
The Economic Importance of Alaska's Wildlife in 2011

May 2014

Appendix A: Methodology

Prepared for:

The Alaska Department of Fish and Game



Prepared by:

ECONorthwest
ECONOMICS • FINANCE • PLANNING



Appendix A – Methodology

This Appendix contains a detailed account of the methods used to collect, process, and analyze the data that underlie the findings presented in *The Economic Importance of Alaska’s Wildlife in 2011: Final Report*.

Section 1. Data Collection

In this section, we describe the methods we used to collect the data underlying our analysis of the economic importance of Alaska’s wildlife. The data collection involved survey research, key informant interviews, literature reviews, and consultation with experts. We also accessed data that the State of Alaska had collected in the past.

A. Survey Research

Here, we present information about our surveys: the survey questionnaire design, the sampling design, the survey deployment process, and the representativeness of the survey samples. Section 2 contains information about the processing and analysis of the data we collected through the surveys.

1. Survey Questionnaire Design

The research design included a series of six distinct but interrelated surveys, each with its own questionnaire. The research team, working with ADF&G staff, developed an initial set of questions for each survey questionnaire that would collect the information needed to conduct the economic analysis. The research team selected the wording and format for each question carefully to ensure that it reflected the best practices for survey research, such as minimizing non-response and recall bias. The team also emphasized precision in the wording and design of the questions to elicit useful information—especially for the questions that obtained information about respondents’ expenditures on hunting and viewing activities, and their willingness-to-pay additional amounts for those activities.

Peer-reviewed literature, professional standards, and experience gained from past studies in Alaska and elsewhere in the U.S. guided the design of the question content and format. For example, an extensive review of questions from previous expenditure studies and willingness-to-pay studies provided the basis for designing comparable questions for this study. The research team gave additional consideration to the amount of data that could feasibly be collected in one survey effort: many more questions were considered than ultimately ended up in each questionnaire. Throughout the process, ADF&G staff reviewed each questionnaire multiple times, providing insights and recommendations about the effectiveness of alternative wording for several questions.

The types of survey questions included simple yes/no format, ranking scales that ranged from very negative to very positive, and multi-part tables requiring the respondent to provide

detailed information about expenditures and activities. The surveys asked respondents to report information primarily for their household, although some questions focused on individual opinions and characteristics.¹ One area of interest involved the respondent's assessment of wildlife's contribution to her or his quality of life and its influence on the decision to live in Alaska. Questions on these topics asked the respondent to select from a list of options ranging from not at all important to extremely important. Another area of interest involved the number of hunting and viewing trips households took in 2011, the amount of time and money the households expended on the trips, and the individual's assessment of the satisfaction with the trips. Accordingly, the questions related to these issues gathered detailed information on trip location, duration, time of year, spending, the factors that influenced the level of satisfaction, and other, related variables. A third area of interest involved the value people place on conserving wildlife. Questions related to this issue collected information about survey respondents' willingness to pay for wildlife conservation. Another series of questions collected demographic data on the survey respondents.

Question Development for the Analysis of Economic Activity Supported by Wildlife-Related Expenditures

In this study we collected detailed information about households' expenditures on hunting and wildlife-viewing activities. We developed questions about expenditures in several categories. These included trip-related expenditures, such as gasoline, food, lodging, and trip packages; and expenditures on gear and equipment, such as firearms, binoculars, and camping equipment. We also asked about expenditures on real estate used primarily for hunting or viewing² and—for Alaska residents—on supplies for viewing wildlife around the home.

Most of the questions on expenditures asked only for information on the expenditures made in Alaska. For trip packages, which are generally lump-sum amounts that may cover the purchase of goods and services both inside and outside of Alaska, we did not ask explicitly about the Alaska-only portions, as consumers would likely not know the monetary or spatial breakdown of the different elements of package expenditures. Instead, we asked about the specific goods and services included in the package.³ For gear and equipment expenditures, we asked about the percentage of time respondents would use them for hunting or viewing activities in Alaska.

Because of the volume of information requested about expenditures, we consolidated the expenditure questions into two focused surveys—one for wildlife viewers and the other for hunters. The questionnaires for these surveys had similar structure, focus, and language.

¹ It is customary to use the household as the focus of study in economic research such as this. Households are considered a basic economic unit in society—where individuals pool their income, share goods and services, and make decisions about participation in and expenditures on activities, such as hunting and wildlife viewing.

² Across the majority of surveys, the data on real estate expenditures were not statistically significant. We describe the statistical significance tests in Section 2. The results of the real estate questions are available in Appendices G and H.

³ See Section 2.B.2 for information about assumptions we used in our analysis of package expenditures.

Question Development for the Contingent Valuation Analysis

We employed contingent valuation techniques to estimate the gross economic value of wildlife-related goods and services associated with hunting and viewing. These techniques measure the amounts households were willing to pay for the goods and services, distinct from what they actually paid. The specific techniques we used comply with widely accepted recommendations and guidelines.⁴ A recent review of this method concluded that a “considerable body of evidence now supports the view that contingent valuation done appropriately can provide a reliable basis for gauging what the public is willing to trade off to obtain well-defined public goods.”⁵

Through our surveys of residents and visitors, we collected information on the following four topics using the contingent valuation method:

1. Willingness to make additional travel expenditures for the same hunting or wildlife-viewing trip: In the same four surveys that collected detailed expenditure information from residents and visitors about their 2011 hunting and wildlife-viewing trips, we asked each respondent if the household still would have made the trip if the cost of the trip had been higher.⁶ The extent to which a household was willing to pay more than it actually paid for its trip reflects the net economic benefit of the trip to the household. Adding this amount to the expenditures for the trip reflects the trip’s total value to the household.⁷

2. Willingness to make additional travel expenditures for the same wildlife-viewing trip, but with a visit to a specially managed wildlife area: In the wildlife-viewing surveys only, we asked if the household would have paid more for the trip if it had included a visit to an area specifically managed to ensure it could have viewed one or more species particularly important

⁴ See Arrow, K., R. Solow, E. Leamer et al. 1993. “Report of the NOAA Panel on Contingent Valuation.” *Federal Register* 58 (10): 4601-4614; and U.S. Environmental Protection Agency. 2010. *Guidelines for Preparing Economic Analyses*. Center for Environmental Economics, Office of Policy. December 17.

⁵ Carson, R.T. 2012. “Contingent Valuation: A Practical Alternative when Prices Aren’t Available.” *Journal of Economic Perspectives* 26 (4): 27-42.

