potential inconsistencies in the database could be addressed, but this action is in the list of priorities.

2. Given the funding limitation that the subsistence harvest monitoring program faces and the difficulty in ensuring statewide coverage, a revision of the community rotation schedule is recommended. A revised rotation schedule should clearly address the rotation of both communities and regions (Appendix 3) and be based on established monitoring priorities, such as regions with high reliance on bird harvest, birds of conservation concern, threatened and endangered species, and species for which there is little harvest history.

TASK 9: DEVELOP THE TRAINING PLAN

OBJECTIVES

1. Outline a training plan for the migratory bird subsistence harvest survey that clarifies the training procedures, promotes greater procedural consistency, and improves accuracy of the resulting data.
2. Develop tailored recommendations for survey managers, field coordinators, and surveyors. Additional details can then be incorporated after the AMBCC evaluates and determines specific revisions to the survey methods.

BACKGROUND

Previous training relied on a complex set of instructions provided in one large handbook, which included the survey background, orientation materials for field coordinators, and instructions for surveyors (AMBCC 2007). Feedback from field coordinators and regional partners strongly requested simplification and related improvements to this document. Because the survey is highly decentralized and involves many participants of different organizations, the training program and materials need to be very clear, concise, and easy to use by field coordinators and surveyors across the state. To make these materials more "user-friendly," a reorganization of the survey handbook is proposed. The handbook should be formatted into separate modules or elements specific to survey managers, field coordinators, and surveyors (see Task 10b).

TYPES OF TRAINING

To address the different roles of managing and implementing the survey, three types of training are needed, including:

1. An initial, one-time train-the-trainer session to be held after completion of the revision of the survey, with all personnel involved in managing the survey, as well as field coordinators, in attendance.
2. Sporadic refresher train-the-trainer sessions for field coordinators and regional partners as needed.
3. Annual training of surveyors led by their field coordinators.

It is critically important that the harvest survey program invest in providing this training, without which methodological consistency and resulting program integrity cannot be maintained.

RECOMMENDATIONS

1. Initial train-the-trainer for survey managers and field coordinators

Survey managers and field coordinators should attend an initial train-the-trainer session delivered by the survey coordinator. This statewide training should be delivered in a centralized location, such as Anchorage, in order to maximize consistency and interaction, and should be structured to promote the engagement and interest of regional partners.

1.1 CONTENT

The initial train-the-trainer session should provide participants with comprehensive documentation on the background of the subsistence harvest monitoring program, details of survey methods and implementation, tools to promote community involvement, troubleshooting tools, and in-season support resources.

The survey coordinator should then conduct a comprehensive training session, using a train-the-trainer approach, on the updated survey design and training materials as approved by the ABMCC Harvest Survey Committee. This would ensure that field coordinators accurately transmit key elements to surveyors, specifically:

1. The how and why of methods, procedures, and survey forms and accessory tools.
2. The how and why of administrative aspects, such as contracts, Memoranda of Understanding (MOUs), administrative forms, and payment of surveyors.
3. Key training points for surveyors, including tips and techniques for stimulating and reinforcing community involvement and household participation.
4. Where to find in-season support and problem resolution in the field before survey forms are consolidated and submitted to the data management agency.

The initial training should include interactive sessions with regional partners. A presentation of survey management and implementation by representatives of each regional partner should inform participants of how the survey has been implemented in each region, any difficulties, and the levels of community involvement. These presentations should be coordinated prior to the training so as to ensure coverage of critical aspects of implementing the survey. This session should also include a "feedback" exercise, during which the concerns, needs, comments, suggestions, and expectations of regional partners regarding the modifications to the program are discussed.

Each regional partner should be encouraged to send 2 persons to the initial train-the-trainer session in order to help develop a community-based capability to implement the survey. Furthermore, having more than one person familiar with the design and implementation of the survey would support the continuity of survey activities despite the inevitable turnover in personnel.

Benefits of an initial train-the-trainer would include first-hand training for all field coordinators, staff engagement and integration, regional partner participation, and greater likelihood of consistent implementation of the survey methods. This, in turn, would improve the accuracy, comparability, and utility of the survey data. Costs of an initial train-the-trainer would include travel for most of the participants. However, given the current lack of standardization of survey management and data collection between regions, such an initial training seems crucial for the sustainability of the survey program.

2. Refresher train-the-trainer session for survey managers and field coordinators

After any significant adjustment or modification to the survey methods, a refresher train-the-trainer session should be scheduled prior to the next survey year, in one central location for cost-effectiveness, and including the participation of field coordinators and assistant survey coordinators or their equivalents. Much of the material and information presented during the initial train-the-trainer session would be used during refresher train-the-trainer sessions; however, special emphasis should be given on the new procedures.

3. Yearly training for surveyors

Surveyors should be trained each year, prior to survey implementation, since some annual staff turnover is naturally expected. The field coordinators should be the primary deliverers of training to surveyors. These sessions would be most effective and affordable if they were locally coordinated and delivered, in contrast to the statewide training for field coordinators. Because the surveyors' training would be highly decentralized, the materials used and required procedures should be standard across regions, and very clear and straightforward. Surveyor training should emphasize 3 main topics: 1) understanding the protocols for selection of households to be surveyed, 2) using consistent procedures for interacting with respondents, and 3) completing all forms and resolving any problems with the field coordinator before forms are sent out of the community.

Even with effective surveyor pre-implementation training, various challenges or procedural questions will arise each year in the field. Field coordinators should be available to address these issues during data collection, so that questions will be resolved in a timely fashion, which would ensure that the resulting data are fully usable.

4. Training Materials

The training materials should be organized by audience: survey managers, field coordinators, and surveyors. Feedback from users supports this approach.

Some key elements that should be included in the field coordinator training manuals, some of which should be revised and updated, are as follows:

1. A brief overview of the program objectives, current status, results, and how the results are disseminated by management agencies, research organizations, regional partners, communities, and the general public.
2. A summary of key findings from this survey assessment, and recommendations adopted by the AMBCC Harvest Survey Committee that modified the survey program.

3. An updated organizational chart showing the staff structure and responsibilities based on current functional units. The original organizational chart of the program as adopted in 2003 is presented in Appendix 19.
4. An updated list of regions and regional partners, their management bodies, and contacts for subjects related to the implementation of the harvest survey.
5. An overview of the methods behind and the administration of survey instruments aimed at field coordinators so that they may train the surveyors.
6. Examples of administrative requirements, such as federally-required forms for expenditures.

Training materials for surveyors should focus on the required survey forms, along with explanatory materials and examples. These may need revision following decisions made by the AMBCC after review of this assessment.

TASK 10: REVIEW SURVEY IMPLEMENTATION

TASK 10A: REVIEW OF SURVEY HANDBOOK

Objective

Review the survey handbook and identify those sections that specifically address the tasks of survey managers, field coordinators, and surveyors.

Review process

An in-review version of the "Survey Methods and Procedures" was submitted to the AMBCC Harvest Survey Committee along with this report. During its June meeting, the Harvest Survey Committee formed a "Handbook and Training" sub-committee, composed of Molly Chythlook (chair), Winnonna Brown, Mike Pederson, Louie Andrew, and Liliana Naves. Among other tasks, the sub-committee was charged with completing the review of the survey methods following modifications to the survey protocol eventually adopted by the Council.

The in-review document referred to the survey protocol adopted in 2003 and to the current organizational structure of the harvest monitoring program (Appendix 19). Modifications to the current survey protocol eventually adopted by the AMBCC should be easy to incorporate in the overall frame of the handbook.

The text and all appendices were made into a single document in order to facilitate distribution of electronic copies and printing. An automatic table of contents offers an overview of the whole document by listing headings and sub-headings and can be automatically updated if all headings and sub-headings are properly indexed.

Modifications to the structure of the text aimed to:

1. Clearly define responsibilities of all personnel (survey coordinator, assistant survey coordinators, field coordinators, and surveyors).
2. Have different topics in independent sections in order to make it easy to find them.
3. Provide instructions on all steps of data collection, all instruments, and other survey-related documents.

All survey instruments that were not controlled by OMB were reviewed. Proposed modifications aimed to:

- Allow enough space to complete fields by hand.
- Make clear which information is being requested in each field.
- Improve spatial distribution of fields so related subjects are grouped.
- Eliminate unnecessary fields.
- Make form names and field names self-explanatory while keeping elements similar to the previous version.

Modifications were also proposed to permission slips and other survey forms, which depend on OMB approval (see "Recommendations" under Task 3). Modifications to OBM-controlled forms were not discussed in the context of the handbook review and suggestions of new recommended form designs were NOT included in the handbook appendices.

All appendices, such as surveyor job description and surveyor job announcement, were also reviewed. Minor modifications were suggested to improve readability and design.

Recommendations

The survey handbook should be restructured so that it is a complete technical document easily used by survey managers and field coordinators. A simplified reference guide focusing specifically on surveyors' tasks and deadlines and on how to complete and manage forms should be included.

The survey handbook must fully develop its role as an essential tool for the implementation of the survey. A single version of the handbook should be used by all personnel involved in the survey in all regions. For this purpose, the survey handbook must address general protocol related to fieldwork and administrative aspects of the survey program.

A final version of the handbook should be usable for many years or until modifications to the survey protocol or implementation occur. The final version of the survey handbook should be made available in Adobe Acrobat Portable Document Format (PDF format). Printed copies of the handbook should be organized under tabbed headings and placed in 3-ring binders, which should then be distributed to all personnel involved in data collection, management, and analysis. Sampling and administrative protocol specific to certain years, regions, or agencies can be added to the survey handbook binder as modules. A list of names and full contact information of all involved personnel should be updated yearly, and placed as a module in the survey handbook binder. In addition to the survey handbook binder, field coordinators should be issued a CD that has electronic copies of the forms, and of other forms that may need to be edited, such as payment requests that need address updating. The field coordinator would also be able to use these electronic documents to generate "Surveyor Packets."

Next steps towards a final version of the survey handbook

1. The sub-committee carefully reviews the current version of the handbook and its appendices, addressing the questions, comments, and blanks.
2. As soon as this review is complete, the survey handbook and the new version of non-OMB-controlled forms and texts can be used in the current 3-strata sampling design.
3. Any modifications to the survey protocol and implementation eventually adopted by the Harvest Survey Committee should be immediately incorporated into the handbook.

TASK 10B: ASSESS FEASIBILITY OF DEVELOPING AN ALTERNATE SYSTEM TO MANAGE THE SURVEY TO ENSURE THAT IMPROVEMENTS SUCH AS MODIFYING FORMS DO NOT CAUSE DELAYS.

The U.S. Paperwork Reduction Act of 1995 (PRA) requires agencies to submit survey instruments and implementation methodology, as they apply to the collection of information from the public, to the Office of Management and Budget (OMB) for certification under 5 CFR.1320.8(b)(3) and 5 CFR 1320.9. The certification form, instructions, and text from the CFR's are shown in Appendix 20. This process was previously completed for the migratory bird subsistence harvest survey and renewed January 31, 2007, for a 3-year period. With no changes in study procedures or forms, the renewal process should be initiated by spring 2009 to allow sufficient lead time for all review procedures.

There are no certain procedures in place to re-certify a study by control number in the event the structure of data collection or reporting agency changes. The OMB recommends that [federal] survey managers consult with their agency paperwork clearance officer to ascertain those details and the time required to meet OMB requirements (OMB 2006:4). The OMB recommends lead time of at least 120 days to allow time for publication in the Federal Register, as well as time for public comment (OMB 2006:3). They also recommend that OMB be briefed on revisions before submitting an Information Collection Request (ICR).

When an agency is planning a new, large survey data collection, a major revision to an ongoing survey, or large-scale experiments or tests, agencies and OMB frequently find it helpful for the agency to brief OMB on the nature of the planned collection and the proposed methodology. In this less formal context, OMB and agency staff can discuss potential areas of concern, including the need for further detail and justification. This kind of early consultation can considerably reduce the likelihood that major unexpected concerns about survey methodology or statistical sample design will arise during OMB review, and it allows more time for the agency to consider alternatives if necessary. Agencies can then address any issues identified by OMB in their ICRs. While this informal consultation does not affect the timing of the formal OMB review process under the PRA, it can be of benefit in identifying some issues much earlier and may avoid delays that could otherwise occur (OMB 2006:3-4).

There are some instances in which a certification is not required, or can be expedited. Third-party or investigator-initiated grants are generally not subject to review, unless the study is deemed to be at the specific request of the agency, or if the data collection procedures also need to be approved by the granting federal agency (OMB 2006:4). The OMB also notes that, "If the agency requests the collection directly or indirectly through

another entity or contractor or exercises control over those collecting the information, the agency is conducting or sponsoring the collection" (OMB 2006:4).

OMB certification can be expedited under emergency circumstances, if it can be shown that allowing time for public comment would result in public harm, or prevent the agency from responding to an unanticipated event, or prevent or disrupt the collection, or cause the agency to miss a statutory or court-ordered deadline. The OMB states that an emergency clearance cannot be sought because of inadequate project planning (OMB 2006:6).

It is not clear if a generic clearance was originally sought for the migratory bird subsistence harvest survey, but if so, it might have allowed additional collections of information using *similar* methods over multiple years. In that case, the OMB review that occurs every 3 years would be expedited, insofar as changes occurred within the scope of the generic clearance (OMB 2006:6).

It is concluded that a pre-certification consultation with the OMB would be required to discuss any specific changes in the structure of the existing migratory bird subsistence harvest survey, and planning of the timing and implementation of the data collection would be adjusted as necessary.

TASK 10C: POTENTIAL PARTNERS FOR SURVEY IMPLEMENTATION

Different assessments of subsistence uses of biological resources could be combined into coordinated, concurrent field surveys. This could be considered one way to help leverage funding of and streamline field efforts during the migratory bird subsistence harvest survey. In addition, this approach could also reduce respondent and surveyor "burnout," which would eventually improve the quality of the data obtained. As demonstrated by the data analysis in Task 2, it has not been possible to collect complete seasonal harvest data, in part due to respondent/surveyor burnout and in part to complex logistics and high cost of travel. Other research and management organizations have also conducted concurrent surveys on different aspects of the subsistence harvest of migratory birds, and also endured the same difficulties of finding and training coordinators and surveyors, and maintaining field operations. Combined surveys could be highly leveraged, thus reducing overall numbers of training sessions, numbers of field coordinators and surveyors, and levels of respondent/surveyor fatigue.

There may be difficulties in the coordination of the migratory bird subsistence harvest survey with other surveys, such as whether the seasonal timing of the other surveys would be suitable for the migratory bird harvest subsistence harvest survey. Also, although the total number of surveys would decrease, adding questions to any survey would increase interview times, and would not minimize the burden on respondents and surveyors. Finally, surveys could not be combined unless they had identical requirements for confidentiality and public reporting of results.

Example: Marine Mammals-Halibut Survey

Despite these and other difficulties, there are successful cases of combined subsistence harvest surveys that serve as helpful examples. In recent years, ADF&G has combined halibut harvest surveys with marine mammal surveys, greatly optimizing efforts. Both of these surveys need to occur in January-February, or sometimes, in the early spring. This

timeframe seems adequate for a comprehensive survey of many subsistence resources. Depending on the decisions made by the AMBCC Harvest Survey Committee concerning the seasonality of data collection for the migratory birds harvest survey, part of the fieldwork, such as the distribution of survey instruments to households, could be coupled with the ADF&G marine mammals-halibut survey.

Again, based on the timing of data collection related to seasons of harvest, surveys targeting other resources such as game or salmon and other fishes, which are best assessed from October-early winter could be coupled with other phases of the migratory bird subsistence harvest survey.

Recommendations

1. Depending on the decisions made by the AMBCC Harvest Survey Committee, the data collection procedures, such as survey periods, methods for household selection, and sampling proportions, should be clearly defined. These factors define compatibility criteria that would influence the decision to combine fieldwork with different surveys.
2. A strategic activity schedule of annual meetings with representatives of ADF&G, the Federal Subsistence Board, NPS, Stephen Braund & Associates, and others should be established in order to discuss fieldwork schedules and project compatibility. Compatibility should be assessed for specific seasons and regions. The strategic activity schedule should allow enough lead time to coordinate budgets, training, and logistics.

TASK 11: DEVELOP IN-SEASON DATA QUALITY CONTROL

OBJECTIVE

Develop a process for in-season data quality control and prompt correction of inadequacies, including a clear chain of supervision and accountability, a timetable for delivery of products, the identification of technical assistance people, the creation of a telephone “help line,” and other tools to assist surveyors and field coordinators, thereby ensuring that quality data is delivered in a timely manner.

INTRODUCTION

Establishing adequate quality assurance (QA) and quality control (QC) procedures for all stages of a survey is critical for collecting valid data. QA and QC procedures are intended to minimize errors and diverse sources of bias by ensuring that data collection is done in a timely manner, that it follows established methods, and that it is standard among surveyors, field coordinators, regions, and years (EPA 1984). QA and QC procedures must be clearly specified in the survey methods and all survey personnel must be familiar with them. QA procedures are generally implemented before data collection begins and QC procedures during or after data collection. The following considerations and recommendations refer not only to in-season procedures to monitor and troubleshoot data collection, but also to preventative strategies to avoid issues during data collection.

QUALITY ASSURANCE

"Standardization" is a key concept for obtaining good quality data. The establishment and implementation of standard procedures for data collection means that procedures are consistent each time an observation is made and data are collected (Fowler 2004). In a harvest monitoring program such as the migratory bird subsistence harvest survey, all administrative procedures, data collection methods, data analysis and dissemination, and overseeing procedures must be clearly defined and documented. The present survey assessment represents a substantial effort to establish, document, and implement standard procedures for the migratory bird subsistence harvest survey. Modifications to the survey methods and procedures eventually adopted by the AMBCC will define details of the documentation currently being developed.

QUALITY CONTROL

Guarding against missing and inaccurate data is a major objective of any survey. Missing and inaccurate data are caused by three kinds of error.

Coverage errors

Poorly constructed or outdated survey frames are the main source of coverage errors (EPA 1984). This refers to incomplete or outdated household lists, inadequate definition of stratification, and difficulties in adhering to the sampling methods established.

Non-response errors

The surveyor must try to obtain a complete survey instrument from all households selected to participate (EPA 1984, Fowler 2004). Actions that minimize non-response errors are

1. Enlisting community and household participation by properly explaining the reasons and the importance of the survey for the sustainable management of bird populations and the sustainability of the subsistence way of life. The surveyor should explain that the participation of both harvesting and non-harvesting households is equally important in order to obtain realistic harvest estimates.
2. Ensuring that all forms are completed correctly and that all seasonal instruments are collected for all participating households. During the first visit to the household, surveyors should make sure the household understands how to complete the survey instruments. The surveyor should bring extra forms and survey instruments during every household visit, in case the household has lost their copies. The surveyor should help the household complete the survey instrument, if not yet completed. While still at the household, the surveyor should check completed forms for community and household codes, and complete and relevant responses in all fields of the survey instrument. The surveyor should ensure that she or he visits all participating households when collecting seasonal survey instruments.

Response errors

"Response error" refers to responses on survey instruments that do not reflect the actual amount of harvest by a household. Respondents may give inaccurate answers if they do not understand the purposes of the survey, if they do not know how to complete the

instrument, or if they consider a question overly-sensitive, such as reporting the harvest of species closed to harvest (EPA 1984). Response error also may occur if surveyors make mistakes while completing the instruments or other forms for a household, fail in correctly explaining how to complete the form, or do not understand who should participate in the survey (for instance, not making efforts to survey non-harvesting households that were selected).

For errors of non-response, the most common underlying cause is the interaction between surveyors and respondents (EPA 1984, Fowler 2004). Surveyors should maintain a professional and neutral relationship with the respondents. The principal actions the surveyor can take to avoid non-response errors are to 1) make an effort to establish a good relationship with the respondent, 2) comply with the survey procedures, and 3) maintain an open and neutral position on survey topics.

RECOMMENDATIONS

1. Effective coordination

   The migratory bird subsistence harvest survey addresses regions that are large in size and that, for the most part, are off the road system. A central management position should be established in order to oversee data collection across all regions, which is fundamental to ensure adequate coverage of all regions and the standardization of data collection procedures.

2. Develop and implement standard procedures

   As part of a Quality Assurance program, the migratory bird subsistence harvest survey should develop specific documents addressing:

   2.1 Survey methods and procedures

   This should include a complete description of methods and procedures for survey management and data collection, analysis, and dissemination. The current review and suggestions to the survey handbook has addressed some of these topics. Perhaps the recommendations within this assessment report could be combined to create a final document describing the methods and procedures of the survey.

   2.2 Training materials

   These should include a standard training guide and materials for field coordinators, surveyors, and support staff at USFWS and ADF&G.

   2.3 Surveyor handbook

   This should include standard instructions for data collection specifically addressed to surveyors and be a document for their quick reference by including only those topics concerning surveyors' activities. The surveyor handbook should include a clear timetable for the completion of tasks.

3. Monitor surveyor and field coordinator performance

   Some supervision of surveyors is essential in every survey in order to detect performance issues and to assure that the fieldwork proceeds smoothly. Thus, the field coordinator should play a crucial role in controlling the quality of the data collected. His or her primary tasks should be to see that data collection is completed

according to schedule, and that quality standards are met. As the main link between the surveyors and the survey coordinator, the field coordinator should be in constant communication with the surveyors through personal visits, mail, e-mail, radio, and/or telephone. The field coordinator should attempt to adjust surveyor performance through training, supervision, and performance monitoring.

3.1 Establish progress reports

Surveyors should be required to submit to their field coordinator a bi-weekly progress report that includes a summary of their work, such as activities performed, number of households visited, and number of forms collected. The bi-weekly surveyor reports should be used by field coordinators to monitor the quality and the quantity of each surveyor's work.

In turn, field coordinators should submit monthly progress reports to the person in charge of the survey progress statewide.

3.2 Observe household visits

Observation of interviews in both face-to-face and telephone surveys is widely used to train and assess surveyors and to evaluate respondents' reactions (EPA 1984). As part of surveyor training, the field coordinator should accompany the surveyor on his or her first few household visits to ensure that the surveyor understands the data collection procedures and that the surveyor understands how to establish a professional and impartial relationship with the respondents. As part of quality control during data collection, the field coordinator should also continue to observe household visits on an occasional basis after the training period. It is recognized that direct observation of interviews may become expensive if the field coordinator oversees many communities, or is located in another community. However, field coordinators should be instructed to observe some household visits when he or she does have the opportunity. In such occasions, field coordinators should observe less experienced surveyors and surveyors who had performance issues, as shown by their activity reports.

Written evaluation criteria for the survey observation activity should be developed and is vitally important. The criteria should provide guidance to the field coordinator in her or his decision to choose which aspects of the household visit to observe. Field coordinators should use the results of their observations to acknowledge good work as well as to help surveyors improve their performance.

3.3 Evaluate field coordinator and surveyor performance

A system that rates surveyors and field coordinators based on their productivity, accuracy, cooperation, and dependability should be established.

4. Maintain a list of surveyors.

   A list of skilled surveyors in each region should be maintained so that they can be contacted as needed. The list should include names, geographic location, capabilities, and performance rates.

5. Monitor flow of survey forms

Table 17 below describes steps that should be taken to coordinate and monitor the flow of survey forms between field coordinators, surveyors, households, and the data management agency. Some elements of this system are already in use. The forms titled “Surveyor Progress Checklist,” “Problem Report,” and “Field Coordinator Monthly Status Report” are revised versions of forms currently used in the survey (Appendices 21, 22, and 23). Examples of deadlines are also provided. The AMBCC Harvest Survey Committee should define a schedule of activities and deadlines for survey coordinators, field coordinators, and surveyors. A preliminary annual schedule of activities is presented in Table 18.

Table 17.-Steps to coordinate and monitor the flow of survey forms and instruments between field coordinators, surveyors, households, and the data management agency.

Step	Deadline	Action
1.	December 15	**SC** makes sure that all contracts are in place early enough to allow start of field activities according to schedule.
2.	January 15	**SC** trains **FC** in data collection.
3.	March 15	**SC** and **FC** develops outreach in communities; **SC** trains **FC** in preparation of data collection, if needed.
4.	January 30	**SC** sends all survey materials to **FC** as scheduled.
5.	February 28	**FC** provides a complete "Surveyor Package" to each **SU**.
6.	March 15	**FC** assists **SU** in generating or updating household lists and in defining harvest stratification.
7.		**SU** effectively uses "Surveyor Progress Checklist" to manage her or his work.
8.		**SU** effectively uses "Problem Report" to manage document difficulties and irregularities in data collection.
9.		**SU** sends a bi-weekly report[a] of activities to **FC**.
10.		**FC** keeps in touch with **SU** in order to assist with difficulties and monitor progress of data collection. **FC** keeps track of received or missing bi-weekly surveyor's reports and assesses necessity of intervention to improve surveyor performance.
11.		**FC** effectively uses "Checklist for Returned Survey Forms" to manage completed survey instruments, and processes **SU** payment requests.
12.		**FC** addresses issues in data collection (missing forms, inadequate sampling and stratification information).
13.		**FC** sends monthly reports to **SC**.
14.		**SC** keeps track of **FC** monthly reports and addresses issues in data collection.
15.		**FC** sends all completed survey instruments to the **SC** (or directly to the **DM**) in a timely manner.
16.		**DM** ensures data entry and data analysis in a timely manner.
17.		**SC** makes sure that **DM** provides preliminary results to regional partners in a timely manner.
18.		**SC** coordinates review of preliminary results by regional partners and ensures completion of revision in a timely manner.
19.		**SC** makes sure that **DM** completes final results.
20.		**SC** write annual report and disseminates to the AMBCC, Flyway Council, communities, etc.

SC = Survey coordinator

FC = Field coordinator

SU = Surveyor

DM = Data Management Agency

[a] A decision is needed on the adoption of the surveyor's report; if adopted, also on its details and format.

Table 18.-Preliminary annual schedule of activities in the migratory bird subsistence harvest survey.

Activities	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Administrative procedures												
New project budget estimates	x											
Contract modifications		x										
Survey budget allocations		x										
Contract modifications/renewals to federal agencies			x									
Contract renewal to agencies and ADF&G				x								
Receive annual budget					x							
Fieldwork preparation												
USFWS Refuge Information Technician training				x								
Community outreach					x	x	x					
Obtain community approval					x	x	x					
Issue subcontracts to communities and agencies					x	x						
Distribute survey materials to contractors					x	x						
Identify local surveyors					x	x	x					
Train local surveyors						x	x					
Data collection												
Distribute survey materials to households						x	x	x				
Surveyors collect harvest instruments and send them in	x		x				x				x	
Field coordinators return survey forms and instruments	x	x	x	x								x
Data processing												
Data entry and analysis for previous year					x	x	x					
Annual data review by regional partners								x				
Complete approval of annual harvest estimates									x			
Final harvest estimates for Pacific Flyway Council meeting							?[a]				x	
Assessment of annual implementation											x	
Annual survey design modification	x	x										x

[a] How does the AMBCC participate in the March meeting of the Pacific Flyway?

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LITERATURE CITED

ADF&G (Alaska Department of Fish and Game). 2008. Community Subsistence Information System (CSIS). http://www.subsistence.adfg.state.ak.us/CSIS/, Alaska Department of Fish and Game, Anchorage.

AMBCC. (Alaska Migratory Bird Co-management Council) 2003. Recommendations for a statewide Alaska migratory bird subsistence harvest survey. AMBCC Subsistence Harvest Survey ad hoc Committee, Anchorage.

AMBCC. 2007. Subsistence Migratory Bird Harvest Survey Handbook 2007. AMBCC, Anchorage.

Andersen D. B. and G. Jennings. 2001a. The 2000 harvest of migratory birds in ten Upper Yukon River communities, Alaska. Alaska Department of Fish and Game, Division of Subsistence Final Report No. 1 to USFWS under Cooperative Agreement No. 701810J252, Anchorage.

Andersen D. B. and G. Jennings. 2001b. The 2000 harvest of migratory birds in seven Upper Tanana River communities, Alaska. Alaska Department of Fish and Game, Division of Subsistence Final Report No. 2 to USFWS under Cooperative Agreement No. 701810J252, Anchorage.

Atwood E.L. 1956. Validity of mail survey data on bagged waterfowl. Journal of Wildlife Management 20: 1-16.

Bernard D. R., A. E. Bingham and M. Alexandersdottir. 1998. The mechanics of onsite creel surveys in Alaska. Alaska Department of Fish and Game, Special Publication No. 98-1, Anchorage.

Cochran W. G. 1977. Sampling techniques. Third Edition. John Wiley and Sons, New York.

Coiley-Kenner P., T. M. Krieg, M. B. Chythlook, and G. Jennings. 2003. Wild resource harvests and uses by residents of Manokotak, Togiak, and Twin Hills, 1999/2000. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 275, Anchorage.

Denlinger L. M. *Unpublished* 2006. Alaska seabird information series. USFWS Migratory Birds Management, Nongame Program, Anchorage.

Deming W. E. 1950. Some theory of sampling. Dover Publications, New York.

EPA (Environmental Protection Agency). 1984. Survey management handbook – Overseeing the technical progress of a survey contract. Vol. II. U.S. Environmental Protection Agency Report EPA-230-12-84-002.

EPA (Environmental Protection Agency). 1998. Guidance for conducting fish and wildlife consumption surveys. U. S. Environmental Protection Agency Report EPA-823-B-007, Washington, D.C.

Fall J. A. and C. J. Utermohle, editors. 1995. An investigation of the sociocultural consequences of outer continental shelf development in Alaska. OCS Study MMS 95-012. Vol. I: Introduction. Alaska Department of Fish and Game, Division of Subsistence, Anchorage.

Fowler F. J. 2004. Reducing interviewer-related error through interviewer training, supervision, and other means. pp. 259-278 *in* Measurement Errors in Surveys. Biemer PP, Groves RM, Lyberg LE, Mathiowetz NA & Sudman S (Eds.). Wiley & Sons, Hoboken, NJ.

OMB (Office of Management and Budget). 2006. Certification Form. Office of Information and Regulatory Affairs. Retrieved May 6, 2008, from http://www.whitehouse.gov/omb/inforeg/mpc_survey_guidance_2006.pdf

Paige A. W., C. L. Scott, D. B. Andersen, S. Georgette, and R. J. Wolfe. 1996. Subsistence use of birds in the Bering Strait Region, Alaska. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 239, Anchorage.

Reynolds J. H. 2003. Investigating the impact of sampling effort on annual Migratory Bird Subsistence Harvest Survey estimates. Final Report, USFWS Migratory Bird Management, Contract Order 701812M816/001.

Simon J., T. Krauthoefer, D. Koster and D. Caylor. 2007. Subsistence salmon harvest monitoring report, Kuskokwim Fisheries Management Area, Alaska, 2004. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 313, Anchorage.

SPSS®. 2006. Statistical Package for the Social Sciences. Release 15.0 for Windows, SPSS, Inc.

Tarrant M. A and M. J. Manfredo. 1993. Digit preference, recall bias, and nonresponse bias in self reports of angling participation. Leisure Sciences 15: 231-238.

USFWS (U.S. Fish and Wildlife Service). 2007. Migratory bird hunting activity and harvest during the 2001 and 2002 hunting seasons – Final Report. U.S. Department of Interior, Washington, D.C.

USFWS (U.S. Fish and Wildlife Service). 2006. Migratory bird hunting activity and harvest during the 1999 and 2000 hunting seasons – Final Report. U.S. Department of Interior, Washington, D.C.

Westat, Inc. 1989. Investigation of possible recall/reference period bias in national surveys of fishing, hunting, and wildlife-associated recreation. Report to USFWS for Contract 14-16-009-008, Rockville, MA.

Wolfe R. J. 1987. The super-household: specialization in subsistence economies. 14th Annual Meeting of the Alaska Anthropological Association, Anchorage.

Wolfe R. J., A. W. Paige, and C. L. Scott. 1990. The subsistence harvest of migratory birds in Alaska. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 197, Anchorage.

APPENDICES

Appendix 1.-Migratory Bird Subsistence Harvest Survey Issues and Recommendations.

MIGRATORY BIRD SUBSISTENCE HARVEST SURVEY
- ISSUES AND RECOMMENDATIONS -

Division of Subsistence

Alaska Department of Fish and Game

November 23, 2007

Introduction

There are increasing needs to assess and improve the operations and products of the statewide migratory bird subsistence harvest survey. The original survey design adopted by the Alaska Migratory Bird Co-Management Council (AMBCC) in 2003 has not been fully implemented because less than half of the required funds have been available annually. Also, key harvest survey personnel recently have retired. All these circumstances provide a timely opportunity to evaluate problems and concerns, consider technical improvements to the current survey methods, and collaboratively reformulate an operational plan for the survey program. The Alaska Department of Fish and Game (ADF&G) offers the following comments and recommendations to the AMBCC Harvest Survey Committee. ADF&G is prepared to develop a proposal to USFWS for streamlining the survey protocol.

Purpose Statement

Using the approved harvest survey framework for community-based data collection (AMBCC 2003), revise data collection methods to provide more reliable data that can be analyzed and presented to address regional management needs. The goal is to adjust and streamline current data collection methods in order to produce more reliable harvest data comparable across locations, individual surveyors, and timing of the survey. In addition, the survey must be efficient and operationally flexible to stay within available funding.

Issues affecting the collection, analysis, and reliability of the harvest data

1. Sampling design issues

A) Current cluster sampling requires adherence to the predetermined 3-year rotational schedule for selecting communities to be surveyed.

According to the sampling protocol, two-thirds of the communities in each subregion are to be surveyed every year. Adherence to this aspect of the sampling protocol has not occurred because of funding limitations and practicalities of life in rural Alaska. This

produces a reduced sample size which compromises the reliability of the harvest estimates. Also, by reducing the number of communities actually surveyed per year, it takes more years to cover the whole state.

B) Annual selection of communities to be surveyed should take into account that some communities selected in previous years opted to not participate, and that data from some surveyed communities did not meet minimum requirements for analysis. It is unclear how the rotation schedule has been adjusted *ad hoc* to compensate for communities that opted out or produced inadequate data in previous years. Lack of documentation on deviations from procedures and on gaps in historical data likely has negatively affected the value of new data and accuracy of the regional harvest estimates.

C) Conducting the annual statewide harvest survey in three seasonal periods (spring, summer, and fall) does not fit resource availability and customary harvest patterns in many communities. For example, some communities primarily harvest birds during spring migration, take seabird eggs in early summer, have primary access during fall migration, or harvest wintering birds—but are not actively harvesting in all seasons.

This results in sparse data and poor community interest in non-harvest seasons. Lack of data makes it difficult to distinguish between non-harvest and non-surveyed seasons. The inability to interpret these irregular data affects the reliability of harvest estimates.

D) The use of three sampling seasons also has increased the occurrence of missing data because many households do not return one or more seasonal survey forms and some communities do not return survey forms for all three seasons.

Possibly, these facts may be attributed to respondent and surveyor fatigue. Nevertheless, the increased number of instances of missing data reduces the accuracy and reliability of harvest estimates. Missing data also increases costs of data analysis because of the extra work required to track data inconsistencies and to handle missing data in analyses.

E) The stratification procedures rely on the assumption that previous harvest level of all households in each community is known (none, low, and high). However, it is difficult to meet this assumption in large communities such as Bethel or in communities where hunting participation is variable. Surveyors cannot know previous harvest level of all households, particularly in large communities.

F) The elaborate set of rules of stratification based on community size is not consistently applied. A simpler sampling method applicable to a wider range of circumstances would produce more reliable results.

G) Confidence intervals around harvest estimates are distorted by a complex sampling protocol, as well as by the inconsistent use of different sampling strategies (random sampling, stratification, chain referral).

H) In a number of cases, inadequate implementation of stratification by harvest level has resulted in incomplete or unreliable data that could not be included in harvest estimates. In those cases, sampling effort was wasted. Furthermore, sampling errors and missing data increase costs of data analysis and affect reliability of harvest estimates.

2. Data collection issues — training, survey instrument, implementation of survey

A) Training of surveyors is inconsistent within and across regions. Initial training needs to be thorough and consistent statewide, and ongoing training support is needed during survey periods.

B) Follow-up to correct survey implementation problems and to do data quality control with surveyors and field coordinators for complete and correct sampling forms has not been accomplished. This has resulted in incomplete forms and data errors, preventing optimization of sampling efforts. Lack of timely and sufficient quality control makes it difficult to correct data inconsistencies and prevent missing data. It also increases costs of data analysis and adversely affects reliability of harvest estimates.

C) Different sampling approaches have been used in the same communities among the three survey seasons. In addition, different approaches have been used between survey years. Deviations from the original survey protocol have been poorly documented. These facts compromise the ability to produce reliable harvest trends over time.

D) Lack of the filter question "*Did you harvest*?" in survey forms makes it impossible to logic-check forms returned blank as non-harvest or non-survey. Modifications of survey forms require OMB approval.

Recommendations

Goal: to improve the reliability of harvest estimates and to provide information for management needs at current funding level.

1) Reconsider the main geographical scale of survey information. The objective of providing a statewide harvest estimate for migratory birds may not fulfill specific population management needs. Regional harvest estimates may be more robust and provide information at a more appropriate scale for management purposes because:

- A regional approach fits better the seasonal occurrence of species and the ecological importance of different habitats to population sustainability;
- Migratory bird species are managed by populations that occur in one or a few regions; thus harvest surveys can be aligned by region to produce harvest estimates for specific bird populations (e.g., Pacific white-fronted geese in the Y-K Delta and Bristol Bay regions);
- Harvest regulations are developed and implemented for regions;
- Not all regions have been sampled on a yearly basis. Thus, harvest expansion to produce a statewide harvest amount is less likely to properly account for heterogeneity in harvest patterns between regions;
- Program funds have been inadequate for compiling reliable statewide harvests (i.e., requires surveys of all regions); and
- Program funds cannot adequately support harvest surveys in a prioritized set of regions.

2) Consider a modified survey design[2] to improve the reliability of the harvest survey program's information.

Using the existing cluster-stratified sampling framework, the survey methodology could be modified and streamlined. The implementation of harvest level stratification and of three survey seasons could be evaluated from available survey data. This evaluation would compare harvest estimates and their confidence intervals obtained using different sampling scenarios and would be used for evaluating the benefits of one survey method over another. Adjustments to the current sampling design could include, among others:

- A single post-season recall survey, with a goal of improved accuracy and cost-effectiveness, and
- A random household selection rather than a stratified survey.
-

4) Revise and simplify the survey training program and field manuals to adequately define tasks attributed to program managers, field coordinators, and surveyors, and to develop procedures to improve consistency and confidence in the data collected. This may require restructuring program staffing and responsibilities.

5) Consider reallocating program funds to ensure sufficient investment in training and to ensure those benefits improve the quality of the data.

6) Resolve sampling problems in-season to optimize effort of data collection and analysis. This requires improving data quality, reducing missing data, and transmitting surveys for analyses in a timely manner. This saves data analysis time and costs.

[2] The ADF&G Division of Subsistence is prepared to develop such an adapted survey protocol and would provide this to the Harvest Survey Committee in winter 2008 for its consideration

7) Compile and prepare a written summary report each year, providing information on operational effort, work accomplished, and harvest estimates in a regional context, and make copies available to the public after appropriate review.

Appendix 2.-Assessment of the AMBCC Migratory Bird Subsistence Harvest Survey.

Assessment of the AMBCC Migratory Bird Subsistence Harvest Survey
Work Plan and Budget

Division of Subsistence

Alaska Department of Fish and Game

December 21, 2007

Introduction

In 1997, the U.S. Senate ratified amendments to migratory bird treaties with Canada and Mexico to establish a legal framework for traditional spring and summer harvests in Alaska. Regulations implementing new subsistence hunting seasons went into effect in 2003. As an obligation under the amended treaties, the Alaska Migratory Bird Co-Management Council (AMBCC) formed a committee to design a statewide migratory bird subsistence harvest survey to assess the magnitude and composition of traditional bird harvest, as well as begin monitoring trends under the new regulatory regime. A comprehensive survey was designed by 2003, and community surveys were implemented during 2004-2007.

In a November 2007 meeting of the AMBCC- Harvest Survey Committee, the Alaska Department of Fish &Game - Division of Subsistence presented a white paper raising concerns about the quality of information resulting from the Migratory Bird Subsistence Harvest Survey (see Appendix). The Harvest Survey Committee has struggled annually with significant underfunding of the program and operational problems that have had major impacts on the quality of harvest data. Thus, the Committee generally concurred with the concerns presented by ADF&G and requested of the Division of Subsistence a work plan and budget with two objectives: 1) to assess the efficacy of the current harvest survey design, including implementation and products; and 2) to provide recommendations for improving the design, including implementation and products. The Committee and Council recognize the need to conduct an effective survey that provides timely and accurate harvest information to member organizations and the national migratory management community, ultimately to sustain harvest traditions and migratory bird populations.

The scope of this work plan is comprehensive enough to provide meaningful recommendations and takes into account that the assessment and recommendations must be available to the AMBCC and to align with the federal budget process. The present ADF&G work plan will be reviewed by the AMBCC Harvest Survey Committee. Once approved, this work plan will be scheduled and implemented on specific calendar dates.

Given the limited time available for the assessment, the Division proposes basing the recommendations primarily on data from the 2006 survey, although we also may use comparable data from 2004 and 2005 in order to address specific issues.

Below, we list the tasks necessary to assess the survey and produce the recommendations.

Tasks to be performed:

1) Evaluate adherence to sampling protocol

Analyze how 2006 data collection in each community and region related to the current sampling protocol.

2) Evaluate effectiveness of three-season surveys

a) Identify communities that failed to return survey forms for each 2004, 2005, and 2006 season. Establish a list of communities where hunting does not occur in all 3 surveyed seasons, or where respondent/surveyor fatigue may be contributing to a poor response.

b) Determine, by community, the proportion of participating households that provided incomplete data in each of the 3 seasons by analyzing variation in number of survey forms returned for each community.

c) Identify apparent causes for which communities fail to return either any surveys or a reduced number of surveys for an entire season (e.g., no harvest, pursuit of other harvest activities, surveyor or respondent fatigue). Perhaps consult with Cynthia Wentworth, Ron Stanek, and Molly Chythlook, among others. Synthesize analysis of seasonal problems with information from other historical surveys and community studies addressing bird harvest.

3) Analyze refusal rates

Analyze household participation refusal rates in all communities surveyed in 2006. This will allow identification of problems and where to focus outreach, and will assist in the selection of communities to be surveyed.

4) Create a data system to facilitate yearly selection of communities to be surveyed – Rotation schedule

Design a data system to allow easy tracking of which communities were surveyed. This will improve implementation of a rotation schedule and adequately cover the different regions surveyed. The table below provides an example of an electronic file that could be created for this purpose:

Survey year	Community	Index of the quality of data obtained	Sampling strategy employed	Comments
2004	A	met sampling design	census attempted	
2004	B	sampling design partially met	3 strata	fall forms not retuned
2006	C	unable to include in analysis	sub-sampling, 3 strata	

5) Evaluate community stratification in three harvest levels: none, low, or high

a) For each year, calculate the proportion of households in each community for which the reported harvest fit the harvest level assumed before the survey. This will allow evaluation of the extent to which surveyors can informally assign each household in the community to a harvest stratum before the onset of the survey.

b) Calculate the proportion of "harvest" and "non-harvest" households based on reported harvest. This will provide guidance on the merits of considering alternatives of a two-stratum design ("usually harvest" and "not usually harvest") or a random sampling strategy.

6) Review stratification rules and simplify if possible

a) According to the calculated distribution of households in each harvest level (item 5 above), review and simplify, if possible, the set of stratification rules. Re-evaluate the minimum community size (number of households) below which stratification is not recommended

b) Define optimal sampling strategies (attempt census, stratification, etc.) for each community based on community size (number of households) and level of harvest.

c) Develop alternate procedures to select households in each stratum, which would replace the current "overlay palette" described in the Survey Handbook.

7) Assess generation of confidence intervals

Assess the method of calculating confidence intervals of harvest estimates to be sure they address the clustering-stratified sampling protocol and that they can accommodate variability in sampling protocol as much as possible. Perhaps use "bootstrapping," which is computer-generated repetitive re-sampling of the original data. This task will require consultation and possibly analysis to be performed by a statistician or biometrician.

8) Clarify target species

a) Identify those species that are never reported as harvested in a region in order to suggest simplification of choices on survey forms; cross-check with bird biologists to evaluate whether non-reported species occur in regions/communities.

b) Work with bird specialists to identify priority species (threatened and endangered species, non-game species).

We will collaborate with ADF&G Division of Wildlife Conservation and U.S. Fish and Wildlife Service on this task.

9) Develop training plan

Develop a training plan, including recommendations for survey managers, field coordinators, and surveyors. It is understood that implementation of a detailed training plan will depend on the acceptance of the revision of survey methods by the AMBCC, and pending decisions by USFWS on harvest survey program structure and staffing.

10) Review survey implementation

a) Review the Survey Handbook and identify those sections that specifically address the tasks of survey managers, field coordinators, and surveyors.

b) Assess feasibility of developing an alternate system to manage the survey so the use of survey forms does not depend on approval of the Office of Management and Budget, which requires extended timelines. This will facilitate the implementation of necessary modifications to surveys forms such as 1) the inclusion of a "filter question" in the harvest form to clearly identify non-harvest households, 2) to modify the set of species pictured on surveys to better

represent the local bird fauna, and 3) to simplify lists used to classify households for community stratification.

c) Identify potential partners administering other surveys (e.g., marine mammals, fish) in the target communities. This may allow collaboration on logistics and personnel, reduce costs, and minimize surveyor/respondent fatigue.

11) Develop in-season data quality controls

Develop a process for in-season data quality control and prompt correction of inadequacies, including a clear chain of supervision and accountability, timetable for delivery of products, identification of technical assistance people, creation of a telephone "help line", and other tools to assist surveyors and field coordinators thereby ensuring that quality data is delivered in a timely manner.

12) Write a report for this assessment and recommendations

Prepare a draft report to document how the analyses for this assessment of the AMBCC Migratory Bird Subsistence Harvest Survey were performed, to present and discuss the results obtained and the recommendations that stemmed from it. The following timeline extends through completion of a draft report. ADF&G will then submit the draft report for review by the AMBCC Harvest Survey Committee prior to submission of a final report to the USFWS and the AMBCC.