⁶ We posed the question in the following way: “As you know, some of the costs of travel, such as gasoline, have been increasing recently. If the cost of this 2011 trip had increased by \$X would you or your household still have made the trip?” The value of the stated cost increase (\$X) was randomly selected for each respondent from these amounts: \$10, \$130, \$250, \$370, and \$490. If the respondent said, “Yes,” to this original amount, the follow-up question asked if he or she would have been willing to pay twice that amount. If the respondent said, “No,” to the original amount, the follow-up question asked about his or her willingness to pay half the amount.

⁷ For the total trip expenditures, we asked, “In total, how much do you think the overall cost of your trip was, for you and your household? Include what you spent before, during, and after your trip, and purchases you made in Alaska, online, and outside of Alaska, if relevant.” This value may be different from the value of the Alaska-only expenditures we collected elsewhere in the surveys.

to it.⁸ The extent to which a household would have been willing to pay an additional amount for that experience reflects the total value of that particular viewing experience to it.

3. Willingness to contribute to a wildlife and habitat conservation fund: In the general population surveys of samples drawn from all 2011 residents and visitors, we asked respondents whether they would be willing to contribute to a fund, each year for 5 years, to conserve wildlife and habitat in the face of otherwise insufficient funding to do so.⁹ The amount one is willing to contribute to such a fund represents the value one derives from maintaining wildlife populations and habitat at current levels. It reflects both the value one derives from anticipated uses of wildlife-related goods and services and the value one derives from the existence of Alaska's wildlife and its habitat.

4. Willingness to contribute to a wildlife conservation fund for a particular species and its habitat: In the general population surveys of residents and 2011 visitors, we asked respondents if they would be willing to contribute to a fund to conserve a particular species of wildlife and its habitat in the face of otherwise insufficient funding to do so. Individual respondents were randomly asked about one of these four species: brown bears, seabirds such as puffins, moose, or caribou.¹⁰ The amount one is willing to contribute to such a fund represents the value one derives from maintaining the population and habitat of that species at current levels. It reflects

⁸ We posed the question in the following way: "Would you have been willing to pay \$Y more than you actually paid for your trip, if you had been able to visit an area specifically managed that ensures you could have viewed one or more species particularly important to you?" The value of the stated cost increase (\$Y) was randomly selected for each respondent from these amounts: \$10, \$130, \$250, \$370, and \$490. If the respondent said, "Yes," to this original amount, the follow-up question asked if he or she would have been willing to pay twice that amount. If the respondent said, "No," to the original amount, the follow-up question asked about his or her willingness to pay half the amount.

⁹ We posed the question in the following way: "People derive multiple benefits from Alaska's wildlife, including hunting, viewing, and knowing wildlife exist. Imagine that, at some point in the future, current sources of funding become insufficient to maintain wildlife populations, their habitat, and their ability to provide these multiple benefits at the levels we see today. Also assume there were a fund available to raise money for the conservation of wildlife populations and habitat so that people would be able to continue to enjoy these multiple benefits at the levels we see today. Would you contribute any amount of money to that fund?" If the respondent said yes, he or she was asked "Would you contribute \$X per year over the next five years to this fund? The value of the stated contribution (\$X) was randomly selected for each respondent from one of the following amounts: \$10, \$70, \$130, \$190, and \$250. If the respondent said "No," he or she wasn't asked a follow-up question.

¹⁰ We posed the question in the following way: "Imagine that, at some point in the future, current sources of funding are unable to sustain the population, habitat, and multiple benefits associated with Species X. Also assume there were a fund available to raise money for the conservation of Species X populations and habitat so that people would be able to continue to enjoy the multiple benefits associated with Species X at sustainable levels. Would you contribute any amount of money to that fund?" The species included in the question (Species X) was randomly selected from these for each respondent: brown bears, also known as grizzly bears, seabirds such as puffins, caribou, or moose. If they said yes, they were asked "Would you contribute \$X per year over the next five years to this fund?" The value of the stated contribution (\$X) was randomly selected for each respondent from one of the following amounts: \$10, \$70, \$130, \$190, and \$250. If the respondent said "No", they weren't asked a follow-up question.

both the value one derives from anticipated uses of wildlife-related goods and services and the value one derives from the existence of that species and its habitat and from their cultural importance.

The data for each of these four contingent valuation topics come from a set of survey questions that adhered to a particular question format, which included the following components:

- A description of a particular set of circumstances that framed the question.
- A description of the mechanism through which payment would be made.
- A yes/no question asking whether the respondent would pay a given dollar amount.¹¹
- A second yes/no question asking whether the respondent would pay a larger or smaller amount, if the answer to the first question was yes or no, respectively.

Economists call the specific contingent valuation approach we employed the “double-bounded dichotomous choice” approach. Economists generally have found that this approach yields more reliable information than open-ended questions that simply ask a respondent how much she/he would be willing to pay for something. Dichotomous-choice questions involve a simple yes/no question about a respondent’s willingness to pay a given amount, selected randomly from a set of pre-determined values, for a particular good or service. The double-bounded approach involves a follow-up question to the initial willingness-to-pay question with a different value, either above or below the initial value depending on the yes/no response to the initial question. Researchers in diverse settings have documented this overall approach and found it a reliable method for estimating willingness to pay.¹²

We selected the set of dollar values used in the initial and follow-up questions carefully and with reference to the relevant literature on similar research to capture the full distribution of values that respondents would be willing to pay.¹³ We also drew upon insights from ADF&G’s wildlife managers. The final set of dollar values used in the initial questions ranged from \$10 to \$490 for the questions about respondents’ willingness to pay more for their hunting or viewing trips and from \$10 to \$250 for the questions about their willingness to pay into a conservation

¹¹ For two of the sets of contingent valuation questions in our surveys, respondents were first asked if they would be willing to pay anything. This was a yes/no question. Those who said *yes* were then asked the initial and follow-up questions with actual dollar amounts. Those who said *no* were not asked about their willingness to pay particular dollar amounts. The other two sets of questions did not include this yes/no question.

¹² See U.S. Environmental Protection Agency. 2010. *Guidelines for Preparing Economic Analyses*. Center for Environmental Economics, Office of Policy. December 17. p. 7-39; and Hanemann, M., J. Loomis, and B. Kanninen. 1991. “Statistical Efficiency of Double-Bounded Dichotomous Choice Contingent Valuation.” *American Journal of Agricultural Economics* (November): 1255-1263.