Appendix 3.-Regional rotation schedule of the migratory bird subsistence harvest survey.

Regions	2005	2006	2007	2008	2009
Yukon-Kuskokwim Delta[a]	X	X	X	X	X
Bering Strait[b]	X	X		X	
Northwest Arctic[b]	X		X		X
Interior	X	X		X	
North Slope	X		X		X
Bristol Bay	X		X		X
Aleutian	X		X		X
Kodiak		X		X	
Chugach	X	X		X	
Copper Basin	X		X		X
Cook Inlet	X		X		X
Southeast[c]		–		–	

Rotation of regions was implemented in 2006 as a budget reduction measure. Schedule for alternating regions equalizes annual budget totals. Rotation assumptions:

[a] Yukon-Kuskokwim Delta in each year.

[b] Bering Strait and NW Arctic alternate.

[c] Survey of egg harvest in Southeast to be developed.

Appendix 4.-Migratory bird spring/summer subsistence-eligible regions and communities.

Rotation schedule:

Year 1: survey 1s and 2s
Year 2: survey 2s and 3s
Year 3: survey 1s and 3s
Year 4: survey 1s and 2s
Year 5: survey 2s and 3s

Table 19.-Eligible communities and regions, migratory bird subsistence harvest.

Region **Sub-region** **Community**	ADF&G Community Code	Total number of households	Rotation schedule
Aleutians-Pribilofs			
Aleutians-Pribilofs Villages (Field coordinator: ADF&G)			
Adak Station	1	159	?
Akutan	5	34	3
Atka	20	32	3
Cold Bay	100	36	1
False Pass	132	22	3
King Cove	188	170	2
Nelson Lagoon	240	31	2
Nikolski	248	15	1
Sand Point	299	229	1
St. George Island	323	51	2
St. Paul Island	326	177	1
Unalaska (Field coordinator: ADF&G)			
Unalaska	358	945	4
Bering Strait			
Bering Strait Mainland Villages (Field coordinator: Kawerak, Inc.)			
Brevig Mission	69	71	1
Elim	126	84	2
Golovin	146	45	3
Koyuk	204	80	3
Shaktoolik	307	60	3
Shishmaref	311	142	2
St. Michael	325	99	1
Stebbins	327	131	3
Teller	341	71	2
Unalakleet	357	236	1
Wales	365	50	2
White Mountain	367	69	1

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Table 19. Page 2 of 7.

Region / Sub-region / Community	ADF&G Community Code	Total number of households	Rotation schedule
Bering Strait, continued.			
Nome (Field coordinator: Kawerak, Inc.)			
Nome	251	1,296	4
St. Lawrence-Diomede Islands (Field coordinator: Kawerak, Inc.)			
Diomede	114	43	4
Gambell	142	159	4
Savoonga	300	145	4
Bristol Bay			
Alaska Peninsula/Becharof NWR (Field coordinator: BBNA)			
Chignik Bay	86	29	1
Chignik Lagoon	87	33	2
Chignik Lake	88	40	1
Alaska Peninsula/Becharof NWR (Field coordinator: BBNA)			
Egegik	122	44	3
Ivanof Bay	172	21	2
Perryville	269	34	1
Pilot Point	272	29	3
Port Heiden	283	41	2
BBNA Villages (Field coordinator: BBNA)			
Aleknagik	8	70	1
Clark’s Point	96	24	1
Ekwok	124	42	1
Igiugig	168	13	2
Iliamna	170	28	3
King Salmon	189	196	2
Kokhanok	198	35	1
Koliganek	200	42	3
Levelock	211	25	2
Naknek	236	247	1
New Stuyahok	242	95	3
Newhalen	243	45	2
Nondalton	252	40	2
Pedro Bay	266	21	3
South Naknek	320	46	3
Dillingham (Field coordinator: BBNA)			
Dillingham	113	884	4
Togiak NWR (Field coordinator: Togiak NWR)			
Goodnews Bay	147	71	1
Manokotak	217	79	3

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Table 19. Page 3 of 7.

Region / Sub-region / Community	ADF&G Community Code	Total number of households	Rotation schedule
Bristol Bay, Togiak NWR, continued.			
Platinum	275	17	2
Quinhagak	290	144	2
Togiak	345	183	1
Twin Hills	353	25	3
Chugach-Cook Inlet			
Chugach (Field coordinator: ADF&G)			
Chenega Bay	82	22	1
Nanwalek	129	51	1
Port Graham	282	65	2
Tatitlek	338	27	3
Cook Inlet (Field coordinator: ADF&G)			
Tyonek	355	66	4
Copper River Basin			
Copper River Basin (Field coordinator: ADF&G)			
Cantwell	74	102	2
Chistochina	90	37	1
Chitina	91	52	3
Copper Center	103	132	1
Gakona	140	84	3
Gulkana	149	33	2
Mentasta	225	54	2
Tazlina	339	59	1
Interior Alaska			
Innoko NWR (Field coordinator: Innoko NWR)			
Anvik	18	39	2
Grayling	148	53	3
Holy Cross	158	66	2
McGrath	221	145	1
Nikolai	247	40	3
Shageluk	306	42	1
Takotna	333	20	1
Kanuti NWR (Field coordinator: Kanuti NWR)			
Alatna	7	12	3
Bettles/Evansville	60	29	2
Coldfoot	101	6	2
Wiseman	371	7	1
Allakaket	465	55	1

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Table 19. Page 4 of 7.

Region Sub-region Community	ADF&G Community Code	Total number of households	Rotation schedule
Interior Alaska, continued.			
Koyukuk-Nowitna NWR (Field coordinator: Koyukuk-Nowitna NWR)			
Galena	141	225	1
Hughes	164	26	1
Huslia	165	88	3
Kaltag	179	66	1
Koyukuk	205	44	3
Nulato	258	83	2
Ruby	294	77	2
Other Interior AK (Field coordinator: ADF&G)			
Lake Minchumina	209	16	2
Manley Hot Springs	216	32	1
Minto	228	70	3
Nenana	241	180	1
Tanana	336	99	2
Tetlin NWR Tok (Field coordinator: ADF&G)			
Tok	346	351	4
Tetlin NWR Villages (Field coordinator: ADF&G)			
Dot Lake	115	19	2
Eagle	118	68	1
Healy Lake	155	13	3
Northway	256	80	1
Tanacross	335	52	2
Tetlin	343	40	3
Yukon Flats NWR			
Arctic Village	19	52	3
Beaver	56	33	2
Birch Creek	64	10	3
Central	76	48	1
Chalkyitsik	77	35	3
Circle	93	34	1
Fort Yukon	134	205	1
Rampart	291	20	2
Stevens Village	329	35	3
Venetie	363	63	2
Kodiak			
Kodiak-Villages			
Akhiok	2	15	2
Karluk	180	15	3

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Table 19. Page 5 of 7.

Region / Sub-region / Community	ADF&G Community Code	Total number of households	Rotation schedule
Kodiak, Kodiak Villages, continued.			
Larsen Bay	210	31	1
Old Harbor	260	76	1
Ouzinkie	263	69	3
Port Lions	284	71	2
Kodiak City and Road-Connected			
Kodiak City	196	1,996	4
Kodiak Station	197	492	4
Chiniak	402	24	4
Women's Bay	447	251	4
At large	486	1,331	4
Aleneva	566	14	4
North Slope			
North Slope – Barrow (Field coordinator: North Slope Borough)			
Barrow	55	1,390	4
North Slope – Villages (Field coordinator: North Slope Borough)			
Anaktuvak Pass	12	88	2
Atkasuk (Atqasuk)	21	59	1
Kaktovik	177	80	1
Nuiqsut	257	96	3
Point Hope	277	186	1
Point Lay	278	61	3
Wainwright	364	148	2
Northwest Arctic			
Kotzebue			
Kotzebue	203	889	4
NW Arctic Villages (Field coordinator: Selawik NWR)			
Ambler	11	79	1
Buckland	70	85	1
Deering	110	42	3
Kiana	187	95	2
Kivalina	191	78	3
Kobuk	195	26	1
Noatak	250	101	3
Noorvik	253	154	2
Selawik	303	172	1
Shungnak	312	54	2

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Region Sub-region Community	ADF&G Community Code	Total number of households	Rotation schedule
Yukon-Kuskokwim Delta			
Bethel (Field coordinator: Yukon-Delta NWR)			
Bethel	59	1,739	4
Central Kuskokwim (Field coordinator: ADF&G)			
Chuathbaluk	92	34	2
Crooked Creek	107	40	1
Lime Village	212	15	3
Red Devil	292	14	2
Sleetmute	317	41	3
Stony River	330	18	1
Kuskokwim (Field coordinator: Yukon Delta NWR)			
Akiachak	3	140	3
Akiak	4	66	3
Aniak	17	163	2
Atmautluak	22	60	2
Kasigluk	182	101	1
Kwethluk	206	155	1
Lower Kalskag	214	76	1
Napakiak	237	90	1
Napaskiak	238	82	2
Nunapitchuk	259	111	2
Oscarville	262	15	1
Tuluksak	350	86	3
Upper Kalskag	359	59	3
Y-K Mid-Coast (Field coordinator: Yukon Delta NWR)			
Chefornak	80	75	1
Chevak	83	167	1
Hooper Bay	161	227	3
Mekoryuk	224	73	2
Newtok	244	63	3
Nightmute	245	47	1
Scammon Bay	302	96	3
Toksook Bay	347	106	2
Tununak	352	82	2
Y-K North Coast (Field coordinator: Yukon Delta NWR)			
Alakanuk	6	133	1
Emmonak	128	189	3
Kotlik	202	117	2
Nunam Iqua	309	38	3

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Region **Sub-region** **Community**	ADF&G Community Code	Total number of households	Rotation schedule
Y-K Delta, continued.			
Y-K South Coast (Field coordinator: Yukon Delta NWR)			
Eek	121	80	2
Kipnuk	190	137	1
Kongiganak	201	82	3
Kwigillingok	207	73	2
Tuntutuliak	351	81	1
Yukon (Field coordinator: Yukon Delta NWR)			
Marshall	218	91	2
Mountain Village	233	183	2
Pilot Station	273	122	3
Pitka’s Point	274	30	1
Russian Mission	295	70	3
St. Mary’s	324	137	1

Appendix 5.Table 20.-Proportion of households sampled per harvest level in communities sampled in 2006.

Region Sub-region, Community	Harvest level	HH sampled			HH per strata	Percentile of HH sampled			Met sampling goal?		
		Spr	Sum	Fall		Spr %	Sum %	Fall %	Spr	Sum	Fall
Bristol Bay											
Togiak NWR											
Goodnews Bay	none	1	1	1	22	5	5	5	no	no	no
	low	2	2	2	14	14	14	14	no	no	no
	high	13	12	12	29	45	41	41	yes	yes	yes
Platinum	all	5	4	2	14	36	29	14	no	no	no
Quinhagak	none	3	3	3	19	16	16	16	yes	yes	yes
	low	4	4	4	43	9	9	9	no	no	no
	high	39	38	37	82	48	46	45	yes	yes	yes
Togiak	none	9	9	8	88	10	10	9	yes	yes	no
	low	3	3	3	9	33	33	33	yes	yes	yes
	high	46	46	41	86	53	53	48	yes	yes	yes
Chugach-Cook Inlet											
Chugach											
Chenega Bay	none	4	4	4	6	67	67	67	yes	yes	yes
	low	5	5	5	7	71	71	71	yes	yes	yes
	high	3	3	3	5	60	60	60	yes	yes	yes
Port Graham	none	5	5	5	51	10	10	10	no	no	no
	low	1	1	0	3	33	33	0	yes	yes	no
	high	3	3	2	6	50	50	33	yes	yes	yes
Interior Alaska											
Kanuti NWR											
Alatna	all	7	7	7	7	100	100	100	yes	yes	yes
Bettles/Evansville	all	29	29	29	29	100	100	100	yes	yes	yes
Allakaket	all	39	37	37	39	100	95	95	yes	yes	yes
Yukon Flats NWR											
Arctic Village	all	40	29	29	48	83	60	60	yes	yes	yes
Beaver	all	33	22	22	33	100	67	67	yes	yes	yes
Central	all	37	36	36	37	100	97	97	yes	yes	yes
Chalkyitsik	all	34	26	26	34	100	76	76	yes	yes	yes
Circle	all	20	25	25	31	65	81	81	yes	yes	yes
Venetie	all	35	26	26	36	97	72	72	yes	yes	yes

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Region Sub-region, Community	Harvest level	HH sampled			HH per strata	Percentile of HH sampled			Met sampling goal?		
		Spr	Sum	Fall		Spr %	Sum %	Fall %	Spr	Sum	Fall
Tetlin NWR Villages											
Tanacross	none	9	9	9	27	33	33	33	yes	yes	yes
	low	2	2	2	8	25	25	25	yes	yes	yes
	high	9	9	9	17	53	53	53	yes	yes	yes
Tetlin NWR Tok											
Tok	all	60	60	60	182	33	33	33	yes	yes	yes
Other Interior AK											
Lake Minchumina	all	7	7	7	7	100	100	100	yes	yes	yes
Minto	none	8	8	8	22	36	36	36	yes	yes	yes
	low	11	11	11	29	38	38	38	yes	yes	yes
	high	11	11	11	11	100	100	100	yes	yes	yes
Nenana	none	33	33	33	88	38	38	38	yes	yes	yes
	low	16	16	16	47	34	34	34	yes	yes	yes
	high	25	25	25	71	35	35	35	no	no	no
Kodiak											
Kodiak-Villages											
Karluk	all	15	15	0	15	100	100	0	yes	yes	no
Larsen Bay	all	37	37	36	38	97	97	95	yes	yes	yes
Ouzinkie	none	4	3	4	15	27	20	27	yes	yes	yes
	low	11	10	11	31	35	32	35	yes	yes	yes
	high	10	10	10	20	50	50	50	yes	yes	yes
Kodiak City and Road-Connected											
Kodiak City	all	41	40	0	1,996	2	2	0	yes	yes	no
Northwest Arctic											
NW Arctic Villages											
Buckland	none	4	4	4	15	27	27	27	yes	yes	yes
	low	5	5	5	39	13	13	13	no	no	no
	high	13	13	13	31	42	42	42	yes	yes	yes
Kobuk	all	27	27	26	27	100	100	96	yes	yes	yes
Selawik	all	149	149	148	168	89	89	88	yes	yes	yes
Shungnak	none	1	1	1	27	4	4	4	no	no	no
	low	2	2	2	11	18	18	18	yes	yes	yes
	high	5	5	5	15	33	33	33	no	no	no

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Region Sub-region, Community	Harvest level	HH sampled			HH per strata	Percentile of HH sampled			Met sampling goal?		
		Spr	Sum	Fall		Spr %	Sum %	Fall %	Spr	Sum	Fall
Y-K South Coast											
Kipnuk	none	7	7	7	29	24	24	24	yes	yes	yes
	low	2	2	2	35	6	6	6	no	no	no
	high	21	21	21	88	24	24	24	no	no	no
Kongiganak	none	3	3	3	15	20	20	20	yes	yes	yes
	low	4	3	4	6	67	50	67	yes	yes	yes
	high	13	13	12	61	21	21	20	no	no	no
Tuntutuliak	none	0	0	0	14	0	0	0	no	no	no
	low	10	10	10	40	25	25	25	yes	yes	yes
	high	10	10	10	23	43	43	43	yes	yes	yes
Y-K Mid-Coast											
Chefornak	none	1	2	1	22	5	9	5	no	no	no
	low	6	6	6	22	27	27	27	yes	yes	yes
	high	10	10	10	18	56	56	56	yes	yes	yes
Newtok	none	0	0	0	5	0	0	0	no	no	no
	low	4	0	4	15	27	0	27	yes	no	yes
	high	8	0	8	25	32	0	32	no	no	no
Nightmute	none	0	0	0	1	0	0	0	no	no	no
	low	1	1	1	19	5	5	5	no	no	no
	high	8	8	8	21	38	38	38	no	no	no
Scammon Bay	none	0	0	0	12	0	0	0	no	no	no
	low	1	4	4	30	3	13	13	no	no	no
	high	15	19	19	38	39	50	50	no	yes	yes
Y-K North Coast											
Emmonak	none	3	3	3	42	7	7	7	no	no	no
	low	3	3	3	39	8	8	8	no	no	no
	high	19	19	19	80	24	24	24	no	no	no
Nunam Iqua	none	2	2	2	5	40	40	40	yes	yes	yes
	low	13	13	12	14	93	93	86	yes	yes	yes
	high	15	15	15	19	79	79	79	yes	yes	yes
Yukon											
Pilot Station	none	4	4	4	33	12	12	12	yes	yes	yes
	low	9	9	5	71	13	13	7	no	no	no
	high	3	3	5	11	27	27	45	no	no	yes
Pitka’s Point	none	5	5	5	15	33	33	33	yes	yes	yes
	low	5	5	5	8	63	63	63	yes	yes	yes
	high	7	7	7	7	100	100	100	yes	yes	yes

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Table 20. Page 4 of 4.

Region / Sub-region, Community	Harvest level	HH sampled			HH per strata	Percentile of HH sampled			Met sampling goal?		
		Spr	Sum	Fall		Spr %	Sum %	Fall %	Spr	Sum	Fall
Russian Mission	none	1	6	5	14	7	43	36	no	yes	yes
	low	4	4	4	10	40	40	40	yes	yes	yes
	high	16	16	17	43	37	37	40	no	no	no
St. Mary's	all	31	30	28	37	84	81	76	yes	yes	yes
Central Kuskokwim											
Crooked Creek	all	17	17	17	32	53	53	53	yes	yes	yes
Lime Village	all	15	15	15	15	100	100	100	yes	yes	yes
Sleetmute	all	19	19	19	41	46	46	46	no	no	no
Kuskokwim											
Akiachak	none	0	4	4	42	0	10	10	no	no	no
	low	0	6	5	38	0	16	13	no	yes	no
	high	0	24	25	60	0	40	42	no	yes	yes
Akiak	none	2	1	2	13	15	8	15	yes	no	yes
	low	9	7	9	23	39	30	39	yes	yes	yes
	high	16	18	15	30	53	60	50	yes	yes	yes
Kasigluk	none	0	0	1	9	0	0	11	no	no	yes
	low	12	12	19	57	21	21	33	yes	yes	yes
	high	1	1	4	9	11	11	44	no	no	yes
Kwethluk	none	4	4	4	32	13	13	13	yes	yes	yes
	low	10	10	10	60	17	17	17	yes	yes	yes
	high	24	23	23	63	38	37	37	no	no	no
Lower Kalskag	none	6	6	6	39	15	15	15	yes	yes	yes
	low	9	9	9	24	38	38	38	yes	yes	yes
	high	10	10	10	13	77	77	77	yes	yes	yes
Napaskiak	none	3	3	3	31	10	10	10	no	no	no
	low	20	20	18	51	39	39	35	yes	yes	yes
	high	6	7	7	18	33	39	39	no	no	no
Oscarville	none	1	1	1	4	25	25	25	yes	yes	yes
	low	6	6	6	6	100	100	100	yes	yes	yes
	high	3	3	3	3	100	100	100	yes	yes	yes
Tuluksak	none	3	3	3	8	38	38	38	yes	yes	yes
	low	10	10	10	47	21	21	21	yes	yes	yes
	high	2	2	2	5	40	40	40	yes	yes	yes
Upper Kalskag	none	1	0	0	13	8	0	0	no	no	no
	low	0	4	0	16	0	25	0	no	yes	no
	high	10	14	0	23	43	61	0	yes	yes	no

HH = household; Spr = spring; Sum = summer.

Appendix 6. Table 21.-Proportion of surveyed households that returned all and each of the seasonal survey pages for communities-year.

Year	Community	Total number of HH	Number of surveyed HH	Percentage of surveyed HH returning all 3 seasonal survey pages (%)	Percentage of surveyed HH returning spring survey page (%)	Percentage of surveyed HH returning summer survey page (%)	Percentage of surveyed HH returning fall survey page (%)
2005	Adak Station	31	2	100	100	100	100
2005	Akiachak*	114	34	0	0	100	100
2006	Akiachak*	140	35	0	0	97	97
2005	Akiak	57	37	38	68	68	70
2006	Akiak	66	40	33	68	65	65
2005	Akutan	28	11	100	100	100	100
2004	Alakanuk	133	44	86	93	93	93
2004	Alatna	13	4	100	100	100	100
2006	Alatna	7	7	100	100	100	100
2004	Aleknagik*	56	18	61	89	89	72
2005	Anaktuvak Pass	88	18	100	100	100	0[a]
2004	Aniak*	103	11	0	100	0	0
2005	Aniak	163	27	100	100	100	100
2004	Anvik	35	25	100	100	100	100
2005	Anvik	33	33	100	100	100	100
2006	Arctic Village*	48	44	59	91	66	66
2005	Atka	24	21	100	100	100	100
2005	Atkasuk (Atqasuk)	57	17	100	100	100	0[a]
2004	Atmautluak*	53	20	0	100	10	0
2005	Barrow	1,400	213	99	99	99	0[a]
2006	Beaver*	33	33	67	100	67	67
2004	Bethel	1,874	45	100	100	100	100
2005	Bethel*	1,739	225	11	45	37	67
2006	Bettles/Evansville	29	29	100	100	100	100
2004	Brevig Mission	71	20	100	100	100	100
2006	Buckland	85	23	96	96	96	96
2006	Central	37	37	97	100	97	97
2006	Chalkyitsik*	34	34	76	100	76	76
2004	Chefornak	66	20	100	100	100	100
2006	Chefornak	62	18	94	94	100	94
2006	Chenega Bay	18	12	100	100	100	100
2004	Chevak	138	35	71	86	83	83

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Year	Community	Total number of HH	Number of surveyed HH	Percentage of surveyed HH returning all 3 seasonal survey pages (%)	Percentage of surveyed HH returning spring survey page (%)	Percentage of surveyed HH returning summer survey page (%)	Percentage of surveyed HH returning fall survey page (%)
2004	Chignik Bay	27	19	100	100	100	100
2004	Chignik Lagoon	22	18	100	100	100	100
2004	Chignik Lake	28	5	100	100	100	100
2004	Chistochina	23	13	100	100	100	100
2004	Chitina	10	6	100	100	100	100
2004	Chuathbaluk	34	4	100	100	100	100
2006	Circle*	31	31	55	65	81	81
2004	Clark's Point	24	10	100	100	100	100
2005	Clark's Point	20	19	100	100	100	100
2005	Cold Bay	24	6	100	100	100	100
2004	Copper Center	47	12	100	100	100	100
2004	Crooked Creek	40	23	100	100	100	100
2006	Crooked Creek	32	17	100	100	100	100
2005	Dillingham	846	108	99	100	99	100
2005	Diomede	37	18	100	100	100	100
2004	Dot Lake	23	9	100	100	100	100
2004	Eagle	12	9	100	100	100	100
2004	Eek*	75	20	75	75	75	100
2005	Eek*	72	26	38	81	54	54
2005	Egegik	24	7	100	100	100	100
2004	Ekwok	33	9	100	100	100	100
2004	Elim	71	20	100	100	100	100
2005	Elim	64	17	100	100	100	100
2005	Emmonak	161	34	88	94	94	94
2006	Emmonak	161	25	100	100	100	100
2004	Nanwalek*	47	18	89	100	100	89
2004	Fort Yukon	263	101	100	100	100	100
2004	Gakona	24	8	100	100	100	100
2004	Galena	225	37	100	100	100	100
2004	Gambell	121	40	100	100	100	100
2005	Gambell	118	31	100	100	100	100
2005	Golovin	41	17	100	100	100	100
2004	Goodnews Bay	60	11	100	100	100	100
2006	Goodnews Bay	65	16	88	100	94	94
2005	Grayling	32	13	100	100	100	100

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Table 21. Page 3 of 7.

Year	Community	Total number of HH	Number of surveyed HH	Percentage of surveyed HH returning all 3 seasonal survey pages (%)	Percentage of surveyed HH returning spring survey page (%)	Percentage of surveyed HH returning summer survey page (%)	Percentage of surveyed HH returning fall survey page (%)
2004	Gulkana	14	11	100	100	100	100
2004	Holy Cross	66	20	100	100	100	100
2005	Holy Cross	53	53	100	100	100	100
2004	Hooper Bay	224	44	95	100	95	100
2005	Hooper Bay	220	51	94	96	94	100
2004	Hughes	22	14	100	100	100	100
2004	Huslia	78	16	100	100	100	100
2005	Huslia	15	15	93	100	100	93
2004	Igiugig	13	5	100	100	100	100
2005	Iliamna	24	6	100	100	100	100
2005	Ivanof Bay	21	21	100	100	100	100
2005	Kaktovik	65	19	100	100	100	0[a]
2004	Kaltag	58	20	100	100	100	100
2006	Karluk*	15	15	0	100	100	0
2004	Kasigluk	98	30	100	100	100	100
2006	Kasigluk*	75	24	54	54	54	100
2004	King Cove	53	7	100	100	100	100
2005	King Cove	167	20	100	100	100	100
2004	King Salmon	40	8	100	100	100	100
2005	King Salmon*	196	24	0	100	100	0
2004	Kipnuk*	133	40	0	100	95	0
2005	Kipnuk	141	51	88	94	92	94
2006	Kipnuk	152	30	100	100	100	100
2006	Kobuk	27	27	96	100	100	96
2006	Kodiak City*	1,996	42	0	98	95	0
2004	Kokhanok*	33	8	88	88	88	100
2005	Kokhanok	31	12	100	100	100	100
2005	Koliganek	42	9	100	100	100	100
2005	Kongiganak*	82	49	12	41	63	65
2006	Kongiganak	82	20	90	100	95	95
2004	Kotlik	61	30	100	100	100	100
2005	Kotlik	81	39	85	92	92	92
2005	Koyuk	61	28	100	100	100	100
2004	Koyukuk	40	34	100	100	100	100
2005	Koyukuk	33	33	100	100	100	100

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Table 21. Page 4 of 7.

Year	Community	Total number of HH	Number of surveyed HH	Percentage of surveyed HH returning all 3 seasonal survey pages (%)	Percentage of surveyed HH returning spring survey page (%)	Percentage of surveyed HH returning summer survey page (%)	Percentage of surveyed HH returning fall survey page (%)
2004	Kwethluk	121	32	100	100	100	100
2005	Kwethluk	134	28	82	93	93	89
2006	Kwethluk	155	38	97	100	97	97
2004	Lake Minchumina	5	4	100	100	100	100
2006	Lake Minchumina	7	7	100	100	100	100
2006	Larsen Bay	38	38	92	97	97	95
2004	Levelock	23	9	100	100	100	100
2005	Levelock	16	5	100	100	100	100
2006	Lime Village	15	15	100	100	100	100
2004	Lower Kalskag	75	15	100	100	100	100
2006	Lower Kalskag	76	25	100	100	100	100
2004	Manley Hot Springs	38	11	100	100	100	100
2005	Manokotak	79	22	91	100	100	91
2004	Marshall*	85	20	0	100	100	0
2005	Marshall	86	20	100	100	100	100
2005	Mekoryuk*	44	17	65	94	82	76
2004	Mentasta	13	5	100	100	100	100
2006	Minto	62	31	97	97	97	97
2005	Mountain Village*	101	23	57	57	100	100
2004	Naknek	199	48	100	100	100	100
2005	Napaskiak	90	30	97	97	100	100
2006	Napaskiak	100	30	90	97	100	93
2004	Nenana	117	50	100	100	100	100
2006	Nenana	206	77	96	96	96	96
2005	New Stuyahok	95	26	100	100	100	100
2004	Newhalen	36	12	100	100	100	100
2005	Newhalen	45	8	100	100	100	100
2005	Newtok	26	22	91	95	95	100
2006	Newtok*	45	12	0	100	0	100
2004	Nightmute	32	6	100	100	100	100
2006	Nightmute	41	9	100	100	100	100
2004	Nikolai	35	25	100	100	100	100
2005	Nikolai	20	20	100	100	100	100

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Year	Community	Total number of HH	Number of surveyed HH	Percentage of surveyed HH returning all 3 seasonal survey pages (%)	Percentage of surveyed HH returning spring survey page (%)	Percentage of surveyed HH returning summer survey page (%)	Percentage of surveyed HH returning fall survey page (%)
2004	Nome	1,125	119	100	100	100	100
2005	Nome	1,296	105	100	100	100	100
2004	Nondalton	34	11	100	100	100	100
2005	Nondalton	34	11	100	100	100	100
2004	Northway	75	20	100	100	100	100
2004	Nulato	83	18	100	100	100	100
2005	Nulato*	76	17	76	76	88	94
2004	Nunapitchuk*	73	31	16	100	45	16
2005	Nunapitchuk	50	40	100	100	100	100
2004	Oscarville*	15	4	0	100	0	0
2006	Oscarville	13	10	100	100	100	100
2006	Ouzinkie	66	25	92	100	92	100
2005	Pedro Bay	14	5	100	100	100	100
2004	Perryville	34	27	100	100	100	100
2005	Pilot Point	29	9	100	100	100	100
2005	Pilot Station*	122	40	65	75	83	98
2006	Pilot Station*	115	19	58	84	84	74
2004	Pitka's Point	26	15	100	100	100	100
2006	Pitka's Point	30	17	100	100	100	100
2005	Platinum*	14	14	71	93	93	79
2006	Platinum*	14	5	40	100	80	40
2005	Point Hope	150	122	98	99	99	0[a]
2005	Point Lay	55	55	84	84	100	0[a]
2004	Port Graham	64	14	100	100	100	100
2006	Port Graham*	60	10	60	90	90	70
2004	Port Heiden	22	10	100	100	100	100
2005	Port Heiden	32	10	80	80	80	80
2004	Quinhagak	132	30	100	100	100	100
2005	Quinhagak	122	30	97	100	100	97
2006	Quinhagak	144	46	96	100	98	96
2004	Ruby	65	16	100	100	100	100
2005	Ruby	67	15	100	100	100	100
2005	Russian Mission*	60	21	81	81	95	95
2006	Russian Mission*	67	27	74	78	96	96
2004	Savoonga	130	40	100	100	100	100

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Table 21. Page 6 of 7.

Year	Community	Total number of HH	Number of surveyed HH	Percentage of surveyed HH returning all 3 seasonal survey pages (%)	Percentage of surveyed HH returning spring survey page (%)	Percentage of surveyed HH returning summer survey page (%)	Percentage of surveyed HH returning fall survey page (%)
2005	Savoonga	129	34	100	100	100	100
2005	Scammon Bay	40	32	97	97	100	100
2006	Scammon Bay*	80	23	70	70	100	100
2006	Selawik	168	149	99	100	100	99
2005	Shageluk	23	23	100	100	100	100
2005	Nunam Iqua*	38	35	77	83	94	94
2006	Nunam Iqua	38	31	90	97	97	94
2004	Shishmaref	123	21	100	100	100	100
2005	Shishmaref	124	22	100	100	100	100
2006	Shungnak	53	8	100	100	100	100
2006	Sleetmute	41	20	95	95	95	95
2005	South Naknek	35	9	100	100	100	100
2005	St. Mary's*	100	33	61	82	61	79
2006	St. Mary's	37	37	59	84	81	76
2004	St. Michael	99	30	100	100	100	100
2005	Stebbins	131	30	100	100	100	100
2004	Stony River	18	6	100	100	100	100
2005	Takotna	20	20	100	100	100	100
2006	Tanacross	52	20	100	100	100	100
2004	Tatitlek	25	9	100	100	100	100
2004	Teller	67	20	100	100	100	100
2005	Teller	61	17	100	100	100	100
2004	Togiak	174	47	98	100	100	98
2006	Togiak*	183	58	90	100	100	90
2004	Tok	354	16	100	100	100	100
2006	Tok	182	60	100	100	100	100
2004	Toksook Bay*	101	29	83	100	86	83
2005	Toksook Bay	103	25	100	100	100	100
2005	Tuluksak	57	17	100	100	100	100
2006	Tuluksak	60	15	100	100	100	100
2004	Tuntutuliak	78	33	61	79	79	82
2006	Tuntutuliak	77	20	100	100	100	100
2004	Tununak*	68	24	42	100	63	42
2005	Tununak*	62	21	57	62	90	100
2004	Twin Hills	23	9	100	100	100	100

-continued-

Table 21. Page 7 of 7.

Year	Community	Total number of HH	Number of surveyed HH	Percentage of surveyed HH returning all 3 seasonal survey pages (%)	Percentage of surveyed HH returning spring survey page (%)	Percentage of surveyed HH returning summer survey page (%)	Percentage of surveyed HH returning fall survey page (%)
2005	Twin Hills*	20	12	67	83	92	75
2004	Tyonek	51	13	100	100	100	100
2005	Tyonek	49	12	100	100	100	100
2004	Unalakleet	202	50	100	100	100	100
2005	Unalaska	945	33	100	100	100	100
2005	Upper Kalskag*	52	14	0	0	100	100
2006	Upper Kalskag*	52	22	0	50	82	0
2006	Venetie*	36	36	69	97	72	72
2005	Wainwright	136	122	100	100	100	0[a]
2004	Wales	44	17	100	100	100	100
2005	Wales	40	17	100	100	100	100
2004	White Mountain	61	15	100	100	100	100
2004	Allakaket	44	14	100	100	100	100
2006	Allakaket	39	39	95	100	95	95

HH = households.

[a] North Slope communities are not surveyed in fall.

* Indicates communities for which the proportion of households seasonally surveyed varied by at least 10%.

Appendix 7.-Seasonal subsistence bird hunting by region in Alaska.

FIGURE 25. SEASONALITY OF MIGRATORY BIRD HARVESTS BY REGION AND AREA, 1980s

REGION	MIGRATORY BIRD HUNTING												
SOUTHEAST ARCHIPELAGO	J	F	M	A	M	J	J	A	S	O	N	D	SAMPLE
SOUTHEAST	oooo	oo		oooo	oooo	oooo	oooo	OOxx	XXXX	XXXX	XXXX	XXXX	9 of 32 communities
PACIFIC-ALEUTIAN													
PRINCE WILLIAM SD	xxxx	xxxx	xxxx					OOxx	XXXX	XXXX	XXXX	xxxx	3 of 4 communities
LOWER KENAI PENIN	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX			XXXX	XXXX	XXXX	XXXX	2 of 3 communities
KODIAK ISLAND	XXXX	XXXX	XXXX	xxxx	xxxx			oo	xxxx	xXXX	XXXX	XXXX	6 of 9 communities
S ALASKA PENINSULA	XXXX	XXXX	XXXX	XXoo	X	XX			XXXX	XXXX	XXXX		5 of 9 communities
ALEUTIAN-PRIBILOF	XXXX	XXXX	XXXX	xxOO	OO				OOOO	OOOO	OXXX	XXxx	5 of 9 communities
SUBARCTIC COAST-INTERIOR													
N ALASKA PENINSULA				xxxx	xxxx	x		xxxx	XXXX	XXX			7 of 7 communities
BRISTOL BAY-ILIAMNA				oXXX	XXXX	OO		ooOO	OXXX	XXOO			11 of 18 communities
YUKON-KUSK DELTA			oooo	ooxx	XXXX	XXOO	OOOO	xxXX	XXXX	XXxx	oooo		17 of 38 communities
S NORTON SOUND				xxxx	XXxx	oooo		Ox	XXXx	ooo			3 of 3 communities
UPPER COOK INLET				XX	XXXX	xxxx		x	XXXX	XXXX			2 of 2 communities
UPPER KUSKOKWIM				ooXX	XXXX	XXxx	OOOO	xxxx	XXxx	Oo			9 of 13 of communities
U YUKON-KOYUKUK				oOXX	XXXX	XXxx	xxxx	XXXX	XXXX	OO			15 of 32 communities
ARCTIC													
SEWARD PEN-BERING	OOOO	OOOO	OOOO	xxXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	xOOO	OOOO	9 of 17 communities
NORTHWEST ARCTIC				O	OXXX	XXXX	XXXX	XXXX	XXXX	XXXx	xx		7 of 11 communities
ARCTIC SLOPE			o	OOOx	XXXX	XXXX	XXXX	XXXX	XXXX				7 of 11 communities
ROAD NETWORK													
UPPER TANANA			o	oooo	OOOO	oooo	OOOO	OOOO	XXXX	XxOO			5 of 7 communities

Percent of communities hunting: o = 1-24%; O = 25-49%; x = 50-74%; X = 75-100%

Source: Wolfe et al. 1990.

Appendix 8. Table 22.-Household refusal rates in the Migratory Bird Subsistence Harvest Survey.

Year	Region Sub-region Community	Households contacted (n)	Refusal rate (%)
	Y-K Delta		
	Central Kuskokwim		
2006	Crooked Creek*	25	32
2006	Lime Village	15	0
2006	Sleetmute	25	24
2006	Stony River*	8	63
	Bering Strait		
	Bering Strait Mainland Villages		
2004	Brevig Mission	20	0
2004	Elim*	29	31
2005	Elim	20	5
2005	Golovin	17	0
2005	Koyuk	30	7
2005	Shishmaref*	116	86
2004	St. Michael*	45	31
2005	Stebbins*	57	49
2004	Teller	19	5
2005	Teller	18	0
2004	Wales	20	15
2004	White Mountain	15	0
	St. Lawrence-Diomede Islands		
2004	Gambell	55	27
2005	Gambell	33	6
2005	Savoonga	42	19
	Nome		
2005	Nome	130	24
	Northwest Arctic		
	Northwest Arctic Villages		
2006	Buckland	24	0
2006	Kiana*	32	91
2006	Kobuk	26	0
2006	Selawik	148	0
2006	Shungnak*	12	33
	Interior Alaska		
	Kanuti National Wildlife Refuge		
2006	Alatna*	11	36
2006	Bettles/Evansville	29	0

-continued-

Table 22. Page 2 of 4.

Year	Region Sub-region Community	Households contacted (n)	Refusal rate (%)
Interior Alaska, Kanuti National Wildlife Refuge, continued.			
2006	Allakaket	43	9
	Innoko National Wildlife Refuge		
2004	Anvik*	35	34
2005	Anvik*	28	61
2005	Grayling	32	0
2006	Grayling*	30	83
2004	Holy Cross*	66	65
2005	Holy Cross	53	0
2006	Holy Cross*	49	86
2004	Nikolai	34	21
2005	Nikolai	23	26
2006	Nikolai*	21	43
2005	Shageluk	23	0
2006	Shageluk*	22	68
2005	Takotna	20	0
	Yukon Flats National Wildlife Refuge		
2006	Arctic Village	48	15
2006	Beaver	33	0
2006	Central	7	0
2006	Chalkyitsik	34	6
2006	Circle	31	13
2006	Fort Yukon	55	0
2006	Venetie	36	0
	Tetlin National Wildlife Refuge Villages		
2004	Dot Lake	9	0
2004	Eagle	9	0
2004	Northway	20	0
2006	Tanacross	20	0
	Tetlin National Wildlife Refuge Tok		
2004	Tok	16	0
2006	Tok	60	0
	Other Interior AK		
2006	Lake Minchumina	7	0
2006	Minto	29	0
2004	Nenana	51	2
2006	Nenana	74	1

-continued-

Table 22. Page 3 of 4.

Year	Region Sub-region Community	Households contacted (n)	Refusal rate (%)
	North Slope		
	North Slope-Villages		
2005	Anaktuvak Pass	18	0
2005	Atkasuk (Atqasuk)	18	0
2005	Kaktovik	19	0
2005	Point Hope	150	20
2005	Point Lay	54	15
2005	Wainwright	134	9
	North Slope-Barrow		
2005	Barrow	206	2
	Aleutians-Pribilofs		
	Aleutians-Pribilofs Villages		
2005	Akutan	12	8
2005	Cold Bay	6	0
2005	King Cove	20	0
	Kodiak		
	Kodiak-Villages		
2004	Akhiok	8	0
2006	Akhiok	38	11
2006	Karluk	15	7
2006	Larsen Bay*	36	100
2004	Old Harbor	27	0
2006	Old Harbor	17	6
2006	Ouzinkie	27	0
2004	Port Lions	14	0
	Kodiak City and Road Connected		
2006	Kodiak City*	61	38
	Copper River Basin		
2004	Chistochina	13	0
2004	Chitina	6	0
2004	Copper Center	12	0
2004	Gakona*	7	43
2004	Gulkana	11	18
	Cook Inlet		
2005	Tyonek	17	29
	Chugach		
2006	Chenega Bay	15	20
2004	Nanwalek	4	0
2004	Port Graham	5	0

-continued-

Table 22. Page 4 of 4.

Region Sub-region Year	Community	Households contacted (n)	Refusal rate (%)
Copper River Basin, Chugach, continued			
2006	Port Graham	8	25
2004	Tatitlek	9	0

* Indicates communities-years for which the refusal rate was 30% or higher.

Appendix 9.-Recommended design of Permission Slip Form.

Household Permission Slip

We have agreed to participate in the Migratory Bird Subsistence Harvest Survey and we have accepted the survey forms. We understand that the harvest surveyor for our village will be back to pick up a page of the survey the first week of July, the first week of September, and the first week of November.

Community: _____ Date: _____ Harvest year: _____

Household code: _____ **YES_____ NO_____** Alternate_____

Household Permission Slip

We have agreed to participate in the Migratory Bird Subsistence Harvest Survey and we have accepted the survey forms. We understand that the harvest surveyor for our village will be back to pick up a page of the survey the first week of July, the first week of September, and the first week of November.

Community: _____ Date: _____ Harvest year: _____

Household code: _____ **YES_____ NO_____** Alternate_____

Household Permission Slip

We have agreed to participate in the Migratory Bird Subsistence Harvest Survey and we have accepted the survey forms. We understand that the harvest surveyor for our village will be back to pick up a page of the survey the first week of July, the first week of September, and the first week of November.

Community: _____ Date: _____ Harvest year: _____

Household code: _____ **YES_____ NO_____** Alternate_____

Appendix 10. Table 23.-**List of all communities surveyed in 2004, 2005, and 2006, and number of survey instruments returned for each survey season.**

Sub-region	Community	Year	Total households	Spring instruments	Summer instruments	Fall instruments
Aleutians-Pribilofs Villages	Adak Station	2005	62	2	2	2
Kuskokwim	Akiachak	2005	114	0	34	34
Kuskokwim	Akiachak	2006	280	0	34	34
Kuskokwim	Akiak	2005	114	25	25	26
Kuskokwim	Akiak	2006	132	27	26	26
Aleutians-Pribilofs Villages	Akutan	2005	56	11	11	11
Y-K North Coast	Alakanuk	2004	266	41	41	41
Kanuti NWR	Alatna	2004	26	4	4	4
Kanuti NWR	Alatna	2006	14	7	7	7
BBNA Villages	Aleknagik	2004	112	16	16	13
North Slope - Villages	Anaktuvak Pass	2005	176	18	18	0
Kuskokwim	Aniak	2004	206	11	0	0
Kuskokwim	Aniak	2005	326	27	27	27
Innoko NWR	Anvik	2004	70	25	25	25
Innoko NWR	Anvik	2005	66	33	33	33
Yukon Flats NWR	Arctic Village	2006	48	40	29	29
Aleutians-Pribilofs Villages	Atka	2005	48	21	21	21
North Slope - Villages	Atkasuk (Atqasuk)	2005	114	17	17	0
Kuskokwim	Atmautluak	2004	106	20	2	0
North Slope - Barrow	Barrow	2005	2,800	211	211	0
Yukon Flats NWR	Beaver	2006	33	33	22	22
Bethel	Bethel	2004	2,656	45	45	45
Bethel	Bethel	2005	1,739	102	84	150
Kanuti NWR	Bettles/Evansville	2006	58	29	29	29
BS Mainland Villages	Brevig Mission	2004	142	20	20	20
NW Arctic Villages	Buckland	2006	170	22	22	22
Yukon Flats NWR	Central	2006	37	37	36	36
Yukon Flats NWR	Chalkyitsik	2006	34	34	26	26
Y-K Mid-Coast	Chefornak	2004	132	20	20	20
Y-K Mid-Coast	Chefornak	2006	124	17	18	17
Chugach	Chenega Bay	2006	36	12	12	12
Y-K Mid-Coast	Chevak	2004	276	30	29	29
Alaska Peninsula/Becharof NWR	Chignik Bay	2004	53	19	19	19

-continued-

Table 23. Page 2 of 7.

Sub-region	Community	Year	Total households	Spring instruments	Summer instruments	Fall instruments
Alaska Peninsula/Becharof NWR	Chignik Lagoon	2004	44	18	18	18
Alaska Peninsula/Becharof NWR	Chignik Lake	2004	56	5	5	5
Copper River Basin	Chistochina	2004	36	13	13	13
Copper River Basin	Chitina	2004	16	6	6	6
Central Kuskokwim	Chuathbaluk	2004	68	4	4	4
Yukon Flats NWR	Circle	2006	31	20	25	25
BBNA Villages	Clark's Point	2004	48	10	10	10
BBNA Villages	Clark's Point	2005	40	19	19	19
Aleutians-Pribilofs Villages	Cold Bay	2005	48	6	6	6
Copper River Basin	Copper Center	2004	59	12	12	12
Central Kuskokwim	Crooked Creek	2004	80	23	23	23
Central Kuskokwim	Crooked Creek	2006	32	17	17	17
Dillingham	Dillingham	2005	1,692	108	107	108
St. Lawrence-Diomede Islands	Diomede	2005	74	18	18	18
Tetlin NWR Villages	Dot Lake	2004	46	9	9	9
Tetlin NWR Villages	Eagle	2004	24	9	9	9
Y-K South Coast	Eek	2004	150	15	15	20
Y-K South Coast	Eek	2005	144	21	14	14
Alaska Peninsula/Becharof NWR	Egegik	2005	48	7	7	7
BBNA Villages	Ekwok	2004	66	9	9	9
BS Mainland Villages	Elim	2004	142	20	20	20
BS Mainland Villages	Elim	2005	128	17	17	17
Y-K North Coast	Emmonak	2005	322	32	32	32
Y-K North Coast	Emmonak	2006	322	25	25	25
Chugach	Nanwalek	2004	94	18	18	16
Yukon Flats NWR	Fort Yukon	2004	526	101	101	101
Copper River Basin	Gakona	2004	32	8	8	8
Koyukuk-Nowitna NWR	Galena	2004	410	37	37	37
St. Lawrence-Diomede Islands	Gambell	2004	242	40	40	40
St. Lawrence-Diomede Islands	Gambell	2005	236	31	31	31

-continued-

Table 23. Page 3 of 7.