¹³ See, for example, Richardson, R. and J. Loomis. 2005. Climate Change and Recreation Benefits in an Alpine National Park. *Journal of Leisure Research* 37(3): 307-20, p. 313; and Hanemann, M., J. Loomis, and B. Kanninen. 1991. “Statistical Efficiency of Double-Bounded Dichotomous Choice Contingent Valuation.” *American Journal of Agricultural Economics* (November). p. 1259.

fund. The questionnaire specified one of the amounts, selected randomly, for each respondent and asked if she or he would be willing to pay it.¹⁴ If the respondent indicated a willingness to pay the initial value, a follow-up question asked if the respondent would be willing to pay double the initial value. If the respondent indicated an unwillingness to pay the initial value, the follow-up question asked if she or he would be willing to pay half the initial value. Therefore, the full range of dollar values asked about in the surveys ranged from \$5 to \$980 for the travel-cost questions, and \$5 to \$500 for the conservation-fund questions.

For respondents who answered yes to both questions—they were willing to pay the initial amount asked about and also double that amount—the maximum amount they would be willing to pay was equal to or greater than the latter. For those who answered no to both values asked about, the amount they would be willing to pay was less than the lowest amount they were asked about. For the others who indicated they would be willing to pay one amount but not another, the amount they would be willing to pay was bounded by the two values asked about. As we describe in Section 2: Data Processing and Analysis, we used statistical analysis of these responses to calculate the average amount that the surveyed population would be willing to pay.

2. Survey Descriptions

We used parallel sets of surveys to collect information from two distinct populations: Alaska residents and out-of-state visitors to Alaska in 2011. Figure 1, which provides an overview of the surveys and their relationship to one another, shows that, for each of these populations, we conducted a set of three complementary surveys. Although individual survey questions were tailored for each group,¹⁵ the resident surveys and the visitor surveys covered the same topics and were nearly identical in format and question design. We describe each of the surveys below.

One survey, the resident or visitor “Population Survey,” collected data from a representative sample of the general population of residents or visitors. This survey focused on collecting information on the extent of their participation in hunting and wildlife-viewing activities in 2011, on wildlife’s importance to their quality of life and influence on their decision to live in Alaska, and on their willingness to pay into a conservation fund to sustain wildlife.

The other two surveys for each population, residents and visitors, focused on participants in hunting and viewing activities. Each of these surveys provided in-depth information about each of these participant groups (hunters and wildlife viewers). These surveys collected detailed information about expenditures and other aspects of one 2011 hunting or viewing trip. We

¹⁴ For the two conservation-fund questions, a question asking whether the respondent would be willing to pay anything at all was asked first. Respondents who said “Yes” were then asked the two questions with dollar values. Those who said “No” were not asked the two questions with dollar values.

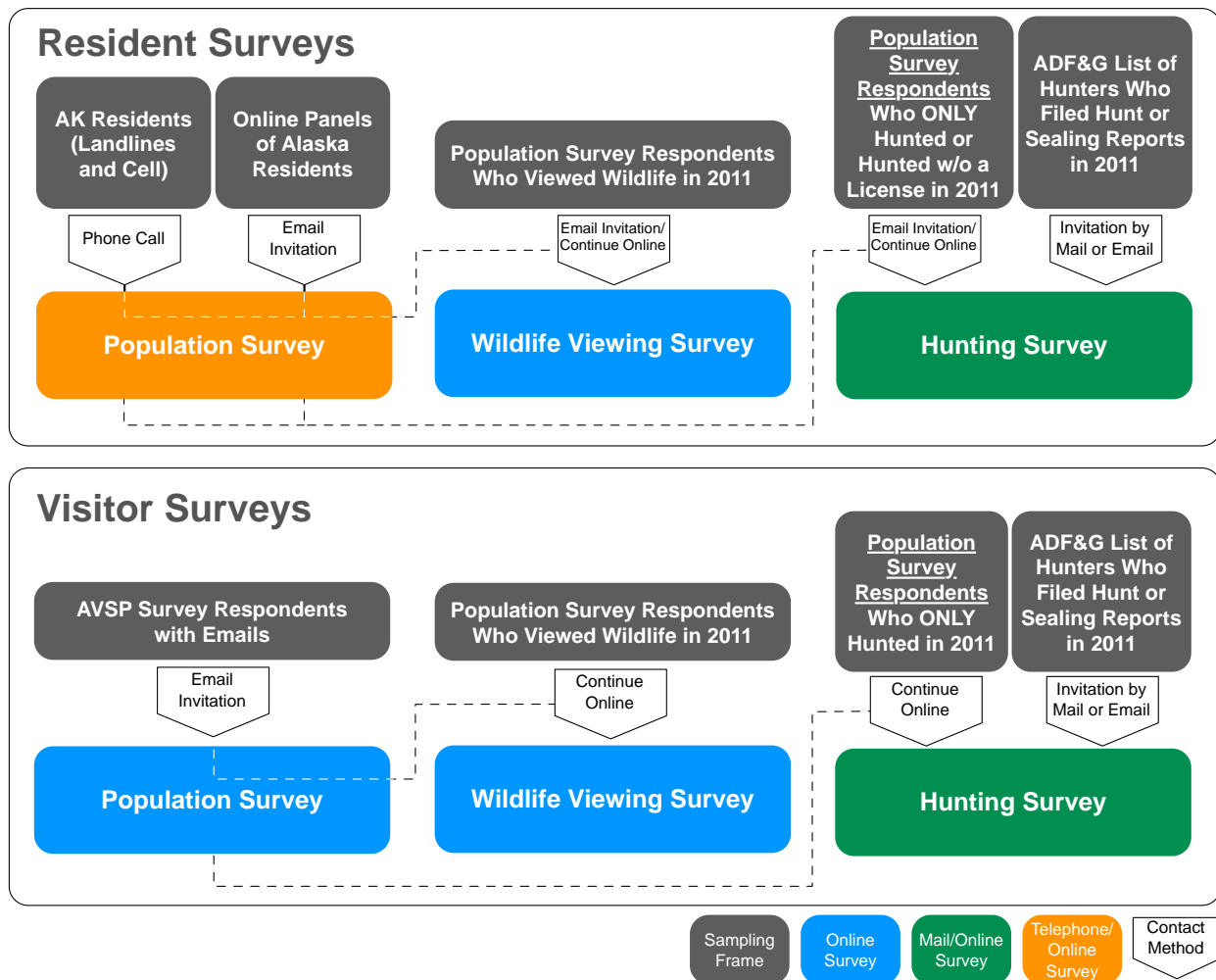
¹⁵ For example, on the visitor surveys, we asked about travel expenditures associated with travel from outside of the state. On the resident surveys, we asked about reasons for living in Alaska.

asked visitors about their most recent trip, and we asked residents about their most recent trip to a particular region. They also collected detailed information about their expenditures throughout the year on wildlife-related gear and equipment and real estate. Most of the expenditure questions focused on only the expenditures within Alaska, and we collected detailed information about the categories of goods and services purchased within the state (including both trip and gear and equipment expenditures). We also collected some information about purchases outside of Alaska across two other question topics. First, we asked for the total cost of the trip (including expenditures before, during, and after the trip, and purchases made in Alaska, online, and outside of Alaska). Second, we asked about the cost of trip packages, such as cruises or guided hunting or fishing trips, which may include expenditures for goods or services purchased or consumed outside of Alaska.