Sub-region	Community	Year	Total households	Spring instruments	Summer instruments	Fall instruments
BS Mainland Villages	Golovin	2005	82	17	17	17
Togiak NWR	Goodnews Bay	2004	60	11	11	11
Togiak NWR	Goodnews Bay	2006	130	16	15	15
Innoko NWR	Grayling	2005	64	13	13	13
Copper River Basin	Gulkana	2004	27	11	11	11
Innoko NWR	Holy Cross	2004	132	20	20	20
Innoko NWR	Holy Cross	2005	106	53	53	53
Y-K Mid-Coast	Hooper Bay	2004	447	44	42	44
Y-K Mid-Coast	Hooper Bay	2005	440	49	48	51
Koyukuk-Nowitna NWR	Hughes	2004	36	14	14	14
Koyukuk-Nowitna NWR	Huslia	2004	156	16	16	16
Koyukuk-Nowitna NWR	Huslia	2005	30	15	15	14
BBNA Villages	Igiugig	2004	13	5	5	5
BBNA Villages	Iliamna	2005	46	6	6	6
Alaska Peninsula/Becharof NWR	Ivanof Bay	2005	42	21	21	21
North Slope - Villages	Kaktovik	2005	130	19	19	0
Koyukuk-Nowitna NWR	Kaltag	2004	116	20	20	20
Kodiak-Villages	Karluk	2006	30	15	15	0
Kuskokwim	Kasigluk	2004	196	30	30	30
Kuskokwim	Kasigluk	2006	150	13	13	24
Aleutians-Pribilofs Villages	King Cove	2004	106	7	7	7
Aleutians-Pribilofs Villages	King Cove	2005	334	20	20	20
BBNA Villages	King Salmon	2004	80	8	8	8
BBNA Villages	King Salmon	2005	392	24	24	0
Y-K South Coast	Kipnuk	2004	173	40	38	0
Y-K South Coast	Kipnuk	2005	282	48	47	48
Y-K South Coast	Kipnuk	2006	304	30	30	30
NW Arctic Villages	Kobuk	2006	54	27	27	26
Kodiak City and Road-Connected	Kodiak City	2006	1,996	41	40	0
BBNA Villages	Kokhanok	2004	66	7	7	8
BBNA Villages	Kokhanok	2005	62	12	12	12

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Table 23. Page 4 of 7.

Sub-region	Community	Year	Total households	Spring instruments	Summer instruments	Fall instruments
BBNA Villages	Koliganek	2005	84	9	9	9
Y-K South Coast	Kongiganak	2005	164	20	31	32
Y-K South Coast	Kongiganak	2006	164	20	19	19
Y-K North Coast	Kotlik	2004	122	30	30	30
Y-K North Coast	Kotlik	2005	162	36	36	36
BS Mainland Villages	Koyuk	2005	122	28	28	28
Koyukuk-Nowitna NWR	Koyukuk	2004	74	34	34	34
Koyukuk-Nowitna NWR	Koyukuk	2005	66	33	33	33
Kuskokwim	Kwethluk	2004	242	32	32	32
Kuskokwim	Kwethluk	2005	268	26	26	25
Kuskokwim	Kwethluk	2006	310	38	37	37
Other Interior AK	Lake Minchumina	2004	10	4	4	4
Other Interior AK	Lake Minchumina	2006	14	7	7	7
Kodiak-Villages	Larsen Bay	2006	38	37	37	36
BBNA Villages	Levelock	2004	46	9	9	9
BBNA Villages	Levelock	2005	32	5	5	5
Central Kuskokwim	Lime Village	2006	15	15	15	15
Kuskokwim	Lower Kalskag	2004	150	15	15	15
Kuskokwim	Lower Kalskag	2006	152	25	25	25
Other Interior AK	Manley Hot Springs	2004	76	11	11	11
Togiak NWR	Manokotak	2005	158	22	22	20
Yukon	Marshall	2004	170	20	20	0
Yukon	Marshall	2005	172	20	20	20
Y-K Mid-Coast	Mekoryuk	2005	88	16	14	13
Copper River Basin	Mentasta	2004	26	5	5	5
Other Interior AK	Minto	2006	124	30	30	30
Yukon	Mountain Village	2005	202	13	23	23
BBNA Villages	Naknek	2004	398	48	48	48
Kuskokwim	Napaskiak	2005	180	29	30	30
Kuskokwim	Napaskiak	2006	200	29	30	28
Other Interior AK	Nenana	2004	234	50	50	50
Other Interior AK	Nenana	2006	412	74	74	74
BBNA Villages	New Stuyahok	2005	190	26	26	26
BBNA Villages	Newhalen	2004	72	12	12	12
BBNA Villages	Newhalen	2005	78	8	8	8
Y-K Mid-Coast	Newtok	2005	52	21	21	22

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Table 23. Page 5 of 7.

Sub-region	Community	Year	Total households	Spring instruments	Summer instruments	Fall instruments
Y-K Mid-Coast	Newtok	2006	90	12	0	12
Y-K Mid-Coast	Nightmute	2004	64	6	6	6
Y-K Mid-Coast	Nightmute	2006	82	9	9	9
Innoko NWR	Nikolai	2004	62	25	25	25
Innoko NWR	Nikolai	2005	40	20	20	20
Nome	Nome	2004	2,250	119	119	119
Nome	Nome	2005	2,592	105	105	105
BBNA Villages	Nondalton	2004	68	11	11	11
BBNA Villages	Nondalton	2005	68	11	11	11
Tetlin NWR Villages	Northway	2004	150	20	20	20
Koyukuk-Nowitna NWR	Nulato	2004	166	18	18	18
Koyukuk-Nowitna NWR	Nulato	2005	152	13	15	16
Kuskokwim	Nunapitchuk	2004	146	31	14	5
Kuskokwim	Nunapitchuk	2005	100	40	40	40
Kuskokwim	Oscarville	2004	15	4	0	0
Kuskokwim	Oscarville	2006	26	10	10	10
Kodiak-Villages	Ouzinkie	2006	132	25	23	25
BBNA Villages	Pedro Bay	2005	28	5	5	5
Alaska Peninsula/Becharof NWR	Perryville	2004	68	27	27	27
Alaska Peninsula/Becharof NWR	Pilot Point	2005	58	9	9	9
Yukon	Pilot Station	2005	244	30	33	39
Yukon	Pilot Station	2006	230	16	16	14
Yukon	Pitka’s Point	2004	52	15	15	15
Yukon	Pitka’s Point	2006	60	17	17	17
Togiak NWR	Platinum	2005	28	13	13	11
Togiak NWR	Platinum	2006	14	5	4	2
North Slope - Villages	Point Hope	2005	300	121	121	0
North Slope - Villages	Point Lay	2005	110	46	55	0
Chugach	Port Graham	2004	128	14	14	14
Chugach	Port Graham	2006	120	9	9	7
Alaska Peninsula/Becharof NWR	Port Heiden	2004	22	10	10	10

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Table 23. Page 6 of 7.

Sub-region	Community	Year	Total households	Spring instruments	Summer instruments	Fall instruments
Alaska Peninsula/Becharof NWR	Port Heiden	2005	64	8	8	8
Togiak NWR	Quinhagak	2004	264	30	30	30
Togiak NWR	Quinhagak	2005	244	30	30	29
Togiak NWR	Quinhagak	2006	288	46	45	44
Koyukuk-Nowitna NWR	Ruby	2004	130	16	16	16
Koyukuk-Nowitna NWR	Ruby	2005	134	15	15	15
Yukon	Russian Mission	2005	120	17	20	20
Yukon	Russian Mission	2006	134	21	26	26
St. Lawrence-Diomede Islands	Savoonga	2004	260	40	40	40
St. Lawrence-Diomede Islands	Savoonga	2005	258	34	34	34
Y-K Mid-Coast	Scammon Bay	2005	40	31	32	32
Y-K Mid-Coast	Scammon Bay	2006	160	16	23	23
NW Arctic Villages	Selawik	2006	168	149	149	148
Innoko NWR	Shageluk	2005	46	23	23	23
Y-K North Coast	Nunam Iqua	2005	76	29	33	33
Y-K North Coast	Nunam Iqua	2006	76	30	30	29
BS Mainland Villages	Shishmaref	2004	247	21	21	21
BS Mainland Villages	Shishmaref	2005	248	22	22	22
NW Arctic Villages	Shungnak	2006	106	8	8	8
Central Kuskokwim	Sleetmute	2006	41	19	19	19
BBNA Villages	South Naknek	2005	70	9	9	9
Yukon	St. Mary’s	2005	200	27	20	26
Yukon	St. Mary’s	2006	37	31	30	28
BS Mainland Villages	St. Michael	2004	198	30	30	30
BS Mainland Villages	Stebbins	2005	262	30	30	30
Central Kuskokwim	Stony River	2004	36	6	6	6
Innoko NWR	Takotna	2005	40	20	20	20
Tetlin NWR Villages	Tanacross	2006	104	20	20	20
Chugach	Tatitlek	2004	50	9	9	9
BS Mainland Villages	Teller	2004	134	20	20	20
BS Mainland Villages	Teller	2005	122	17	17	17
Togiak NWR	Togiak	2004	348	47	47	46
Togiak NWR	Togiak	2006	366	58	58	52
Tetlin NWR Tok	Tok	2004	370	16	16	16
Tetlin NWR Tok	Tok	2006	182	60	60	60

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Table 23. Page 7 of 7.

Sub-region	Community	Year	Total households	Spring instruments	Summer instruments	Fall instruments
Y-K Mid-Coast	Toksook Bay	2004	202	29	25	24
Y-K Mid-Coast	Toksook Bay	2005	206	25	25	25
Kuskokwim	Tuluksak	2005	114	17	17	17
Kuskokwim	Tuluksak	2006	120	15	15	15
Y-K South Coast	Tuntutuliak	2004	108	26	26	27
Y-K South Coast	Tuntutuliak	2006	154	20	20	20
Y-K Mid-Coast	Tununak	2004	68	24	15	10
Y-K Mid-Coast	Tununak	2005	124	13	19	21
Togiak NWR	Twin Hills	2004	46	9	9	9
Togiak NWR	Twin Hills	2005	40	10	11	9
Cook Inlet	Tyonek	2004	103	13	13	13
Cook Inlet	Tyonek	2005	98	12	12	12
BS Mainland Villages	Unalakleet	2004	404	50	50	50
Unalaska	Unalaska	2005	1,890	33	33	33
Kuskokwim	Upper Kalskag	2005	104	0	14	14
Kuskokwim	Upper Kalskag	2006	104	11	18	0
Yukon Flats NWR	Venetie	2006	36	35	26	26
North Slope - Villages	Wainwright	2005	272	122	122	0
BS Mainland Villages	Wales	2004	88	17	17	17
BS Mainland Villages	Wales	2005	80	17	17	17
BS Mainland Villages	White Mountain	2004	122	15	15	15
Kanuti NWR	Allakaket	2004	88	14	14	14
Kanuti NWR	Allakaket	2006	78	39	37	37

Appendix 11.Table 24.-Distribution of households between harvest level strata, 2004-2006.

Year	Community	Total HH in community	Percentage of HH in "none" stratum (%)	Percentage of HH in "low" stratum (%)	Percentage of HH in "high" stratum (%)
2005	Adak Station	31	74	13	13
2006	Akiachak	140	30	27	43
2005	Akiak*	57	21	28	51
2006	Akiak*	66	20	35	45
2005	Akutan	28	54	21	25
2004	Alakanuk	133	21	38	41
2004	Alatna	13	31	31	38
2006	Alatna	7	100	0	0
2004	Aleknagik	56	11	32	57
2005	Anaktuvak Pass	88	69	20	10
2004	Aniak	103	82	17	2
2005	Aniak	163	34	36	30
2004	Anvik	35	26	63	11
2005	Anvik	33	79	12	9
2005	Atka	24	71	13	17
2005	Atkasuk (Atqasuk)	57	26	21	53
2004	Atmautluak	53	9	53	38
2005	Barrow	1,400	65	14	21
2004	Bethel	782	70	12	18
2006	Bettles/Evansville	29	100	0	0
2004	Brevig Mission	71	65	30	6
2006	Buckland	85	18	46	36
2004	Chefornak	66	18	61	21
2006	Chefornak	62	35	35	29
2006	Chenega Bay	18	33	39	28
2004	Chevak	138	7	61	33
2004	Chignik Bay	26	65	12	23
2004	Chignik Lagoon	22	45	32	23
2004	Chignik Lake	28	54	14	32
2004	Chistochina	13	23	46	31
2004	Chitina	6	67	17	17
2004	Chuathbaluk	34	88	6	6
2004	Clark's Point*	24	0	29	71
2005	Clark's Point*	20	10	35	55
2005	Cold Bay	24	21	58	21
2004	Copper Center	12	67	33	0
2004	Crooked Creek	40	88	13	0
2005	Dillingham	846	40	26	34

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Table 24. Page 2 of 6.

Year	Community	Total HH in community	Percentage of HH in "none" stratum (%)	Percentage of HH in "low" stratum (%)	Percentage of HH in "high" stratum (%)
2005	Diomede	37	32	5	62
2004	Dot Lake	23	0	26	74
2004	Eagle	12	33	42	25
2004	Eek*	75	19	32	49
2005	Eek*	72	28	28	44
2005	Egegik	24	46	29	25
2004	Ekwok	33	12	55	33
2004	Elim*	71	31	49	20
2005	Elim*	64	31	44	25
2005	Emmonak*	161	32	29	39
2006	Emmonak*	161	26	24	50
2004	Nanwalek	47	62	19	19
2004	Fort Yukon	263	48	22	29
2004	Gakona	8	88	0	13
2004	Galena	185	58	22	21
2004	Gambell	121	37	31	31
2005	Gambell	118	29	19	53
2005	Golovin	41	2	44	54
2006	Goodnews Bay	65	34	22	45
2005	Grayling	32	59	28	13
2004	Gulkana	13	85	15	0
2004	Holy Cross*	66	77	20	3
2005	Holy Cross*	53	87	6	8
2004	Hooper Bay*	223	46	31	23
2005	Hooper Bay*	220	30	36	33
2004	Hughes	14	0	50	50
2004	Huslia	78	35	51	14
2005	Huslia	15	60	7	33
2005	Iliamna	22	68	27	5
2005	Ivanof Bay	21	62	29	10
2005	Kaktovik	65	12	32	55
2004	Kaltag	58	47	22	31
2006	Karluk	15	67	13	20
2004	Kasigluk*	98	24	66	9
2006	Kasigluk*	75	12	76	12
2004	King Cove	53	0	58	42
2005	King Cove	167	65	18	17
2004	King Salmon	40	38	38	25

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Table 24. Page 3 of 6.

Year	Community	Total HH in community	Percentage of HH in "none" stratum (%)	Percentage of HH in "low" stratum (%)	Percentage of HH in "high" stratum (%)
2005	King Salmon	196	26	36	38
2004	Kipnuk*	40	40	48	13
2005	Kipnuk*	141	46	38	16
2006	Kipnuk*	152	19	23	58
2006	Kobuk	27	41	11	48
2004	Kokhanok*	33	58	27	15
2005	Kokhanok*	31	55	23	23
2005	Koliganek	42	40	33	26
2005	Kongiganak	82	71	26	4
2006	Kongiganak	82	18	7	74
2004	Kotlik	61	0	57	43
2005	Kotlik	81	28	31	41
2005	Koyuk	61	5	30	66
2004	Koyukuk	34	53	38	9
2005	Koyukuk	33	76	12	12
2004	Kwethluk*	121	30	34	36
2005	Kwethluk*	134	36	43	21
2006	Kwethluk*	155	21	39	41
2004	Lake Minchumina*	5	40	40	20
2006	Lake Minchumina*	7	43	57	0
2004	Levelock	23	0	17	83
2005	Levelock	16	56	44	0
2004	Lower Kalskag*	75	44	36	20
2006	Lower Kalskag*	76	51	32	17
2004	Manley Hot Springs	38	26	21	53
2005	Manokotak	79	49	6	44
2004	Marshall	85	36	40	24
2005	Marshall	86	27	28	45
2005	Mekoryuk	44	11	27	61
2004	Mentasta	13	38	31	31
2006	Minto	62	35	47	18
2005	Mountain Village	101	30	44	27
2004	Naknek	199	26	36	38
2005	Napaskiak	90	12	23	64
2006	Napaskiak	100	31	51	18
2004	Nenana*	117	44	26	30
2006	Nenana*	206	43	23	34
2005	New Stuyahok	95	51	18	32

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Table 24. Page 4 of 6.

Year	Community	Total HH in community	Percentage of HH in "none" stratum (%)	Percentage of HH in "low" stratum (%)	Percentage of HH in "high" stratum (%)
2004	Newhalen*	36	11	39	50
2005	Newhalen*	33	36	42	21
2005	Newtok	26	46	27	27
2006	Newtok	45	11	33	56
2004	Nightmute	32	38	44	19
2006	Nightmute	41	2	46	51
2004	Nikolai*	27	0	70	30
2005	Nikolai*	20	15	55	30
2004	Nome*	1,125	80	12	9
2005	Nome*	1,296	83	9	8
2004	Nondalton*	34	0	44	56
2005	Nondalton*	34	24	24	53
2004	Northway	75	51	25	24
2004	Nulato*	83	45	35	20
2005	Nulato*	76	54	38	8
2004	Nunapitchuk	73	10	82	8
2005	Nunapitchuk	50	16	46	38
2006	Oscarville	13	31	46	23
2006	Ouzinkie	66	23	47	30
2005	Pedro Bay	14	14	50	36
2004	Perryville	34	24	32	44
2005	Pilot Point	29	34	10	55
2005	Pilot Station	122	27	25	48
2006	Pilot Station	115	29	62	10
2004	Pitka's Point*	26	50	23	27
2006	Pitka's Point*	30	50	27	23
2005	Platinum	14	29	36	36
2005	Point Hope	150	47	31	22
2005	Point Lay	55	29	45	25
2004	Port Graham*	64	72	17	11
2006	Port Graham*	60	85	5	10
2005	Port Heiden	32	53	16	31
2004	Quinhagak*	132	31	27	42
2005	Quinhagak*	122	25	38	37
2006	Quinhagak*	144	13	30	57
2004	Ruby*	65	91	9	0
2005	Ruby*	67	91	9	0
2005	Russian Mission*	60	25	13	62

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Table 24. Page 5 of 6.

Year	Community	Total HH in community	Percentage of HH in "none" stratum (%)	Percentage of HH in "low" stratum (%)	Percentage of HH in "high" stratum (%)
2006	Russian Mission*	67	21	15	64
2004	Savoonga*	130	18	35	48
2005	Savoonga*	129	14	37	49
2006	Scammon Bay	80	15	38	48
2005	Shageluk	23	74	26	0
2005	Nunam Iqua	38	11	13	76
2006	Nunam Iqua	38	13	37	50
2004	Shishmaref*	124	42	24	34
2005	Shishmaref*	124	41	24	35
2006	Shungnak	53	51	21	28
2005	South Naknek	35	83	14	3
2005	St. Mary's	100	10	40	50
2004	St. Michael	99	28	23	48
2005	Stebbins	131	21	47	32
2004	Stony River	18	67	11	22
2005	Takotna	20	100	0	0
2006	Tanacross	52	52	15	33
2004	Tatitlek	25	80	0	20
2004	Teller	67	37	39	24
2005	Teller	61	16	48	36
2004	Togiak	174	28	13	59
2006	Togiak	183	48	5	47
2004	Tok	16	6	13	81
2004	Toksook Bay*	101	27	23	50
2005	Toksook Bay*	103	33	33	34
2005	Tuluksak	57	7	70	23
2006	Tuluksak	60	13	78	8
2004	Tuntutuliak	30	33	17	50
2006	Tuntutuliak	77	18	52	30
2005	Tununak	62	13	29	58
2004	Twin Hills	23	70	0	30
2005	Twin Hills	20	30	40	30
2004	Tyonek*	52	35	48	17
2005	Tyonek*	49	35	49	16
2004	Unalakleet	202	43	46	11
2005	Unalaska	945	89	6	5
2005	Upper Kalskag	52	56	25	19
2006	Upper Kalskag	52	25	31	44

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Table 24. Page 6 of 6.

Year	Community	Total HH in community	Percentage of HH in "none" stratum (%)	Percentage of HH in "low" stratum (%)	Percentage of HH in "high" stratum (%)
2005	Wainwright	136	52	16	32
2004	Wales*	44	11	20	68
2005	Wales*	40	10	30	60
2004	White Mountain	61	74	5	21
2004	Allakaket	44	39	32	30

HH = households.

* Communities for which distribution of households between harvest level strata is consistent between years

Appendix 12.Table 25.-Fit of harvest level stratification based on previous household harvest level, to the yearly household harvest for survey years 2004, 2005, and 2005.

		None		Low		High	
Year	Community	HH surveyed	HH fitting assigned harvest level (%)	HH surveyed	HH fitting assigned harvest level (%)	HH surveyed	HH fitting assigned harvest level (%)
2005	Adak Station	1	100	0	-	1	100
2005	Akiachak	34	47	0	-	0	-
2006	Akiachak	4	50	6	33	25	32
2005	Akiak	4	0	11	45	22	82
2006	Akiak	3	33	14	0	23	74
2005	Akutan	2	100	4	0	5	100
2004	Alakanuk	5	0	13	46	26	42
2004	Alatna	1	100	1	100	2	100
2006	Alatna	7	100	0	-	0	-
2004	Aleknagik	1	0	4	75	13	46
2005	Anaktuvak Pass	8	100	5	40	5	80
2004	Aniak	4	100	5	40	2	50
2005	Aniak	6	83	7	43	14	0
2004	Anvik	0	-	21	5	4	50
2005	Anvik	26	100	4	25	3	100
2005	Atka	14	100	3	100	4	75
2005	Atkasuk (Atqasuk)	1	100	4	75	12	42
2004	Atmautluak	0	-	6	17	14	100
2005	Barrow	89	99	40	35	82	96
2004	Bethel	18	94	12	83	15	80
2005	Bethel	59	90	66	14	100	38
2006	Bettles/Evansville	29	100	0	-	0	-
2004	Brevig Mission	5	60	11	45	4	50
2006	Buckland	4	100	5	40	13	54
2004	Chefornak	1	100	9	0	10	100
2006	Chefornak	2	100	6	0	10	100
2006	Chenega Bay	4	100	5	0	3	67
2004	Chevak	5	20	12	17	18	94
2004	Chignik Bay	12	83	1	0	6	17
2004	Chignik Lagoon	7	100	6	0	5	40
2004	Chignik Lake	0	-	1	0	4	25
2004	Chistochina	3	100	6	50	4	100
2004	Chitina	4	100	1	0	1	100
2004	Chuathbaluk	0	-	2	100	2	100

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Table 25. Page 2 of 6.

Year	Community	None		Low		High	
		HH surveyed	HH fitting assigned harvest level (%)	HH surveyed	HH fitting assigned harvest level (%)	HH surveyed	HH fitting assigned harvest level (%)
2004	Clark's Point	0	-	2	0	8	25
2005	Clark's Point	1	100	7	0	11	73
2005	Cold Bay	6	33	0	-	0	-
2004	Copper Center	8	100	4	50	0	-
2004	Crooked Creek	18	100	5	100	0	-
2005	Dillingham	19	74	23	9	66	41
2005	Diomede	2	50	0	-	16	63
2004	Dot Lake	0	-	1	0	8	63
2004	Eagle	3	100	3	67	3	100
2004	Eek	1	0	2	0	17	100
2005	Eek	0	-	5	40	20	100
2005	Egegik	2	50	2	0	3	67
2004	Ekwok	1	100	3	0	5	20
2004	Elim	3	33	9	56	8	75
2005	Elim	2	50	7	71	8	63
2005	Emmonak	4	100	10	0	20	70
2006	Emmonak	3	33	3	33	19	21
2004	Nanwalek	3	100	6	33	9	89
2004	Fort Yukon	30	87	9	0	62	100
2004	Gakona	7	86	0	-	1	100
2004	Galena	15	73	6	67	16	19
2004	Gambell	5	0	17	0	18	100
2005	Gambell	3	100	3	0	25	100
2005	Golovin	1	0	5	60	11	55
2004	Goodnews Bay	3	67	3	67	5	100
2006	Goodnews Bay	1	0	2	0	13	77
2005	Grayling	0	-	9	22	4	100
2004	Gulkana	9	78	2	50	0	-
2004	Holy Cross	7	86	11	55	2	100
2005	Holy Cross	46	100	3	67	4	100
2004	Hooper Bay	13	69	12	50	19	79
2005	Hooper Bay	10	60	13	8	28	36
2004	Hughes	0	-	7	14	7	57
2004	Huslia	5	100	6	33	5	60
2004	Igiugig	0	-	2	50	3	100
2005	Iliamna	3	67	2	0	1	100
2005	Ivanof Bay	13	100	6	67	2	50

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Table 25. Page 3 of 6.

Year	Community	None		Low		High	
		HH surveyed	HH fitting assigned harvest level (%)	HH surveyed	HH fitting assigned harvest level (%)	HH surveyed	HH fitting assigned harvest level (%)
2005	Kaktovik	1	100	3	33	15	40
2004	Kaltag	5	60	5	0	10	10
2004	Kasigluk	1	0	26	0	3	100
2006	Kasigluk	1	100	19	5	4	50
2004	King Cove	0	-	3	0	4	100
2005	King Cove	0	-	5	0	15	100
2004	King Salmon	2	100	2	0	4	100
2005	King Salmon	4	75	6	17	14	100
2004	Kipnuk	16	0	19	11	5	100
2005	Kipnuk	16	38	19	5	15	93
2006	Kipnuk	7	86	2	100	21	100
2004	Kokhanok	2	100	2	0	4	50
2005	Kokhanok	4	100	2	50	6	17
2005	Koliganek	2	100	4	25	3	67
2005	Kongiganak	29	14	20	35	0	-
2006	Kongiganak	3	33	4	50	13	92
2004	Kotlik	0	-	20	15	10	90
2005	Kotlik	1	0	8	13	30	80
2005	Koyuk	1	0	3	67	24	50
2004	Koyukuk	22	86	7	100	5	100
2004	Kwethluk	7	57	10	20	15	87
2005	Kwethluk	8	100	11	0	9	56
2006	Kwethluk	4	50	10	10	24	67
2004	Lake Minchumina	1	100	2	100	1	100
2004	Levelock	0	-	1	0	8	38
2005	Levelock	1	0	4	25	0	-
2004	Lower Kalskag	5	40	5	0	5	0
2006	Lower Kalskag	6	100	9	11	10	60
2004	Manley Hot Springs	1	100	1	0	9	100
2005	Manokotak	2	50	1	0	19	100
2004	Marshall	5	60	6	0	9	22
2005	Marshall	5	60	4	25	11	64
2005	Mekoryuk	2	100	6	33	9	67
2004	Mentasta	1	100	3	0	1	100
2006	Minto	8	50	11	18	11	64
2005	Mountain Village	7	43	9	44	7	57
2004	Naknek	6	100	11	18	31	65

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Table 25. Page 4 of 6.

Year	Community	None		Low		High	
		HH surveyed	HH fitting assigned harvest level (%)	HH surveyed	HH fitting assigned harvest level (%)	HH surveyed	HH fitting assigned harvest level (%)
2005	Napaskiak	4	100	4	0	22	77
2006	Napaskiak	3	33	20	0	7	86
2004	Nenana	17	82	15	7	18	50
2006	Nenana	33	88	16	6	25	72
2005	New Stuyahok	5	0	6	0	15	93
2004	Newhalen	1	0	3	0	8	100
2005	Newhalen	2	100	3	67	3	0
2005	Newtok	12	8	4	25	6	67
2006	Newtok	0	-	4	25	8	75
2004	Nightmute	3	0	2	50	1	100
2006	Nightmute	0	-	1	0	8	88
2004	Nikolai	0	-	18	22	7	57
2005	Nikolai	3	100	11	18	6	100
2004	Nome	67	93	22	32	30	33
2005	Nome	63	89	12	17	30	40
2004	Nondalton	0	-	2	0	9	44
2005	Nondalton	4	0	2	0	5	100
2004	Northway	6	17	6	33	8	50
2004	Nulato	4	100	5	40	9	22
2005	Nulato	5	100	6	17	5	60
2004	Nunapitchuk	4	25	23	4	4	50
2005	Nunapitchuk	7	71	18	11	15	60
2004	Oscarville	3	100	0	-	1	100
2006	Oscarville	1	0	6	0	3	100
2006	Ouzinkie	4	100	11	18	10	50
2005	Pedro Bay	1	100	2	0	2	0
2004	Perryville	8	100	9	0	10	40
2005	Pilot Point	9	44	0	-	0	-
2005	Pilot Station	4	25	9	44	27	48
2006	Pilot Station	4	25	10	30	5	40
2004	Pitka’s Point	4	50	5	40	6	33
2006	Pitka’s Point	5	100	5	60	7	57
2005	Platinum	4	50	5	0	5	60
2005	Point Hope	60	97	37	27	25	64
2005	Point Lay	16	94	25	12	14	64
2004	Port Graham	7	100	3	0	4	75
2006	Port Graham	6	100	1	0	3	67

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Table 25. Page 5 of 6.

Year	Community	None		Low		High	
		HH surveyed	HH fitting assigned harvest level (%)	HH surveyed	HH fitting assigned harvest level (%)	HH surveyed	HH fitting assigned harvest level (%)
2004	Port Heiden	2	100	4	75	4	100
2005	Port Heiden	2	100	2	0	4	25
2004	Quinhagak	4	75	5	0	21	95
2005	Quinhagak	4	50	7	43	19	95
2006	Quinhagak	3	33	4	0	39	87
2004	Ruby	10	100	6	50	0	-
2005	Ruby	9	89	6	33	0	-
2005	Russian Mission	2	50	1	100	18	33
2006	Russian Mission	6	50	4	75	17	82
2004	Savoonga	3	0	13	15	24	100
2005	Savoonga	3	0	7	14	24	96
2006	Scammon Bay	0	-	4	0	19	79
2005	Shageluk	17	100	6	33	0	-
2005	Nunam Iqua	2	0	6	33	27	89
2006	Nunam Iqua	2	100	13	23	16	75
2004	Shishmaref	5	60	8	25	8	100
2005	Shishmaref	1	100	4	0	17	71
2006	Shungnak	1	100	2	100	5	100
2005	South Naknek	3	33	5	0	1	100
2005	St. Mary’s	11	55	3	0	19	47
2004	St. Michael	3	67	8	13	19	100
2005	Stebbins	2	0	12	8	16	81
2004	Stony River	0	-	2	100	4	75
2005	Takotna	20	100	0	-	0	-
2006	Tanacross	9	89	2	0	9	56
2004	Tatitlek	5	0	0	-	4	75
2004	Teller	4	100	8	0	8	38
2005	Teller	2	100	4	25	11	55
2004	Togiak	5	100	2	0	40	38
2006	Togiak	9	67	3	0	46	65
2004	Tok	3	33	0	-	13	92
2004	Toksook Bay	3	0	10	20	16	88
2005	Toksook Bay	2	50	6	17	17	100
2005	Tuluksak	4	25	7	71	6	50
2006	Tuluksak	3	33	10	0	2	50
2004	Tuntutuliak	13	62	4	0	16	94
2006	Tuntutuliak	0	-	10	10	10	70

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Table 25. Page 6 of 6.

Year	Community	None		Low		High	
		HH surveyed	HH fitting assigned harvest level (%)	HH surveyed	HH fitting assigned harvest level (%)	HH surveyed	HH fitting assigned harvest level (%)
2004	Tununak	22	45	2	0	0	-
2005	Tununak	1	100	2	0	18	39
2004	Twin Hills	3	33	0	-	6	50
2005	Twin Hills	2	100	5	60	4	0
2004	Tyonek	3	100	5	40	5	60
2005	Tyonek	2	100	5	20	5	0
2004	Unalakleet	9	89	23	26	18	28
2005	Unalaska	15	100	9	33	9	22
2005	Upper Kalskag	3	100	6	50	5	60
2006	Upper Kalskag	1	0	4	0	17	29
2005	Wainwright	65	97	22	0	35	43
2004	Wales	2	100	2	0	13	62
2005	Wales	1	100	4	0	12	25
2004	White Mountain	5	80	2	50	8	75
2004	Allakaket	3	0	4	50	7	71
2006	Allakaket	20	95	13	62	6	50

HH = Household.

Appendix 13. Table 26.-Proportion of households harvesting migratory birds in studies developed by ADF&G between 1980 and 2003.

Year	Community	Proportion of "harvester" households (%)
1982	Akhiok	95.2
1986	Akhiok	16.7
1989	Akhiok	70.0
1992	Akhiok	37.5
2003	Akhiok	36.4
1990	Akutan	52.0
1996	Akutan	32.1
1984	Angoon	10.5
1987	Angoon	7.7
1996	Angoon	4.1
1988	Barrow	34.0
1989	Barrow	37.0
1985	Beaver	83.9
2000	Beaver	55.6
1984	Brevig Mission	75.0
1989	Brevig Mission	80.0
1995	Brevig Mission	44.6
1982	Cantwell	4.7
1999	Cantwell	3.9
1982	Cheesh'na (Chistochina)	22.7
1987	Cheesh'na (Chistochina)	7.1
2000	Cheesh'na (Chistochina)	60.9
1984	Chenega Bay	50.0
1985	Chenega Bay	62.5
1989	Chenega Bay	5.6
1990	Chenega Bay	16.7
1991	Chenega Bay	22.2
1992	Chenega Bay	34.8
1993	Chenega Bay	26.1
1997	Chenega Bay	26.7
2000	Chenega Bay	33.3
2003	Chenega Bay	18.8
1984	Chignik Bay	47.4
1989	Chignik Bay	37.1
1991	Chignik Bay	26.7

-continued-

Table 26. Page 2 of 9.

Year	Community	Proportion of "harvester" households (%)
2003	Chignik Bay	22.7
1984	Chignik Lagoon	52.9
1989	Chignik Lagoon	33.3
2003	Chignik Lagoon	31.3
1984	Chignik Lake	60.9
1989	Chignik Lake	52.4
1991	Chignik Lake	50.0
2003	Chignik Lake	33.3
1982	Chiniak	17.6
1987	Chisana	16.7
1982	Chitina	8.7
1987	Chitina	5.6
2000	Chitina	10.0
2000	Circle	42.3
1989	Clark's Point	58.8
1987	Coffman Cove	10.5
1998	Coffman Cove	22.0
1990	Cooper Landing	4.9
1982	Copper Center	3.7
1987	Copper Center	6.3
2000	Copper Center	2.1
1985	Cordova	24.3
1988	Cordova	28.5
1991	Cordova	24.8
1992	Cordova	29.3
1993	Cordova	20.2
1997	Cordova	24.1
2003	Cordova	23.6
1987	Craig	6.2
1997	Craig	10.4
1994	Deering	62.2
1997	Deering	52.6
1984	Dillingham	22.9
1995	Diomede	46.2
1987	Dot Lake	26.7
2000	Dot Lake	13.3
2000	Eagle Village	50.0
1982	East Glenn Highway	6.7
1987	East Glenn Highway	16.7

-continued-

Table 26. Page 3 of 9.

Year	Community	Proportion of "harvester" households (%)
1987	Edna Bay	50.0
1998	Edna Bay	16.7
1984	Egegik	52.0
1987	Ekwok	41.4
1993	Elim	61.1
1980	Emmonak	88.9
1988	False Pass	50.0
1996	False Pass	26.7
1987	Fort Yukon	66.6
2000	Fort Yukon	51.0
1998	Fritz Creek	7.7
1982	Gakona	21.7
1987	Gakona	8.7
1985	Galena	47.3
1995	Gambell	85.5
1996	Game Creek	50.0
1982	Glennallen	3.9
1987	Glennallen	3.1
1986	Gold Creek	20.0
1982	Golovin	75.0
1989	Golovin	78.8
1990	Grayling	70.7
1982	Gulkana	8.3
1987	Gulkana	15.0
1987	Gustavus	22.8
1987	Haines	13.9
1996	Haines	10.8
1987	Healy	8.6
2000	Healy Lake	28.6
1987	Hollis	20.2
1998	Hollis	8.7
1990	Holy Cross	61.5
1982	Homer	9.8
1985	Hoonah	12.7
1987	Hoonah	17.7
1996	Hoonah	7.8
1990	Hope	5.4
1986	Hurricane-Broad Pass	12.5
1983	Huslia	69.6

-continued-

Table 26. Page 4 of 9.

Year	Community	Proportion of "harvester" households (%)
1987	Hydaburg	7.5
1997	Hydaburg	7.8
1987	Hyder	30.3
1983	Igiugig	66.7
1992	Igiugig	90.0
1983	Iliamna	10.0
1991	Iliamna	30.4
1984	Ivanof Bay	83.3
1989	Ivanof Bay	100.0
1985	Kake	5.7
1987	Kake	10.8
1996	Kake	2.7
1985	Kaktovik	71.4
1992	Kaktovik	51.1
1982	Karluk	75.0
1986	Karluk	26.3
1989	Karluk	57.1
1990	Karluk	41.2
1991	Karluk	30.8
1987	Kasaan	14.3
1982	Kenai	4.1
1991	Kenai	7.0
1992	Kenai	8.1
1993	Kenai	7.9
1982	Kenny Lake	8.3
1987	Kenny Lake	4.9
1993	Kiana	42.9
1996	Kiana	32.1
1992	King Cove	41.3
1992	Kivalina	71.0
1996	Kivalina	54.5
1984	Klawock	16.7
1987	Klawock	11.2
1997	Klawock	8.5
1987	Klukwan	7.1
1996	Klukwan	9.7
1996	Kobuk	56.0
1982	Kodiak City	10.3
1991	Kodiak City	10.0

-continued-

Table 26. Page 5 of 9.

Year	Community	Proportion of "harvester" households (%)
1992	Kodiak City	9.0
1993	Kodiak City	14.3
1991	Kodiak Road	7.9
1983	Kokhanok	47.4
1992	Kokhanok	44.4
1987	Koliganek	66.7
1980	Kotlik	100.0
1986	Kotzebue	38.6
1991	Kotzebue	35.0
1997	Kotzebue	57.8
1995	Koyuk	86.5
1986	Kwethluk	68.5
1982	Lake Louise	46.2
1987	Lake Louise	5.9
1982	Larsen Bay	50.0
1986	Larsen Bay	18.9
1989	Larsen Bay	32.4
1990	Larsen Bay	34.3
1991	Larsen Bay	36.8
1992	Larsen Bay	24.3
1993	Larsen Bay	25.0
1997	Larsen Bay	23.1
2003	Larsen Bay	4.0
1988	Levelock	51.9
1992	Levelock	46.7
1985	Manokotak	88.9
1999	Manokotak	51.9
1982	Matanuska Glacier	6.7
1982	McCarthy Road	23.1
1987	McCarthy Road	11.8
1987	McKinley Park Village	3.1
1982	Mentasta Lake	36.8
1987	Mentasta Lake	12.5
1987	Mentasta Pass	20.0
1987	Metlakatla	15.9
1987	Meyers Chuck	20.0
1984	Minto	82.2
1980	Mountain Village	81.3
1987	Nanwalek	39.4

-continued-

Table 26. Page 6 of 9.

Year	Community	Proportion of "harvester" households (%)
1989	Nanwalek	27.3
1990	Nanwalek	28.6
1991	Nanwalek	27.6
1992	Nanwalek	34.4
1993	Nanwalek	30.3
1997	Nanwalek	34.5
2000	Nanwalek	31.3
2003	Nanwalek	22.7
1998	Naukati Bay	22.0
1987	Nelson Lagoon	69.2
1996	Nelson Lagoon	50.0
1987	New Stuyahok	67.5
1983	Newhalen	18.2
1991	Newhalen	53.8
1990	Nikolski	71.4
1996	Nikolski	44.4
1998	Ninilchik	3.0
1994	Noatak	39.7
1997	Noatak	55.3
1995	Nome	30.8
1983	Nondalton	57.1
1996	Noorvik	78.0
1998	North Fork Road	1.7
1982	North Wrangell Mountains	20.0
1987	Northway	62.2
2000	Northway Village	4.8
1985	Nuiqsut	85.0
1993	Nuiqsut	72.6
1980	Nunam Iqua (Sheldon Point)	100.0
1982	Old Harbor	80.5
1986	Old Harbor	52.3
1989	Old Harbor	39.6
1991	Old Harbor	35.7
1997	Old Harbor	55.8
2003	Old Harbor	34.6
1982	Ouzinkie	68.8
1986	Ouzinkie	55.9
1989	Ouzinkie	48.6
1990	Ouzinkie	47.2

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Table 26. Page 7 of 9.

Year	Community	Proportion of "harvester" households (%)
1991	Ouzinkie	53.1
1992	Ouzinkie	51.9
1993	Ouzinkie	44.3
1997	Ouzinkie	55.3
2003	Ouzinkie	49.0
1982	Paxson-Sourdough	30.0
1987	Paxson	42.9
1982	Pedro Bay	35.3
1996	Pedro Bay	15.4
1987	Pelican	20.3
1984	Perryville	55.0
1989	Perryville	29.6
2003	Perryville	40.7
1987	Petersburg	30.7
1985	Petersville	17.6
1987	Pilot Point	76.5
1987	Point Baker	31.6
1987	Point Lay	77.4
1987	Port Alexander	14.8
1983	Port Alsworth	23.1
1987	Port Graham	35.2
1989	Port Graham	31.3
1990	Port Graham	23.9
1991	Port Graham	20.4
1992	Port Graham	31.3
1993	Port Graham	19.6
1997	Port Graham	20.5
2000	Port Graham	19.6
2003	Port Graham	12.8
1987	Port Heiden	45.9
1982	Port Lions	60.0
1986	Port Lions	35.4
1989	Port Lions	44.4
1993	Port Lions	42.2
2003	Port Lions	29.6
1987	Port Protection	16.0
1996	Port Protection	16.0
1982	Quinhagak	83.3
2000	Rampart	42.1

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Table 26. Page 8 of 9.

Year	Community	Proportion of "harvester" households (%)
1994	Saint George	25.0
1994	Saint Paul	31.0
1984	San Juan Bay	50.0
1992	Sand Point	23.1
1995	Savoonga	98.4
1987	Saxman	3.3
1993	Selawik	43.1
1997	Selawik	71.7
1982	Seldovia	8.6
1991	Seldovia	13.6
1992	Seldovia	15.4
1993	Seldovia	18.5
1990	Shageluk	40.6
1993	Shaktoolik	76.1
1982	Shishmaref	81.4
1989	Shishmaref	47.6
1995	Shishmaref	64.4
1993	Shungnak	50.0
1987	Sitka	6.1
1996	Sitka	5.8
1987	Skagway	6.2
1982	Slana	6.3
1987	Slana Homestead North	12.5
1987	Sourdough	11.1
1992	South Naknek	17.1
1982	South Wrangell Mountains	20.0
1987	South Wrangell Mountains	7.1
1980	Stebbins	91.7
1993	Stebbins	90.0
1984	Stevens Village	76.7
2000	Stevens Village	54.2
1985	Talkeetna	4.4
1987	Tanacross	44.4
1987	Tanana	45.4
1987	Tatitlek	47.4
1988	Tatitlek	61.9
1989	Tatitlek	27.3
1990	Tatitlek	29.4
1991	Tatitlek	47.4

-continued-

Table 26. Page 9 of 9.

Year	Community	Proportion of "harvester" households (%)
1993	Tatitlek	50.0
1997	Tatitlek	50.0
2000	Tatitlek	5.6
2003	Tatitlek	28.0
1987	Tazlina	6.7
1995	Teller	40.0
1984	Tenakee Springs	4.2
1987	Tenakee Springs	25.8
1987	Tetlin	49.7
2000	Tetlin	6.7
1987	Thorne Bay	21.0
1998	Thorne Bay	10.1
1999	Togiak	45.9
1987	Tok	22.0
1982	Tonsina	13.3
1987	Tonsina	9.6
1985	Trapper Creek	5.3
1986	Tununak	87.9
1999	Twin Hills	83.3
1983	Tyonek	37.5
2000	Tyonek	36.6
1987	Ugashik	80.0
1995	Unalakleet	51.7
1994	Unalaska	9.7
1991	Valdez	6.0
1992	Valdez	10.0
1993	Valdez	2.9
2000	Venetie	67.6
1998	Voznesenka	11.1
1993	Wales	35.7
1987	Whale Pass	22.2
1995	White Mountain	86.2
1996	Whitestone Logging Camp	20.8
1990	Whittier	5.7
1987	Wrangell	17.0
1984	Yakutat	40.0
1987	Yakutat	29.5
2000	Yakutat	20.9

Source: ADF&G Community Subsistence Information System 2008.

Appendix 14. Table 27.-Inferred sampling method employed in each community-year.

Year	Community	Total comm HH	Sampling method	Non-stratified		Stratified					
						"None"		"Low"		"High"	
				Total HH	Samp HH	Total HH	Samp HH	Total HH	Samp HH	Total HH	Samp HH
2004	Alakanuk	133	3			28	4	51	12	54	25
2004	Alatna	13	3			4	1	4	1	5	2
2004	Aleknagik	56	3			6	1	18	4	32	10
2004	Aniak	103	3			84	4	17	5	2	2
2004	Anvik	35	1	35		9	0	22	21	4	4
2004	Atmautluak	53	3			5	0	28	4	20	14
2004	Bethel	782	9			544	18	97	12	141	15
2004	Brevig Mission	71	3			46	5	21	11	4	4
2004	Chefornak	66	3			12	1	40	9	14	10
2004	Chevak	138	3			9	3	84	11	45	15
2004	Chignik Bay	26	1	27		17	12	3	1	6	6
2004	Chignik Lagoon	22	1	22		10	7	7	6	5	5
2004	Chignik Lake	28	3			15	0	4	1	9	4
2004	Chistochina	13	1	23		3	3	6	6	4	4
2004	Chitina	6	1	10		4	4	1	1	1	1
2004	Chuathbaluk	34	3			30	0	2	2	2	2
2004	Clark's Point	24	3			0	0	7	2	17	8
2004	Copper Center	12	3			8	8	4	4	0	0
2004	Crooked Creek	40	3			35	18	5	5	0	0
2004	Dot Lake	23	3			0	0	6	1	17	8
2004	Eagle	12	1	12		4	3	5	3	3	3
2004	Eek	75	3			14	1	24	1	37	15
2004	Ekwok	33	3			4	1	18	3	11	5
2004	Elim	71	3			22	3	35	9	14	8
2004	Nanwalek	47	3			29	3	9	6	9	8
2004	Fort Yukon	263	3			127	30	59	9	77	62
2004	Gakona	8	9			7	7	0	0	1	1
2004	Galena	185	3			107	15	40	6	38	16
2004	Gambell	121	3			45	5	38	17	38	18
2004	Goodnews Bay	-	3			-	3	-	3	-	5
2004	Gulkana	13	1	14		11	9	2	2	0	0
2004	Holy Cross	66	3			51	7	13	11	2	2
2004	Hooper Bay	223	3			102	13	69	12	52	19
2004	Hughes	14	1	22		0	0	7	7	7	7
2004	Huslia	78	3			27	5	40	6	11	5
2004	Igiugig	0	3			0	0	0	2	0	3
2004	Kaltag	58	3			27	5	13	5	18	10

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Table 27. Page 2 of 6.