The full set of surveys allows us to carefully combine results from across the surveys. For example, the population survey of Alaska residents allows us to calculate the percentage and, hence, the total number of Alaska households that hunted in 2011. In addition, the survey of resident hunting participants allows us to calculate respondents' average expenditures on, for instance, hunting gear by Alaska households that hunted in 2011. By combining the information from the surveys, we can estimate the total expenditures on hunting gear by all Alaska households in 2011.

This section of the memo provides details about the design of each of the survey questionnaires for each population. Appendix D includes each survey questionnaire. We present the details about the sample size and response rate for each survey separately under *Survey Administration Details* later in this section.

Figure 1. Alaska Resident and Visitor Surveys



Source: ECONorthwest

Note: This figure is intended to convey information about the general survey approach. For detailed information about the surveys, including exceptions to the general approach, please see the accompanying text.

Alaska Resident Population Survey

The Resident Population Survey obtained information from a representative sample of all Alaska residents age 16 or older. One important objective of the Resident Population Survey was to collect information on the number of times resident households participated in hunting or viewing activities in 2011. In addition, the survey collected information on the economic importance the survey respondents place on conserving wildlife populations; the contribution wildlife and wildlife-related activities make to residents' quality of life; and wildlife's influence on their decision to live in Alaska.

This survey also collected information about respondents' demographic characteristics, which we used to determine the extent to which the sample represented the overall population. To that end, we established a target sample size of 1,500 and set quotas for the number of surveys to be completed by residents of each region (Southeast, Southcentral, Southwest, Interior, and

North) and in accord with a number of other demographic categories. We developed quotas for these categories to correspond to the statewide and regional characteristics reported in 2010 US Census information.¹⁶ The primary demographic quotas were for gender, age, and ethnicity. The secondary quotas were for income and education. The sample for this survey satisfied all geographic and demographic quotas.

As we describe below, we used more than one method for sampling and for data collection. For example, we conducted the survey online and by telephone. Our purpose in using multiple sampling and data-collection methods was to increase incidence among younger residents and other population subgroups that typically do not participate in traditional telephone surveys. Through these methods, we attained a sample more representative of the overall population of Alaska and each region than would have been possible using a narrower set of sampling techniques and surveying methods.

Online survey respondents came from a broad cross-section of Alaska residents who were professionally recruited to participate in a survey-research panel maintained by Research Now and GMI.¹⁷ Opinion research firms regularly use these panels to develop representative samples for online surveys.

RDD Field Services¹⁸ completed the telephone surveys using both listed samples,¹⁹ which are lists with contact information for the targeted population that are scientifically constructed by professional sampling experts based on such sources as telephone directories, and also random digit dialing. Scientific Telephone Samples, a well-established sampling firm, provided the telephone samples (both landline and cell) for the surveys.²⁰ The telephone questionnaire mirrored the question sequencing and wording of the online survey questionnaire.

Alaska Resident Wildlife Viewing Survey

The Alaska Resident Wildlife-Viewing Survey collected detailed information about the wildlife-viewing activities of Alaska households—and especially information about the expenditures within Alaska that households made in conjunction with one wildlife-viewing trip and all 2011 purchases of gear in Alaska that were used for wildlife viewing. Respondents indicated all regions where they viewed wildlife in 2011, and then we asked them to provide information about their most recent trip to a specific region.

¹⁶ This sample size will yield sufficient statistical power to provide analytical results at +/- 1.5% to 2.5% at the 95% confidence level.

¹⁷ These are market research firms. For more information, see www.researchnow.com and www.gmi-mr.com.

¹⁸ RDD Field Services is a data collection and survey-research firm based in Portland, Oregon. See www.rrd.info for more information.

¹⁹ “Listed samples” are lists with contact information. They are often compiled primarily from phone directories but may also be drawn from other sources.

²⁰ For more information about Scientific Telephone Samples, see www.stssamples.com.

The Resident Wildlife-Viewing Survey was administered as an online survey only. The survey consisted of approximately 30 primary questions (several questions had multiple parts). We administered the survey as a follow-up to a subset of respondents to the Resident Population Survey. The subset generally consisted of the respondents who indicated that their household viewed wildlife in 2011 (including those whose household had also hunted in 2011). It excluded, however, those respondents who indicated that their household had viewed wildlife and hunted but the respondent had not purchased a hunting license in 2011. The questionnaire reassured those respondents that their answer would remain confidential and then asked them to participate in the Resident Hunting Survey, described in the next section.

The online respondents to the Resident Population Survey who were eligible and consented to take the Resident Wildlife-Viewing Survey were asked to proceed to the wildlife-viewing survey online after they concluded the population survey. Nearly all the resident wildlife-viewing surveys were completed by respondents who completed the online resident population survey and, hence, were already online. Those who participated in the population survey by telephone and were eligible to take the wildlife-viewing survey were asked at the end of the telephone survey to go online to take the wildlife-viewing survey. Few did so.²¹

Alaska Resident Hunting Survey

The Resident Hunting Survey collected information about the hunting activities of Alaska households and especially about the nature and extent of hunting-related expenditures that Alaska households made in 2011. As with the Resident Wildlife-Viewing Survey, this survey primarily sought information from respondents about their households' expenditures within Alaska on a single 2011 hunting trip, all gear and equipment purchased in Alaska in 2011 for hunting, and Alaska real estate used for hunting. Respondents indicated all regions where they hunted in 2011, and then we asked them to provide information about their most recent trip to one of those regions.

We surveyed individuals using a combination of mail and online surveys. The survey questionnaire consisted of approximately 25 primary questions (several questions had multiple parts).

We used ADF&G data sources to identify hunters for the primary pool of respondents for this survey. The ADF&G data included names and contact information for residents who filed a harvest report or who sealed an animal at any time for the 2010-2011 hunting season or, in early

²¹ We cannot determine whether this subgroup of respondents differs in any systematic way from those who did not respond. As we describe in the section on response rates, we did compare the characteristics of all the respondents to this survey with the characteristics of the overall population and applied weights to increase the overall representativeness of the sample.

2012, for the 2011-2012 hunting season.²² By definition, these individuals were licensed to hunt for one or both of these periods.

The ADF&G sent email invitations (and a reminder email) for the online hunter survey to all resident licensed hunters with email addresses included in ADF&G's data for 2011. We used a mail survey with the same questions as the online instrument for a random sample of resident licensed hunters without email addresses in the ADF&G data. Individuals who received the survey by mail had the option to complete the survey online.