Year	Community	Total comm HH	Sampling method	Non-stratified		Stratified					
						"None"		"Low"		"High"	
				Total HH	Samp HH	Total HH	Samp HH	Total HH	Samp HH	Total HH	Samp HH
2004	Kasigluk	98	3			24	1	65	26	9	3
2004	King Cove	53	3			0	0	31	3	22	4
2004	King Salmon	40	3			15	2	15	2	10	4
2004	Kipnuk	40	9			16	15	19	19	5	5
2004	Kokhanok	33	3			19	2	9	2	5	3
2004	Kotlik	61	3			0	0	35	20	26	10
2004	Koyukuk	34	3			18	22	13	7	3	5
2004	Kwethluk	121	3			36	7	41	10	44	15
2004	Lake Minchumina	5	1	5		2	1	2	2	1	1
2004	Levelock	23	3			0	0	4	1	19	8
2004	Lower Kalskag	75	3			33	5	27	5	15	5
2004	Manley Hot Springs	38	3			10	1	8	1	20	9
2004	Marshall	85	3			31	5	34	6	20	9
2004	Mentasta	13	3			5	1	4	3	4	1
2004	Naknek	199	3			52	6	71	11	76	31
2004	Nenana	117	3			51	17	31	15	35	18
2004	Newhalen	36	3			4	1	14	3	18	8
2004	Nightmute	32	3			12	3	14	2	6	1
2004	Nikolai	27	9			0	0	19	18	8	7
2004	Nome	1,125	3			895	67	132	22	98	30
2004	Nondalton	34	3			0	0	15	2	19	9
2004	Northway	75	3			38	6	19	6	18	8
2004	Nulato	83	3			37	4	29	5	17	9
2004	Nunapitchuk	73	3			7	3	60	12	6	2
2004	Oscarville	0	9			0	3	0	0	0	1
2004	Perryville	34	3			8	8	11	9	15	10
2004	Pitka's Point	26	3			13	4	6	5	7	6
2004	Port Graham	64	3			46	7	11	3	7	4
2004	Port Heiden	-	9			-	2	-	4	-	4
2004	Quinhagak	132	3			41	4	36	5	55	21
2004	Ruby	65	3			59	10	6	6	0	0
2004	Savoonga	130	3			23	3	45	13	62	24
2004	Shishmaref	124	3			52	5	30	8	42	8
2004	St. Michael	99	3			28	3	23	8	48	19
2004	Stony River	18	9			12	0	2	2	4	4
2004	Tatitlek	25	3			20	5	0	0	5	4

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Table 27. Page 3 of 6.

Year	Community	Total comm HH	Sampling method	Non-stratified		Stratified					
						"None"		"Low"		"High"	
				Total HH	Samp HH	Total HH	Samp HH	Total HH	Samp HH	Total HH	Samp HH
2004	Teller	67	3			25	4	26	8	16	8
2004	Togiak	174	3			49	5	22	2	103	40
2004	Tok	16	9			1	3	2	0	13	13
2004	Toksook Bay	101	3			27	3	23	9	51	14
2004	Tuntutuliak	30	9			10	10	5	3	15	14
2004	Tununak	0	9			0	14	0	2	0	0
2004	Twin Hills	23	3			16	3	0	0	7	6
2004	Tyonek	52	3			18	3	25	5	9	5
2004	Unalakleet	202	3			86	9	93	23	23	18
2004	Wales	44	3			5	2	9	2	30	13
2004	White Mountain	61	3			45	5	3	2	13	8
2004	Allakaket	44	3			17	3	14	4	13	7
2005	Adak Station	31	9			23	1	4	0	4	1
2005	Akiachak	-	9			-	34	-	0	-	0
2005	Akiak	57	3			12	3	16	7	29	16
2005	Akutan	28	3			15	2	6	4	7	5
2005	Anaktuvak Pass	88	3			61	12	18	8	9	8
2005	Aniak	163	3			55	6	59	7	49	14
2005	Anvik	33	1	33		26	26	4	4	3	3
2005	Atka	24	1	24		17	14	3	3	4	4
2005	Atkasuk (Atqasuk)	57	3			15	2	12	6	30	18
2005	Barrow	1,400	3			905	134	198	60	297	123
2005	Bethel	0	9			0	21	0	37	0	54
2005	Clark's Point	20	1	20		2	1	7	7	11	11
2005	Cold Bay	24	9			5	6	14	0	5	0
2005	Dillingham	846	3			339	19	217	23	290	66
2005	Diomede	37	9			12	2	2	0	23	16
2005	Eek	72	3			20	0	20	3	32	14
2005	Egegik	24	3			11	2	7	2	6	3
2005	Elim	64	3			20	2	28	7	16	8
2005	Emmonak	161	3			52	4	47	9	62	19
2005	Gambell	118	3			34	3	22	3	62	25
2005	Golovin	41	3			1	1	18	5	22	11
2005	Grayling	32	9			19	0	9	9	4	4
2005	Holy Cross	53	1	53		46	46	3	3	4	4
2005	Hooper Bay	220	3			67	9	80	13	73	27
2005	Huslia	15	1	15	15	9		1		5	

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Table 27. Page 4 of 6.

Year	Community	Total comm HH	Sampling method	Non-stratified		Stratified					
						"None"		"Low"		"High"	
				Total HH	Samp HH	Total HH	Samp HH	Total HH	Samp HH	Total HH	Samp HH
2005	Iliamna	22	3			15	3	6	2	1	1
2005	Ivanof Bay	21	1	21		13	13	6	6	2	2
2005	Kaktovik	65	3			8	2	21	5	36	23
2005	King Cove	167	3			108	0	30	5	29	15
2005	King Salmon	196	3			50	4	71	6	75	14
2005	Kipnuk	141	3			65	15	54	18	22	14
2005	Kokhanok	31	3			17	4	7	2	7	6
2005	Koliganek	42	3			17	2	14	4	11	3
2005	Kongiganak	82	9			58	16	21	11	3	0
2005	Kotlik	81	3			23	1	25	8	33	27
2005	Koyuk	61	3			3	1	18	3	40	24
2005	Koyukuk	33	1	33	33	25		4		4	
2005	Kwethluk	134	3			48	8	58	10	28	8
2005	Levelock	16	3			9	1	7	4	0	0
2005	Manokotak	79	3			39	2	5	1	35	18
2005	Marshall	86	3			23	5	24	4	39	11
2005	Mekoryuk	44	3			5	2	12	4	27	9
2005	Mountain Village	101	3			30	6	44	8	27	5
2005	Napaskiak	90	3			11	4	21	4	58	22
2005	New Stuyahok	95	3			48	5	17	6	30	15
2005	Newhalen	33	3			12	2	14	3	7	3
2005	Newtok	26	1	26		12	12	7	4	7	6
2005	Nikolai	20	1	20		3	3	11	11	6	6
2005	Nome	1,296	9			1,081	63	115	12	100	30
2005	Nondalton	34	3			8	4	8	2	18	5
2005	Nulato	76	3			41	5	29	5	6	5
2005	Nunapitchuk	50	1	50		8	7	23	18	19	15
2005	Pedro Bay	14	3			2	1	7	2	5	2
2005	Pilot Point	29	9			10	9	3	0	16	0
2005	Pilot Station	122	3			33	3	31	7	58	24
2005	Platinum	14	1	14		4	4	5	4	5	5
2005	Point Hope	150	1	150		70	89	47	56	33	37
2005	Point Lay	55	1	55		16	22	25	35	14	17
2005	Port Heiden	32	3			17	2	5	2	10	4
2005	Quinhagak	122	3			31	4	46	7	45	19
2005	Ruby	67	3			61	9	6	6	0	0
2005	Russian Mission	60	3			15	1	8	1	37	17

-continued-

Table 27. Page 5 of 6.

Year	Community	Total comm HH	Sampling method	Non-stratified		Stratified					
						"None"		"Low"		"High"	
				Total HH	Samp HH	Total HH	Samp HH	Total HH	Samp HH	Total HH	Samp HH
2005	Savoonga	129	3			18	3	48	7	63	24
2005	Scammon Bay	0	1	40	32						0
2005	Shageluk	23	1	23		17	17	6	6	0	0
2005	Nunam Iqua	38	1	38		4	2	5	5	29	25
2005	Shishmaref	124	3			51	1	30	4	43	17
2005	South Naknek	35	3			29	3	5	5	1	1
2005	St. Mary's	100	3			10	6	40	3	50	15
2005	Stebbins	131	3			28	2	61	12	42	16
2005	Takotna	20	1	20		20	20	0	0	0	0
2005	Teller	61	3			10	2	29	4	22	11
2005	Toksook Bay	103	3			34	2	34	6	35	17
2005	Tuluksak	57	3			4	4	40	7	13	6
2005	Tununak	62	3			8	1	18	2	36	15
2005	Twin Hills	20	3			6	2	8	4	6	4
2005	Tyonek	49	3			17	2	24	5	8	5
2005	Unalaska	945	9			838	15	58	9	49	9
2005	Upper Kalskag	52	3			29	3	13	6	10	5
2005	Wainwright	136	1	136		71	98	22	33	43	53
2005	Wales	40	3			4	1	12	4	24	12
2006	Akiachak	140	3			42	4	38	6	60	25
2006	Akiak	66	3			13	2	23	8	30	16
2006	Alatna	7	1	7		7	7	0	0	0	0
2006	Arctic Village	-	1	48	33						0
2006	Beaver	-	1	33	26						0
2006	Bettles/Evansville	29	1	29	0	29	29	0	0	0	0
2006	Buckland	85	3			15	4	39	5	31	13
2006	Central	-	1	37	36						0
2006	Chalkyitsik	-	1	34	29						0
2006	Chefornak	62	3			22	1	22	6	18	10
2006	Chenega Bay	18	3			6	4	7	5	5	3
2006	Circle	-	1	31	23						0
2006	Crooked Creek	-	1	32	17						0
2006	Emmonak	161	3			42	3	39	3	80	19
2006	Goodnews Bay	65	3			22	1	14	2	29	12
2006	Karluk	15	1	15	15	10	0	2	0	3	0
2006	Kasigluk	75	3			9	1	57	14	9	2
2006	Kipnuk	152	3			29	7	35	2	88	21

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Table 27. Page 6 of 6.

Year	Community	Total comm HH	Sampling method	Non-stratified		Stratified					
						"None"		"Low"		"High"	
				Total HH	Samp HH	Total HH	Samp HH	Total HH	Samp HH	Total HH	Samp HH
2006	Kobuk	27	1	27	27	11	0	3	0	13	0
2006	Kodiak City	-	9			-	0	-	0	-	0
2006	Kongiganak	82	3			15	3	6	4	61	13
2006	Kwethluk	155	3			32	4	60	10	63	23
2006	Lake Minchumina	7	1	7	7	3	0	4	0	0	0
2006	Larsen Bay	-	1	38	37						0
2006	Lime Village	-	1	15	15						0
2006	Lower Kalskag	76	3			39	6	24	9	13	10
2006	Minto	62	3			22	8	29	11	11	11
2006	Napaskiak	100	3			31	3	51	19	18	7
2006	Nenana	206	3			88	33	47	16	71	25
2006	Newtok	45	3			5	0	15	4	25	8
2006	Nightmute	41	3			1	0	19	1	21	8
2006	Oscarville	13	3			4	1	6	6	3	3
2006	Ouzinkie	66	3			15	4	31	11	20	10
2006	Pilot Station	115	3			33	4	71	8	11	4
2006	Pitka's Point	30	3			15	5	8	5	7	7
2006	Platinum	-	1	14	4						0
2006	Port Graham	60	3			51	5	3	1	6	3
2006	Quinhagak	144	3			19	3	43	4	82	38
2006	Russian Mission	67	3			14	4	10	4	43	16
2006	Scammon Bay	80	3			12	0	30	3	38	18
2006	Selawik	-	1	168	149						0
2006	Nunam Iqua	38	3			5	2	14	13	19	15
2006	Shungnak	53	3			27	1	11	2	15	5
2006	Sleetmute	-	1	41	19						0
2006	St. Mary's	-	1	37	30						0
2006	Tanacross	52	3			27	9	8	2	17	9
2006	Togiak	183	3			88	9	9	3	86	44
2006	Tok	-	1	182	60						0
2006	Tuluksak	60	3			8	3	47	10	5	2
2006	Tuntutuliak	77	3			14	0	40	10	23	10
2006	Upper Kalskag	52	3			13	1	16	4	23	12
2006	Venetie	-	1	36	29						0
2006	Allakaket	39	1	39		20	20	13	12	6	5

Sampling method = sampling method inferred; Total HH = total number of households in stratum; Samp HH = total number of sampled households; HH = household; 1 = Census attempted; 3 = 3 harvest level stratification; 9 = unknown. Data for "Total community" are presented for community-years where a census was attempted if no other stratification information was available.

Appendix 15. Table 28.-Bird species/species categories depicted on the harvest survey instruments.

	Bird species	7-FW-103 Main form	7-FW-103a Interior Alaska	7-FW-103b Southern Coastal Alaska
1	Arctic tern	x	x	x
2	Auklet	x		x
3	Black brant	x	x	x
4	Black oystercatcher			x
5	Black scoter	x	x	x
6	Black-legged kittiwake			x
7	Bristle-thighed curlew	x		x
8	Bufflehead	x	x	x
9	Cackling Canada goose	x		x
10	Canvasback	x	x	x
11	Common eider	x		x
12	Common loon	x	x	x
13	Common merganser	x	x	x
14	Cormorant	x		x
15	Emperor goose	x		x
16	Glaucous gull	x	x	
17	Glaucous-winged gull			x
18	Godwit	x	x	x
19	Golden plover	x	x	x
20	Goldeneye	x	x	x
21	Green-winged teal	x	x	x
22	Guillemot	x		x
23	Harlequin duck	x	x	x
24	Herring gull		x	x
25	King eider	x		x
26	Kittiwake	x		
27	Lesser Canada goose	x	x	x
28	Lesser snow goose	x	x	x
29	Long-tailed duck	x	x	x
30	Mallard	x	x	x
31	Mew gull	x	x	
32	Murre	x		x
33	Other bird	x	x	x
34	Pacific loon	x	x	x
35	Pintail	x	x	x
36	Ptarmigan (non-migratory)	x	x	x
37	Puffin	x		x
38	Red-breasted merganser	x	x	x
39	Red-legged kittiwake			x

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Table 28. Page 2 of 2.

	Bird species	7-FW-103 Main form	7-FW-103a Interior AK	7-FW-103b Southern Coastal AK
40	Red-necked grebe		x	
41	Red-throated loon	x	x	x
42	Sabine's gull	x		x
43	Sandhill crane	x	x	x
44	Scaup	x	x	x
45	Shoveler	x	x	x
46	Small shorebird	x	x	x
47	Spectacled eider	x		x
48	Spruce grouse (non-migratory)	x	x	
49	Steller's eider	x		x
50	Surf scoter	x	x	x
51	Tundra swan	x	x	x
52	Unidentified duck	x	x	x
53	Whimbrel	x	x	
54	White-fronted goose	x	x	x
55	White-winged scoter	x	x	x
56	Wigeon	x	x	x
57	Yellow-billed loon	x		x
	Total	**49**	**38**	**49**

Main form: North Slope, Northwest Arctic, Bering Strait, Yukon Kuskokwim Delta, and Bristol Bay except the southern side of the Alaska Peninsula.

Interior Alaska: Tanana Chiefs Conference and Copper River regions.

Southern Coastal Alaska: Alaska Peninsula, Aleutian Islands, Kodiak, and Chugach-Cook Inlet regions.

Appendix 16. Table 29.-Bird species reported as harvested in the Migratory Bird Subsistence Harvest Survey in 2004, 2005, and 2006.

	Main form					Interior Alaska form		Southern Coastal Alaska form			
Species	North Slope	NW Arctic	Bering Strait	Y-K Delta	Bristol Bay	Interior Alaska	Copper River Basin	Aleutian-Pribilofs	Kodiak	Chugach-Cook Inlet	South Alaska Peninsula
Arctic tern	x		x	x							
Auklet			x						x		
Black-legged kittiwake		x	x		x					x	
Black brant	x		x	x	x	x	x	x			x
Black oystercatcher								x			
Black scoter		x	x	x	x	x	x	x	x	x	x
Bristle-thighed curlew				x	x						
Bufflehead			x	x	x	x	x	x	x	x	x
Cackling Canada goose	x	x	x	x	x	x		x		x	
Canvasback		x	x	x	x	x	x	x	x		
Common eider	x	x	x	x	x			x			x
Common loon			x	x	x	x				x	
Common merganser			x	x	x	x		x	x	x	x
Cormorant			x	x						x	
Emperor goose			x	x	x			x			x
Glaucous gull			x	x	x			x		x	x
Godwit				x	x	x					
Golden plover			x	x	x			x			
Goldeneye		x	x	x	x	x	x	x	x	x	x
Green-winged teal		x	x	x	x	x	x	x	x	x	x
Guillemot			x								
Harlequin duck			x	x	x	x		x	x	x	x
Herring gull								x	x		
King eider	x		x	x	x			x	x		

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Table 29. Page 2 of 3.

Species	Main form					Interior Alaska form		Southern Coastal Alaska form			
	North Slope	NW Arctic	Bering Strait	Y-K Delta	Bristol Bay	Interior Alaska	Copper River Basin	Aleutian-Pribilofs	Kodiak	Chugach-Cook Inlet	South Alaska Peninsula
Large shorebird											
Lesser Canada goose	x	x	x	x	x	x	x	x	x	x	x
Lesser Snow goose	x	x	x	x	x	x					
Long-tailed duck	x	x	x	x	x	x		x	x	x	x
Mallard	x	x	x	x	x	x	x	x	x	x	x
Mew gull			x	x	x						
Murre	x		x	x	x						
Other bird	x		x	x	x	x	x				
Pacific loon			x	x	x						
Pintail	x	x	x	x	x	x	x	x	x	x	x
Ptarmigan	x	x	x	x	x	x	x	x	x		x
Puffin			x	x				x		x	
Red-breasted merganser			x	x	x	x		x		x	x
Red-legged kittiwake									x		
Red-throated loon			x	x	x						
Sabine's gull			x	x							
Sandhill crane	x		x	x	x	x		x		x	
Scaup	x	x	x	x	x	x	x	x	x	x	x
Shoveler		x	x	x	x	x	x	x	x	x	x
Small shorebird	x		x	x	x	x	x	x		x	
Spectacled eider	x		x	x	x						
Spruce grouse			x	x	x	x	x				
Steller's eider	x		x	x	x						x
Surf scoter		x	x	x	x	x		x	x	x	x
Tundra swan	x	x	x	x	x	x	x	x		x	

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Table 29. Page 3 of 3.

	Main form					Interior Alaska form		Southern Coastal Alaska form			
Species	North Slope	NW Arctic	Bering Strait	Y-K Delta	Bristol Bay	Interior Alaska	Copper River Basin	Aleutian-Pribilofs	Kodiak	Chugach-Cook Inlet	South Alaska Peninsula
Unidentified duck	x	x	x	x	x	x	x	x			
Unidentified goose											
Unidentified gull											
Unidentified scoter											
Unknown kittiwake											
Whimbrel			x	x	x						
White-winged scoter		x	x	x	x	x	x	x	x	x	
White fronted goose	x	x	x	x	x	x		x			
Wigeon		x	x	x	x	x	x	x	x		x
Yellow billed loon	x		x	x	x						

Appendix 17. Table 30.-Bird eggs reported as harvested in the Migratory Bird Subsistence Harvest Survey in 2004, 2005, and 2006.

	Main form					Interior Alaska form		Southern Coastal Alaska form			
Species	North Slope	NW Arctic	Bering Strait	Y-K Delta	Bristol Bay	Interior Alaska	Copper River Basin	Aleutian-Pribilofs	Kodiak	Chugach-Cook Inlet	South Alaska Peninsula
Eggs Arctic tern	x		x	x	x	x		x		x	
Eggs Auklet			x								
Eggs Black-legged kittiwake			x	x	x			x	x	x	
Eggs Black brant	x		x	x							
Eggs Black oystercatcher								x	x		
Eggs Black scoter			x	x		x					
Eggs Bristle-thighed curlew			x	x	x						
Eggs Bufflehead				x		x	x				
Eggs Cackling Canada goose	x	x	x	x	x						
Eggs Canvasback			x	x		x					
Eggs Common eider			x	x							
Eggs Common loon			x	x	x						
Eggs Common merganser									x		
Eggs Cormorant			x		x						
Eggs Emperor goose			x	x	x						
Eggs Glaucous gull	x	x	x	x	x	x		x	x	x	x
Eggs Godwit			x	x	x						
Eggs Golden plover			x	x	x			x		x	
Eggs Goldeneye											
Eggs Green-winged teal				x	x	x	x				
Eggs Guillemot			x								
Eggs Harlequin duck											
Eggs Herring gull					x	x		x	x	x	
Eggs King eider	x		x	x	x			x			

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Table 30. Page 2 of 3.

Species	Main form					Interior Alaska form		Southern Coastal Alaska form			
	North Slope	NW Arctic	Bering Strait	Y-K Delta	Bristol Bay	Interior Alaska	Copper River Basin	Aleutian-Pribilofs	Kodiak	Chugach-Cook Inlet	South Alaska Peninsula
Eggs Large shorebird											
Eggs Lesser Canada goose	x	x	x	x	x	x				x	
Eggs Lesser Snow goose	x		x	x							
Eggs Long-tailed duck	x		x	x							
Eggs Mallard		x	x	x	x	x	x		x	x	
Eggs Mew gull		x	x	x	x	x					
Eggs Murre	x	x	x	x	x					x	
Eggs Other bird	x		x	x	x			x			
Eggs Pacific loon		x	x	x	x	x					
Eggs Pintail		x	x	x	x	x	x				
Eggs Ptarmigan			x	x	x		x	x			
Eggs Puffin		x	x					x		x	
Eggs Red-breasted merganser						x					
Eggs Red-legged kittiwake								x	x		
Eggs Red-throated loon			x	x							
Eggs Sabine's gull		x	x	x							
Eggs Sandhill crane		x	x	x	x	x					
Eggs Scaup			x	x	x						
Eggs Shoveler		x	x	x	x	x	x				
Eggs Small shorebird			x	x	x	x					
Eggs Spectacled eider			x								
Eggs Spruce grouse						x					
Eggs Steller's eider			x								
Eggs Surf scoter											
Eggs Tundra swan	x	x	x	x	x	x					

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Table 30. Page 3 of 3.