Respondents to the population survey provided a secondary source of respondents to the Resident Hunting Survey. We administered the Resident Hunting Survey to respondents to the population survey who indicated that, while they or members of their household hunted in 2011, the individual respondent had not purchased a hunting license in 2011. Approximately 28 percent of the Resident Population Survey respondents who indicated that they or members of their household hunted fell into this category.²³ We also asked respondents from the population survey who indicated they hunted (and purchased a license) but did not view wildlife to complete the hunting survey. An additional 15 percent of the population survey respondents from hunting households fell into this category. We asked respondents from the population survey who indicated they both hunted and viewed wildlife to complete the wildlife-viewing survey instead of the hunting survey. We did this for two reasons. First, we already had a robust source for licensed hunters through our use of the ADF&G data and had invited them separately to participate in the hunting survey. Second, the population survey was the only source of respondents for the wildlife-viewing survey.

Visitor Population Survey

The Visitor Population Survey collected information on the incidence of wildlife-related activities among visitors to the state of Alaska in 2011 and on the characteristics of those visitors. For this survey, we built on the survey research efforts that the Alaska Department of Commerce, Community, and Economic Development (DCCED)²⁴ conducted through the Alaska

²² We used ADF&G data sources to identify hunters for the primary pool of respondents for this survey. The ADF&G data do not capture all persons who hunted but instead include those who filed a harvest report or who sealed an animal at any time during the calendar year 2011. ADF&G requires harvest reports from everyone issued a drawing or registration hunting permit and from anyone who picked up a harvest ticket for moose, sheep, caribou, or black bear, regardless of whether they hunted.

²³ This may be a topic worth more research. There are several factors to consider in interpreting these results. For example, respondents were asked "Did you or members of your household hunt?" If they answered "Yes" to that question, they were asked "Did you purchase an Alaska hunting license in 2011?" It is possible that some respondents who did not purchase a license did not hunt (although other members of their household did). In addition, some respondents may have been eligible to hunt without the need to purchase a license.

²⁴ Within DCCED, the Division of Economic Development's tourism programs oversee the AVSP.

Visitor Statistics Program (AVSP).²⁵ That program surveyed 8,111 visitors to Alaska from May 2011 to April 2012. To supplement the information already collected from these individuals through the AVSP, we developed an online survey with questions about the visitor's wildlife-related trip(s) to Alaska in 2011.

We asked all visitors with email addresses in the 2011–2012 AVSP database—5,205 individuals—to participate in this survey on behalf of their households. ADF&G made the request via an email invitation, followed by a reminder email.

After completing the part of the survey that asked each respondents how many times his or her household had participated in a hunting or viewing trip in 2011, respondents who indicated that they viewed wildlife in 2011 were directed to the online Visitor Wildlife Viewing Survey. We directed respondents who indicated that they hunted to the online Visitor Hunting Survey, and those who indicated that they both viewed wildlife and hunted to the wildlife-viewing survey.

Visitor Wildlife Viewing Survey

To determine the kinds and amounts of wildlife-viewing expenditures that visitors to Alaska made in 2011, we administered the Visitor Wildlife-Viewing Survey to respondents who indicated that they viewed wildlife. The questions in this survey were the same as those in the Resident Wildlife Viewing Survey, with minor modifications. This survey collected detailed information about the wildlife-viewing activities of visitors—and especially information about the expenditures they made in Alaska in conjunction with their last wildlife-viewing trip and all purchases of gear and equipment in Alaska that were used for wildlife viewing in the state in 2011. This online survey consisted of 30 primary questions (several questions had multiple parts).

Visitor Hunter Survey

This survey gathered information about the kinds and amounts of expenditures within Alaska for each visitor household's last 2011 hunting trip and all of its purchases in Alaska of gear and equipment used for hunting in the state in 2011.

As with the Resident Hunting Survey, we identified most of the individuals to receive the Visitor Hunting Questionnaire from ADF&G data that contain the names and contact information of licensed hunters. To those for whom we had an email address but no mail address, we sent email invitations to complete the survey questionnaire online. To those for whom we had a mail address, we sent a paper questionnaire by mail. Combined, we attempted

²⁵ The AVSP intercepts visitors to Alaska at different departure points throughout the state during different seasons. Visitors are counted, then given an opportunity to complete an online survey about their visit, including trip details (e.g., destination, activities, expenditures), their origin, and their intent to visit Alaska again. More information is available about the AVSP at <http://www.commerce.state.ak.us/ded/dev/toubus/research.htm>.

to contact 6,127 non-resident hunters who, according to the ADF&G data, either filed a required hunt report or sealed an animal in 2011.²⁶ The secondary pool of respondents for this survey came from the Visitor Population Survey. Although we directed most hunters from that survey to complete the wildlife-viewing survey,²⁷ we asked those who reported they hunted and did not engage in wildlife-viewing activities in 2011 to complete the Visitor Hunting Survey.²⁸

The ADF&G sent email invitations (and a reminder email) to all visitor hunters' email addresses listed in ADF&G's data files. Our team mailed a survey with the same questions as the online questionnaire to all individuals without listed email addresses. These respondents also had the option to complete the survey online. The Visitor Hunter Survey consisted of approximately 30 primary questions (several questions had multiple parts) similar to those in the Resident Hunter Survey.

3. Survey Deployment

The research design employed a hybrid approach—using telephone, email, and mail—for contacting potential participants in the survey. This approach reflects today's realities of survey research. The research team selected the most appropriate method or methods for the type of data being collected. This approach capitalized on the advantages of each method and made efficient use of budgetary resources and time.

For example, telephone surveys are useful for reaching the general population. They are not efficient for collecting detailed information across many questions, however, as individuals often exhibit impatience with a call lasting more than a few minutes. Mail and online methods are useful when questions may require respondents to take their time and carefully consider their responses, including possibly finding receipts to help verify expenditures. Questionnaires that take longer than 15 minutes to complete—which could easily be the case for the hunting and viewing surveys that sought information about different activities, species, expenditure categories, and seasons—result in higher completion rates by mail or online relative to telephone surveys. Online and mail surveys are more efficient for large samples, make for easier randomizing of specific questions and/or sets of questions, and allow for longer questionnaires. They also precisely collect each respondent's response to an open-ended question, increasing the reliability of the results relative to telephone surveys in which the interviewer summarizes

²⁶ We used ADF&G data sources to identify hunters for the primary pool of respondents for this survey. The ADF&G data do not capture all persons who hunted but instead include those who filed a harvest report or who sealed an animal at any time during the calendar year 2011. ADF&G requires harvest reports from everyone issued a drawing or registration hunting permit and from anyone who picked up a harvest ticket for moose, sheep, caribou, or black bear, regardless of whether they hunted.