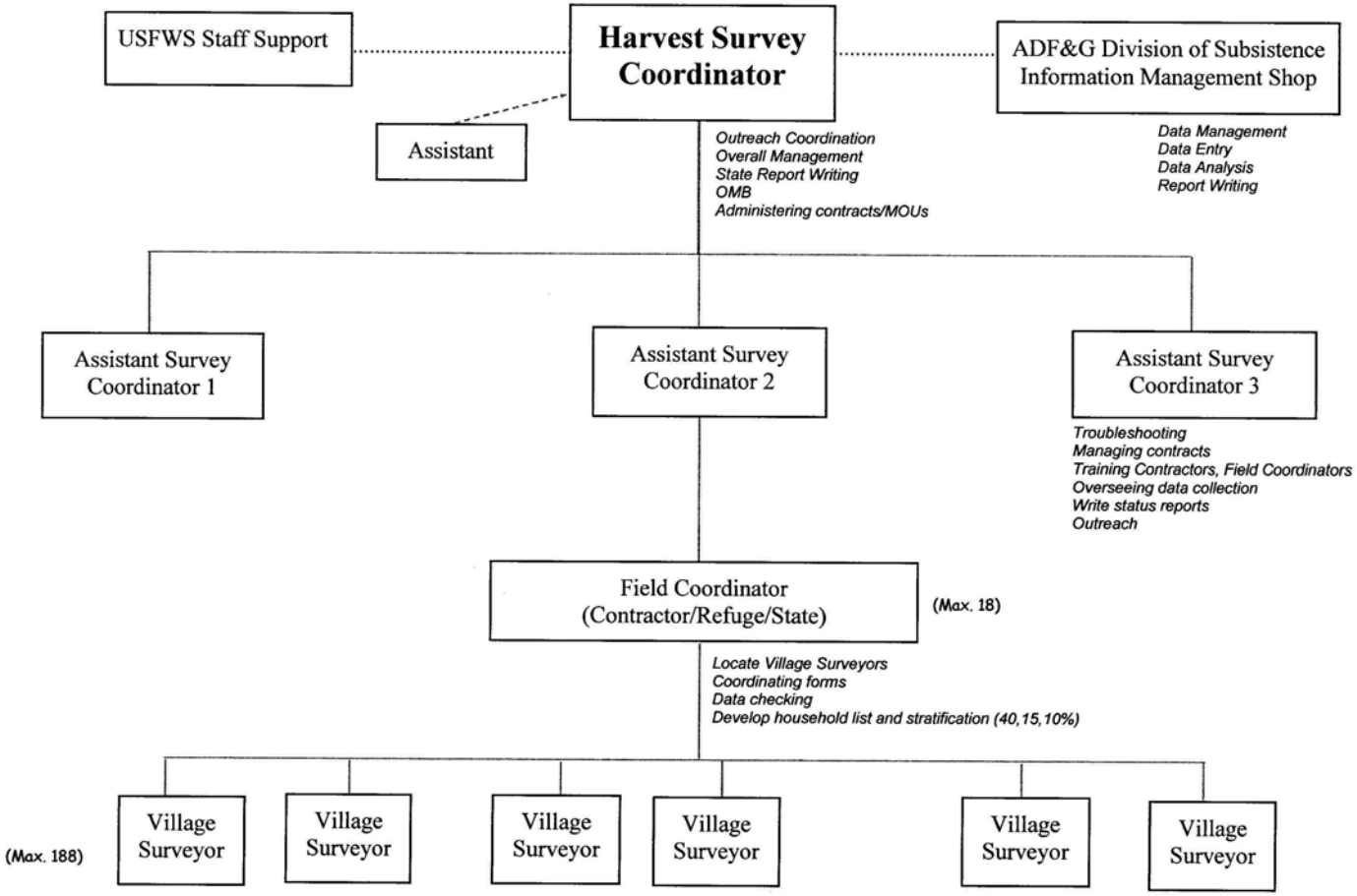
	Main form					Interior Alaska form		Southern Coastal Alaska form			
Species	North Slope	NW Arctic	Bering Strait	Y-K Delta	Bristol Bay	Interior Alaska	Copper River Basin	Aleutian-Pribilofs	Kodiak	Chugach-Cook Inlet	South Alaska Peninsula
Eggs Unidentified duck	x		x	x	x	x					
Eggs Unidentified goose											
Eggs Unidentified gull											
Eggs Unidentified scoter											
Eggs Unknown kittiwake											
Eggs Whimbrel			x	x	x						
Eggs White-winged scoter			x	x		x					
Eggs White Fronted goose	x	x	x	x	x						
Eggs Wigeon			x	x	x	x					
Eggs Yellow billed loon			x	x							

Appendix 18.-Report of unidentified bird species per region, survey years 2004, 2005, and 2006.

	Main form					Interior Alaska form		Southern Coastal Alaska form			
Species	North Slope	NW Arctic	Bering Strait	Y-K Delta	Bristol Bay	Interior Alaska	Copper River Basin	Aleutian-Pribilofs	Kodiak	Chugach-Cook Inlet	South Alaska Peninsula
Other bird species	3	-	4	11	11	5	8	-	-	-	-
Unidentified duck	1	1	2	20	21	17	2	2	-	-	-
Eggs of other bird species	4	-	1	4	5	-	-	1	-	-	-
Eggs of other unidentified duck	1	-	3	2	1	3	-	-	-	-	-
Total number of records of bird harvest	**668**	**292**	**3,376**	**9,621**	**3,001**	**2,722**	**101**	**337**	**270**	**170**	**84**
Total number of records of egg harvest	**36**	**34**	**661**	**1,190**	**406**	**43**	**7**	**68**	**67**	**35**	**8**

A record refers to a household report of harvest of bird or eggs of a species/species category in a given year.

Appendix 19.-Original organizational chart of the migratory bird subsistence harvest survey as adopted in 2003.



Appendix 20.-OMB certification form, instructions, and text.

PAPERWORK REDUCTION ACT SUBMISSION

Please read the instructions before completing this form. For additional forms or assistance in completing this form, contact your agency's Paperwork Clearance Officer. Send two copies of this form, the collection instrument to be reviewed, the Supporting Statement, and any additional documentation to: **Office of Information and Regulatory Affairs, Office of Management and Budget, Docket Library, Room 10102, 725 17th Street NW, Washington, DC 20503.**

1. Agency/Subagency originating request

2. OMB control number b. ☐ None
a. __ __ __ __ - __ __ __ __ __ __ __ __

3. Type of information collection *(check one)*
a. ☐ New Collection
b. ☐ Revision of a currently approved collection
c. ☐ Extension of a currently approved collection
d. ☐ Reinstatement, **without change**, of a previously approved collection for which approval has expired
e. ☐ Reinstatement, **with change**, of a previously approved collection for which approval has expired
f. ☐ Existing collection in use without an OMB control number
For b-f, note Item A2 of Supporting Statement instructions

4. Type of review requested *(check one)*
a. ☐ Regular
b. ☐ Emergency - Approval requested by: ___/___/___
c. ☐ Delegated

5. Small entities
Will this information collection have a significant economic impact on a substantial number of small entities?
☐ Yes ☐ No

6. Requested expiration date
a. ☐ Three years from the approval date b. ☐ Other: ____/____

7. Title

8. Agency form number(s) *(if applicable)*

9. Keywords

10. Abstract

11. Affected public *(Mark primary with "P" and all others with "X")*
a. __ Individuals or households
b. __ Business or other for-profit
c. __ Not-for-profit institutions
d. __ Farms
e. __ Federal Government
f. __ State, Local, or Tribal Government

12. Obligation to respond *(Mark primary with "P" and all others that apply with "X")*
a. ☐ Voluntary
b. ☐ Required to obtain or retain benefits
c. ☐ Mandatory

13. Annual reporting and recordkeeping hour burden
a. Number of respondents _____
b. Total annual responses _____
1. Percentage of these responses collected electronically _____%
c. Total annual hours requested _____
d. Current OMB inventory _____
e. Difference _____
f. Explanation of difference
1. Program change _____
2. Adjustment _____

14. Annual reporting and recordkeeping cost burden *(in thousands of dollars)*
a. Total annualized capital/startup costs _____
b. Total annual costs (O&M) _____
c. Total annualized cost requested _____
d. Current OMB inventory _____
e. Difference _____
f. Explanation of difference
1. Program change _____
2. Adjustment _____

15. Purpose of information collection *(Mark primary with "P" and all others that apply with "X")*
a. __ Application for benefits
b. __ Program evaluation
c. __ General purpose statistics
d. __ Audit
e. __ Program planning or management
f. __ Research
g. __ Regulatory or compliance

16. Frequency of recordkeeping or reporting *(check all that apply)*
a. ☐ Recordkeeping b. ☐ Third party disclosure
c. ☐ Reporting:
1. ☐ On occasion 2. ☐ Weekly 3. ☐ Monthly
4. ☐ Quarterly 5. ☐ Semi-annually 6. ☐ Annually
7. ☐ Biennially 8. ☐ Other (describe) _____

17. Statistical methods
Does this information collection employ statistical methods?
☐ Yes ☐ No

18. Agency contact *(person who can best answer questions regarding the content of this submission)*
Name: _____
Phone: _____

19. Certification for Paperwork Reduction Act Submissions

On behalf of this Federal agency, I certify that the collection of information encompassed by this request complies with 5 CFR 1320.9. NOTE: The text of 5 CFR 1320.9, and the related provisions of 5 CFR 1320.8(b)(3), appear at the end of the instructions. *The certification is to be made with reference to those regulatory provisions as set forth in the instructions.* The following is a summary of the topics, regarding the proposed collection of information, that the certification covers: (a) It is necessary for the proper performance of agency functions; (b) It avoids unnecessary duplication; (c) It reduces burden on small entities; (d) It uses plain, coherent, and unambiguous language that is understandable to respondents; (e) Its implementation will be consistent and compatible with current reporting and recordkeeping practices; (f) It indicates the retention periods for recordkeeping requirements; (g) It informs respondents of the information called for under 5 CFR 1320.8 (b)(3) about: (i) Why the information is being collected; (ii) Use of information; (iii) Burden estimate; (iv) Nature of response (voluntary, required for a benefit, or mandatory); (v) Nature and extent of confidentiality; and (vi) Need to display currently valid OMB control number; (h) It was developed by an office that has planned and allocated resources for the efficient and effective management and use of the information to be collected (see note in Item 19 of the instructions); (i) It uses effective and efficient statistical survey methodology (if applicable); and (j) It makes appropriate use of information technology. If you are unable to certify compliance with any of these provisions, identify the item below and explain the reason in Item 18 of the Supporting Statement.

Signature of Senior Official or designee Date

5 CFR 1320.9 reads "As part of the agency submission to OMB of a proposed collection of information, the agency (through the head of the agency, the Senior Official, or their designee) shall certify (and provide a record supporting such certification) that the proposed collection of information-

"(a) is necessary for the proper performance of the functions of the agency, including that the information to be collected will have practical utility;

"(b) is not unnecessarily duplicative of information otherwise reasonably accessible to the agency;

"(c) reduces to the extent practicable and appropriate the burden on persons who shall provide information to or for the agency, including with respect to small entities, as defined in the Regulatory Flexibility Act (5 U.S.C. § 601(6)), the use of such techniques as:

"(1) establishing differing compliance or reporting requirements or timetables that take into account the resources available to those who are to respond;

"(2) the clarification, consolidation, or simplification of compliance and reporting requirements; or collections of information, or any part thereof;

"(3) an exemption from coverage of the collection of information, or any part thereof;

"(d) is written using plain, coherent, and unambiguous terminology and is understandable to those who are to respond;

"(e) is to be implemented in ways consistent and compatible, to the maximum extent practicable, with the existing reporting and recordkeeping practices of those who are to respond;

"(f) indicates for each recordkeeping requirement the length of time persons are required to maintain the records specified;

"(g) informs potential respondents of the information called for under §1320.8(b)(3); [see below]

"(h) has been developed by an office that has planned and allocated resources for the efficient and effective management and use of the information to be collected, including the processing of the information in a manner which shall enhance, where appropriate, the utility of the information to agencies and the public;

"(i) uses effective and efficient statistical survey methodology appropriate to the purpose for which the information is to be collected; and

"(j) to the maximum extent practicable, uses appropriate information technology to reduce burden and improve data quality, agency efficiency and responsiveness to the public."

NOTE: 5 CFR 1320.8(b)(3) requires that each collection of information:

"(3) informs and provides reasonable notice to the potential persons to whom the collection of information is addressed of:

"(i) the reasons the information is planned to be and/or has been collected;

"(ii) the way such information is planned to be and/or has been used to further the proper performance of the functions of the agency;

"(iii) an estimate, to the extent practicable, of the average burden of the collection (together with a request that the public direct to the agency any comments concerning the accuracy of this burden estimate and any suggestions for reducing this burden);

"(iv) whether responses to the collection of information are voluntary, require to obtain or retain a benefit (citing authority) or mandatory (citing authority);

"(v) the nature and extent of confidentiality to be provided, if any (citing authority); and

"(vi) the fact that an agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number."

Supporting Statement for Paperwork Reduction Act Submissions

General Instructions

A Supporting Statement, including the text of the notice to the public required by 5 CFR 1320.5(a)(i)(iv) and its actual or estimated date of publication in the Federal Register, must accompany each request for approval of a collection of information. The Supporting Statement must be prepared in the format described below, and must contain the information specified in Section A below. If an item is not applicable, provide a brief explanation. When Item 17 of the OMB Form 83-I is checked "Yes", Section B of the Supporting Statement must be completed. OMB reserves the right to require the submission of additional information with respect to any request for approval.

Specific Instructions

A. Justification

1. Explain the circumstances that make the collection of information necessary. Identify any legal or administrative requirements that necessitate the collection. Attach a copy of the appropriate section of each statute and regulation mandating or authorizing the collection of information.

2. Indicate how, by whom, and for what purpose the information is to be used. Except for a new collection, indicate the actual use the agency has made of the information received from the current collection.

3. Describe whether, and to what extent, the collection of information involves the use of automated, electronic, mechanical, or other technological collection techniques or other forms of information technology, e.g., permitting electronic submission of responses, and the basis for the decision for adopting this means of collection. Also describe any consideration of using information technology to reduce burden.

4. Describe efforts to identify duplication. Show specifically why any similar information already available cannot be used or modified for use for the purposes described in Item 2 above.

5. If the collection of information impacts small businesses or other small entities (Item 5 of OMB Form 83-I), describe any methods used to minimize burden.

6. Describe the consequence to Federal program or policy activities if the collection is not conducted or is conducted less frequently, as well as any technical or legal obstacles to reducing burden.

7. Explain any special circumstances that would cause an information collection to be conducted in a manner:

* requiring respondents to report information to the agency more often than quarterly;

* requiring respondents to prepare a written response to a collection of information in fewer than 30 days after receipt of it;

* in connection with a statistical survey, that is not designed to produce valid and reliable results that can be generalized to the universe of study;

* requiring the use of a statistical data classification that has not been reviewed and approved by OMB;

* that includes a pledge of confidentiality that is not supported by authority established in statute or regulation, that is not supported by disclosure and data security policies that are consistent with the pledge, or which unnecessarily impedes sharing of data with other agencies for compatible confidential use; or

* requiring respondents to submit proprietary trade secrets, or other confidential information unless the agency can demonstrate that it has instituted procedures to protect the information's confidentiality to the extent permitted by law.

8. If applicable, provide a copy and identify the date and page number of publication in the Federal Register of the agency's notice, required by 5 CFR 1320.8(d), soliciting comments on the information collection prior to submission to OMB. Summarize public comments received in response to that notice and describe actions taken by the agency in response to these comments. Specifically address comments received on cost and hour burden. Describe efforts to consult with persons outside the agency to obtain their views on the availability of data, frequency of collection, the clarity of instructions and recordkeeping, disclosure, or reporting format (if any), and on the data elements to be recorded, disclosed, or reported. Consultation with representatives of those from whom information is to be obtained or those who must compile records should occur at least once every 3 years - even if the collection of information activity is the same as in prior periods. There may be circumstances that may preclude consultation in a specific situation. These circumstances should be explained.

9. Explain any decision to provide any payment or gift to respondents, other than reenumeration of contractors or grantees.

10. Describe any assurance of confidentiality provided to respondents and the basis for the assurance in statute, regulation, or agency policy.

11. Provide additional justification for any questions of a sensitive nature, such as sexual behavior and attitudes, religious beliefs, and other matters that are commonly considered private. This justification should include the reasons why the agency considers the questions necessary, the specific uses to be made of the information, the explanation to be given to persons from whom the information is requested, and any steps to be taken to obtain their consent.

12. Provide estimates of the hour burden of the collection of information. The statement should:

* Indicate the number of respondents, frequency of response, annual hour burden, and an explanation of how the burden was estimated. Unless directed to do so, agencies should not conduct special surveys to obtain information on which to base hour burden estimates. Consultation with a sample (fewer than

10) of potential respondents is desirable. If the hour burden on respondents is expected to vary widely because of differences in activity, size, or complexity, show the range of estimated hour burden, and explain the reasons for the variance. Generally, estimates should not include burden hours for customary and usual business practices.

* If this request for approval covers more than one form, provide separate hour burden estimates for each form and aggregate the hour burdens in Item 13 of OMB Form 83-I.

* Provide estimates of annualized cost to respondents for the hour burdens for collections of information, identifying and using appropriate wage rate categories. The cost of contracting out or paying outside parties for information collection activities should not be included here. Instead, this cost should be included in Item 13.

13. Provide an estimate for the total annual cost burden to respondents or recordkeepers resulting from the collection of information. (Do not include the cost of any hour burden shown in Items 12 and 14).

* The cost estimate should be split into two components: (a) a total capital and start-up cost component (annualized over its expected useful life) and (b) a total operation and maintenance and purchase of services component. The estimates should take into account costs associated with generating, maintaining, and disclosing or providing the information. Include descriptions of methods used to estimate major cost factors including system and technology acquisition, expected useful life of capital equipment, the discount rate(s), and the time period over which costs will be incurred. Capital and start-up costs include, among other items, preparations for collecting information such as purchasing computers and software; monitoring, sampling, drilling and testing equipment; and record storage facilities.

* If cost estimates are expected to vary widely, agencies should present ranges of cost burdens and explain the reasons for the variance. The cost of purchasing or contracting out information collections services should be a part of this cost burden estimate. In developing cost burden estimates, agencies may consult with a sample of respondents (fewer than 10), utilize the 60-day pre-OMB submission public comment process and use

existing economic or regulatory impact analysis associated with the rulemaking containing the information collection, as appropriate.

* Generally, estimates should not include purchases of equipment or services, or portions thereof, made: (1) prior to October 1, 1995, (2) to achieve regulatory compliance with requirements not associated with the information collection, (3) for reasons other than to provide information or keep records for the government, or (4) as part of customary and usual business or private practices.

14. Provide estimates of annualized costs to the Federal government. Also, provide a description of the method used to estimate cost, which should include quantification of hours, operational expenses (such as equipment, overhead, printing, and support staff), and any other expense that would not have been incurred without this collection of information. Agencies may also aggregate cost estimates from Items 12, 13, and 14 in a single table.

15. Explain the reasons for any program changes or adjustments reported in Items 13 or 14 of the OMB Form 83-I.

16. For collections of information whose results will be published, outline plans for tabulation and publication. Address any complex analytical techniques that will be used. Provide the time schedule for the entire project, including beginning and ending dates of the collection of information, completion of report, publication dates, and other actions.

17. If seeking approval to not display the expiration date for OMB approval of the information collection, explain the reasons that display would be inappropriate.

18. Explain each exception to the certification statement identified in Item 19, "Certification for Paperwork Reduction Act Submissions," of OMB Form 83-I.

B. Collections of Information Employing Statistical Methods

The agency should be prepared to justify its decision not to use statistical methods in any case where such methods might reduce burden or improve accuracy of results. When Item 17 on the Form OMB 83-I is checked, "Yes," the following documentation should be included in the Supporting Statement to the extend that it applies to the methods proposed:

1. Describe (including a numerical estimate) the potential respondent universe and any sampling or other respondent selection methods to be used. Data on the number of entities (e.g., establishments, State and local government units, households, or persons) in the universe covered by the collection and in the corresponding sample are to be provided in tabular form for the universe as a whole and for each of the strata in the proposed sample. Indicate expected response rates for the collection as a whole. If the collection had been conducted previously, include the actual response rate achieved during the last collection.

2. Describe the procedures for the collection of information including:

* Statistical methodology for stratification and sample selection,

* Estimation procedure,

* Degree of accuracy needed for the purpose described in the justification,

* Unusual problems requiring specialized sampling procedures, and

* Any use of periodic (less frequent than annual) data collection cycles to reduce burden.

3. Describe methods to maximize response rates and to deal with issues of non-response. The accuracy and reliability of information collected must be shown to be adequate for intended uses. For collections based on sampling, a special justification must be provided for any collection that will not yield "reliable" data that can be generalized to the universe studied.

4. Describe any tests of procedures or methods to be undertaken. Testing is encouraged as an effective means of refining collections of information to minimize burden and improve utility. Tests must be approved if they call for answers to identical questions from 10 or more respondents. A proposed test or set of test may be submitted for approval separately or in combination with the main collection of information.

5. Provide the name and telephone number of individuals consulted on statistical aspects of the design and the name of the agency unit, contractor(s), grantee(s), or other person(s) who will actually collect and/or analyze the information for the agency.

Appendix 21.-Surveyor Progress Checklist.

MIGRATORY BIRD SUBSISTENCE HARVEST SURVEY

SURVEYOR PROGRESS CHECKLIST

Transfer ONLY the household CODES from the Household Selection List by Activity Level (Form 7-FW-101).

Village: _____ Village #: _____ Surveyor: _____

Harvest year: _____ Total number of households to be surveyed: _____

HH code	Permission slip		Spring		Summer		Fall	
	YES	NO	Date left survey form	Date collected survey form	Date left survey form	Date collected survey form	Date left survey form	Date collected survey form

Appendix 22.-Surveyor Sampling Problem Report.

MIGRATORY BIRD SUBSISTENCE HARVEST SURVEY

SURVEYOR SAMPLING PROBLEM REPORT

Use the back of this page to report additional problems and/or any comments. Return this sheet with your payment request and survey forms.

Village: _____Village code: _____ Surveyor: _____

Date: _____ Survey Period: _____

Survey form number	HH code (if applicable)	Description of problem

Appendix 23.-Subsistence Migratory Bird Harvest Survey checklist of survey progress for field coordinators.

MIGRATORY BIRD SUBSISTENCE HARVEST SURVEY

FIELD COORDINATOR'S PROGRESS CHECKLIST

Village: _____Village code: _____ Surveyor: _____

Harvest year: _____ Total # of households: _____

HH code	Permission Slip	Spring	Summer	Fall	Notes