²⁷ We directed those visitor hunters that indicated that they also engaged in wildlife viewing to take the visitor wildlife viewing survey, because we had a separate source of respondents for the Visitor Hunting Survey.

²⁸ Although we invited all visitor hunters from ADF&G's database separately to participate in the visitor hunting survey, we opted to ask these visitor hunters to take the hunting survey (rather than terminate the survey after the population survey components) because they were already online and likely to respond to the hunting survey.

the response. With each survey method, there are potential problems with ensuring that the sample is representative. We sought to minimize these problems, however, with quotas, statistical weighting, the use of professionally recruited and maintained panels, reminder notices, and incentives to encourage completion of the questionnaires. We detail the outcome of our surveying effort below, under *Survey Administration Details*.

Telephone Survey Deployment

RDD Field Services, a data collection firm, conducted the telephone surveys. Prior to fielding, trained supervisors briefed telephone interviewers on the project, including the precise wording of the questions and pronunciation of words. Interviewers also completed mock interviews to become familiar with the survey and ensure high quality data and a positive respondent experience. Supervisors monitored and validated interviewer performance throughout the process, as well as quotas and completion rates. Additional quality control features of the telephone surveys included:

- The use of both land line and cell numbers to assure inclusion of a broader cross-section of the public.
- RDD Field Services programmers tested the survey program internally.
- A review of the data after the first night in field confirmed that interviewers were administering the questionnaire and recording responses accurately.
- Supervisors monitored calls.
- A separate group of interviewers called 10 percent of the respondents again to verify that the questionnaire was properly administered and to check for consistency of responses.

Online and Mail Survey Deployment

Several surveys were available to respondents in either an online format or a mail format. Everyone who received a survey through the mail was given the option of taking the survey online. Both online and mail surveys employed several common features:

- **State Endorsement:** The online and mail questionnaires included a signed cover letter with state seal from the Department Commissioner requesting participation.
- **Control Numbers:** Unique control numbers guarded against multiple completions by the same respondent.
- **Assurances:** Online and mail questionnaires offered assurances of anonymity and confidentiality, stating that an independent third party was conducting the research.
- **Incentives:** The use of cash incentives increased response rates to the online and mail surveys and assured a more representative sample.²⁹

²⁹ We offered respondents the option to enter into a drawing for cash cards worth \$250 each. In total, 15 cash cards were awarded to survey respondents.

- **Reminder Notices:** a postcard reminder was sent to recipients of the mail survey and an email reminder was sent to recipients of the email invitations.

The online surveys included several additional features in their deployment:

- **ADF&G Email:** ADF&G sent the email invite to reduce the likelihood that recipients would classify them as junk mail.
- **Secure Server:** A secure server hosted the online survey.
- **Soft Launch:** Use of a “soft launch” — sending out the email invite to a randomly selected subset of the survey population rather than the full survey population at first— provided an opportunity to detect problems with administration before full launch.
- **Passwords:** The online survey allowed respondents to start, leave, and come back to the survey to complete it.
- **24-hour support:** Online survey respondents had access to support from a 24-hour help desk.

4. Survey Administration Details

Table 1 provides detailed information about the administration of each survey. It identifies the general population sampled; the sampling frame, i.e., the list or database from which we obtained names of individuals to survey; and the dates that we administered each survey. It also includes, where applicable, data on the number of invitations sent; the number of respondents for each survey, i.e., the sample size; and the response rates.

This information can be used to help assess the strengths and weaknesses of the surveys and to inform future survey efforts. For example, the validity of survey results depends primarily on whether the sample is representative of the population of interest. Toward this end, the sampling frame should be representative of the population. We worked with ADF&G to select the best sampling frames for each of the target populations, as shown in Table 1. Sometimes there is little choice of sampling frame. This was the case with the survey of visitors, as the only existing registry of visitors comes from the AVSP. Hence, we used visitors who provided email addresses in the AVSP for our sampling frame for visitors. This choice provides a reasonable approach for obtaining data from a sample representative of all visitors, as we found no important statistical differences in the overall AVSP data between those with and without email addresses. As we describe in Section 2, we adjust the sample using statistical weighting to increase the extent to which each sample accurately represents the population from which it was drawn.

Where we had any reason to suspect that the sampling frame would be less than ideally representative of the entire population, we implemented measures to address the deficiencies. For example, we wanted to survey the resident hunting population and used the ADF&G data on hunters as the sampling frame. We suspected there would be unlicensed hunters, though, who would not be included in the ADF&G data. Therefore, to ensure we also surveyed unlicensed hunters, we asked another group of hunters to take the hunting survey. This second group was comprised of all of the respondents to the Resident Population Survey who indicated that they had hunted in 2011 but answered “No” when asked if they had purchased a hunting

license. This augmentation of the sampling frame increased the representativeness of our survey sample.

Having identified the sampling frame most representative of the population, we then focused on ensuring that the respondents secured from within the sampling frame also closely represent the population. A concern with all surveys is whether those who responded to the survey are different in some systematic way—have different characteristics, such as age, race, or income, for example—than those who did not respond. If the respondents are different from the non-respondents, then the survey respondents may not be representative of the population, increasing the likelihood that their answers to the questionnaire differ in a systematic way from those that would be obtained if the survey had included the entire population. Researchers call systematic differences non-response bias.

Table 1. Survey Administration Summary

	Alaska Resident Surveys ^a			Non-Resident (Alaska Visitor) Surveys ^a		
	Population Survey	Wildlife Viewing Survey	Hunter Survey	Population Survey	Wildlife Viewing Survey	Hunter Survey
Sample Population	Residents Age 16+	Residents Age 16+ who viewed wildlife in 2011	Residents who hunted in 2011	Visitors to Alaska in 2011	Visitors who viewed wildlife in Alaska in 2011	Visitors who hunted in Alaska in 2011
Sampling Frame	(1) Research Now and GMI Online panels (2) Alaska residents with listed phone numbers	Population survey respondents who indicated they viewed wildlife in 2011, except for those who also reported that they or members of their household hunted in 2011 but they did not purchase a license.	(1) ADF&G data on hunters who filed a hunt report or sealed an animal for 2011 (2) Population survey respondents who a) indicated they or members of their household hunted in 2011 but they did not purchase a license or b) hunted and did not view wildlife in 2011	Visitors to Alaska in 2011 with listed email addresses in the AVSP database	Population survey respondents who indicated they viewed wildlife in 2011	(1) ADF&G data on hunters who filed a hunt report or sealed an animal for 2011 (2) Population survey respondents who indicated they or members of their household hunted and did not view wildlife in 2011
Online						
Email Invitations	3,504	1,083 ^b	16,158	5,205	631	2,453
Online Respondents	630	446	4,306 ^c	708 ^d	530	789 ^c
Response Rate	18%	41% ^b	27% ^e	14%	84%	32% ^e
Online dates	5/4/12-5/10/12	5/4/12-5/30/12	5/16/12-9/10/12	7/12/12-8/18/12	7/12/12-8/18/12	7/12/12-8/8/12
Telephone						
Phone Contacts	1,681 ⁱ					
Phone Respondents	870	NA	NA	NA	NA	NA
Response Rate	52%					
Telephone dates	5/15/12-5/30/12	NA	NA	NA	NA	NA
Mail						
Mailed Surveys	NA	NA	5,500	NA	NA	3,654
Mail Respondents	NA	NA	664 ^f	NA	NA	769 ^f
Response Rate	NA	NA	12% ^g	NA	NA	21% ^g
Mail dates	NA	NA	8/5/12-9/10/12	NA	NA	9/1/12-10/8/12
Total Respondents	1,500	446	4,970	708	530	1,558
Total Response Rate	29%	41%	23%	14%	84%	25%
Weighted Sample Size^h	1,500	445	4,964	666	499	1,383

Notes:

- a. These results do not include surveys completed voluntarily on ADF&G’s website. They were not part of a statistical sample, so the responses are not included in the data results reported in this analysis.
- b. This number represents email invitations sent to eligible respondents who completed the population survey either by telephone or online.
- c. Includes respondents who received an email invitation directly and respondents who received the mail version of the Hunter Survey but followed the directions on the mail survey to take the survey online.
- d. Includes 149 who completed only the visitor population survey, 530 who completed the population survey and the wildlife viewing survey, and 29 who completed the population survey and the hunter survey.
- e. This response rate represents 1) the number of respondents for the Hunter Survey who received email invitations and completed the Hunter Survey online PLUS 2) the number of respondents who received a mail survey but then elected to take the survey online DIVIDED BY the total number of email invitations sent for the Hunter Survey. This likely overestimates the response rate from people who received the email invitation because it includes people who received a mail survey but took the survey online instead.
- f. Includes only respondents who received and returned a mail version of the Hunter survey. Does not include respondents who received a mail survey but took the survey online.
- g. This response rate represents the number of respondents for the Hunter Survey who received and returned mail surveys out of the total number of mail surveys sent. This ratio underestimates the response rate from people who received mail surveys because it does not include those respondents who received a mail survey but took the survey online instead.
- h. See discussion of data cleaning and weighting in Section 2. A.6.
- i. There were a total of 30,697 numbers dialed.

The response rate for a survey indicates the percentage of those asked to participate in the survey who actually responded to it. The response rate depends on a wide variety of variables, such as the length of the survey, the topic, the size of the incentive (if any) for completing the questionnaire, the nature of the pre-contact, the number and type of reminders, the type of postage, and the layout of the questionnaire.

Information about response rates of a sample is useful in developing survey protocol, as it helps researchers estimate the number of contacts that must be made to produce a given sample size. A response rate, however, does not indicate directly the sample's representativeness. The professional literature on survey research widely acknowledges that response rates alone are poor indicators of non-response bias and therefore, should not be understood as being a proxy for the quality of a survey or the representativeness of a given sample. When analyzing the results of a survey, regardless of the response rate, it is more important to systematically test for and address potential sources of nonresponse biases throughout the survey process and in the analysis of survey data.³⁰

The total response rates in Table 1 vary from 14 to 84 percent. These response rates are within the range of our expectations, given the length and complexity of the surveys and the realities of present-day survey research. Even the lower response rates in Table 1 are not uncommon. A study by Pew Research Center for People & the Press explains the changes in response rates that have occurred in recent years and the appropriate steps for ensuring that a survey yields accurate results.³¹ It found the average response rate for telephone surveys dropped from 36 percent in 1997 to 9 percent in 2012. Despite that drop, the study found that "telephone surveys that include landlines and cell phones and are weighted to match the demographic composition of the population continue to provide accurate data on most political, social and economic measures."

Our survey protocol built in measures aimed at increasing both the response rates and, more important, the representativeness of the sample and the results. These included endorsement of the survey by the State of Alaska, with seal and signature; a reminder postcard for mail respondents; a reminder email for online respondents; monetary incentives to complete the

³⁰ See Groves, R.M. (2006). "Nonresponse rates and nonresponse bias in household surveys." *Public Opinion Quarterly*, 70(5): 646-675; Groves, R.M. and Peytcheva, E. (2008). "The impact of nonresponse rates on nonresponse bias: a meta-analysis". *Public Opinion Quarterly*, 72(2), 167-189; Heerwegh, D., Abts, K., and Loosveldt, G. (2007). "Minimizing survey refusal and noncontact rates: do our efforts pay off?" *Survey Research Methods*, Vol. 1 No. 1, 3-10; Schouten, B., Cobben, F., Bethlehem, J. (2009). "Indicators for the representativeness of survey response." *Survey Methodology*, 35 (1), 101 – 113.

³¹ Research shows that survey response rates (for all delivery mediums) have been declining since the 1950s. (See, for example, Pew Research Center for People & the Press. 2012. "Assessing the Representativeness of Public Opinion Surveys: Overview." May 15. Accessed at <http://www.people-press.org/2012/05/15/assessing-the-representativeness-of-public-opinion-surveys/>; and Curtin, R., Presser, S. and Singer, E. (2005). Changes in telephone survey nonresponse over the past quarter century. *Public Opinion Quarterly*. 69. pp. 87-98.)

questionnaire; and promotion of the survey at the website and with information releases to the media.

For the Resident Population Survey, we increased the degree to which the sample represented the population of Alaskans by using demographic quotas, which resulted in a sample population with demographic characteristics that mirror those of the state population. We took additional steps to increase the representativeness of the samples—across all of the survey samples—after the surveying was completed. This involved testing for differences between the respondents and the population by comparing the characteristics of the sample group with known characteristics of the relevant population. This exercise showed the extent to which the samples were representative across those variables of interest. Where differences existed between the sample and the population, we used statistical weighting to increase the representativeness of the sample. That is, we increased the weight of responses from individuals with characteristics underrepresented in our sample (based on demographic and geographic variables). Conversely, we decreased the weight of responses from individuals with characteristics overrepresented in our sample. We describe the weighting process for each survey in Section 2.

The overall result is a set of survey data that reflects a three-step effort to increase the level of confidence that the data closely represent the results we would have obtained if we'd surveyed each of the underlying populations. These three steps addressed the representativeness of the sampling frame from which we drew the sample for each survey, the individuals who responded to the survey, and the data derived from the respondents. Our statistical testing shows that the sample sizes are large enough to produce statistically significant results across the responses to all but a few questions. We address statistical significance in more detail in Section 2. Appendix E contains information on the standard deviations of the survey responses, and Appendices G and H contain the results of specific significance tests.

B. Key-Informant Interviews

We augmented the information obtained from the surveys by interviewing key informants. These individuals have detailed knowledge of different sectors of the economy and the interactions between wildlife and those sectors. We worked with ADF&G staff to identify some of these individuals, and we developed our own list based on the recommendations of the initial key informants and follow-up research. We conducted each interview over the telephone. Prior to each call we developed objectives and a set of specific questions to guide the interview, though we also used open-ended questions to encourage the interviewee to provide whatever information he or she considered relevant. We took detailed notes during each call. In some cases, the interviews provided information that helped us interpret and confirm the data gathered by the surveys. In other cases, the interviews provided information about topics that were not addressed directly in the surveys, such as subsistence activities, trapping, and the importance of wildlife to decisions by households and business to locate in Alaska. Appendix C includes a list of the key informants we interviewed.

C. Other Data Collection

We reviewed other data sources, including peer-reviewed literature, ADF&G data, and past related studies to inform our research design and place the results in context. For example, in 1989, ADF&G initiated a research program to improve understanding of the social importance and the economic impact and value of Alaska's wildlife. The results of the studies, published in nine reports between 1994 and 1997, provided insight into the spending patterns of resident and non-resident hunters and wildlife viewers, the attitudes they held about wildlife, and the value they associated with Alaska's wildlife.³² Since then, to our knowledge, no state agency, organization, or other entity in Alaska has initiated a research effort to understand the economic importance of all wildlife and wildlife-related activities in detail within a specific geographic area.

Other research efforts have looked at pieces of the picture: the importance of specific species,³³ specific wildlife-related activities,³⁴ and specific destinations where wildlife are an important attraction.³⁵ The U.S. Fish and Wildlife's National Survey of Fishing, Hunting, and Wildlife-Associated Recreation is perhaps the most well-known effort, but, although some of its findings are comparable to those from this study and the previous effort by ADF&G, its overall scope and conclusions are more narrow and limited.³⁶ We compare and contrast our research with the National Survey in the *Final Report*.

We also reviewed studies commissioned by the Division of Subsistence at ADF&G for valuable insights into differences between behaviors of subsistence and non-subsistence participants in wildlife-related activities.³⁷ We used information gathered from these and related studies—as

³² See, for example, Miller, S. M. and D. W. McCollum. 1994. *Alaska Voters, Alaska Hunters, and Alaska Nonresident Hunters: Their Characteristics and Attitudes Towards Wildlife*. Alaska Department of Fish and Game, and Miller, S. M., D. W. McCollum. 1997. *Alaska Nonresident Visitors: Their Attitudes Towards Wildlife and Wildlife Related Trip Characteristics and Economics*. Anchorage: Alaska Dept. of Fish and Game, Division of Wildlife Conservation. The full list of reports by Miller and McCollum is included in the bibliography accompanying this report.

³³ See, for example, Northern Economics, Inc. 2006. *The Value of Alaska Moose*. Anchorage Soil and Water Conservation District and the Alaska Soil and Water Conservation District. June.; Giraud, K., B. Turcin, J. Loomis, and J. Cooper. 2002. "Economic benefit of the protection program for the Steller sea lion." *Marine Policy* 26: 451-458.

³⁴ See, for example, Leonard, J. 2008. *Wildlife Watching in the U.S.: The Economic Impacts on National and State Economies in 2006*. Report 2006-1. Wildlife and Sport Fish Restoration Programs. U.S. Fish and Wildlife Service. Arlington, VA. July.; Dugan, D., G. Fay, H. Griego, and S. Colt. 2009. *Nature-Based Tourism in Southeast Alaska*. ISER Working Paper 2009.1. Institute of Social and Economic Research, University of Alaska Anchorage. March.

³⁵ See, for example, Goldsmith, S., J. Brian, and A. Hill. 2003. *The Kodiak National Wildlife Refuge: Economic Importance*. U.S. Fish and Wildlife Service. May.; Styne, D. and A. Ackerman. 2010. *Impacts of Visitor Spending on the Local Economy: Denali National Park Preserve, 2008*. National Park Service. Social Science Program. August.

³⁶ U.S. Fish and Wildlife Service. 2013. *2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation—Alaska*. Report No. FHW/11-AK. January.

³⁷ See, for example, R.J. Wolfe and L.J. Ellanna. 1983. *Resource Use and Socioeconomic Systems: Case Studies of Fishing and Hunting in Alaskan Communities*. Alaska Department of Fish and Game, Division of Subsistence. Juneau, Alaska. March.

well as the experience and insights of ADF&G staff, members of our research team, and others with relevant expertise—to inform our design of the survey instruments.

Section 2. Data Processes and Analysis

In this section we describe the methods we used to process and analyze the data we collected. We also describe how we prepared the data for use in the IMPLAN analysis of economic activity supported by hunting and viewing-related expenditures and in the contingent valuation analysis of the gross economic value and the net economic benefit of hunting- and viewing-related goods and services.

A. Survey-Data Processing, Cleaning, and Weighting

Data cleaning is a standard part of the process of analyzing survey data, and we used generally accepted methods to clean the data for subsequent use in the economic analyses. In general, we aimed to eliminate or correct a variety of possible errors and inconsistencies in the data and to ensure the data are appropriate for the intended analyses. We focused on the treatment of outliers, illogical responses that contradicted one another, responses to open-ended questions, and sampling anomalies. In this section we describe these categories of data issues and the methods we used to address them. We also describe how we weighted each of the surveys to increase the representativeness of the survey respondents.

1. Outliers

Responses that fall far outside of the vast majority of responses—outliers—may significantly increase or decrease the average value of the responses to individual questions. Addressing outliers is critical to appropriate interpretation and application of survey data. We use the average values from the surveys to extrapolate the data to the full populations of Alaska residents and visitors to Alaska. Average values based on outliers will produce biased results. For these reasons, it is important to identify and address outliers.

Substantial research across disciplines has demonstrated the importance of addressing outliers and revealed the range of potentially appropriate methods, based on case-specific circumstances.³⁸ In general, researchers agree that outliers that are the results of error, or that substantially affect the resulting means, should be addressed. When other information allows, adjustments can be made to values to preserve responses. When such interpretation is not possible, data are typically omitted from results. Such adjustments are a routine part of survey

³⁸ See for example, Hodge, V., & Austin, J. 2004. A survey of outlier detection methodologies. *Artificial Intelligence Review*, 22(2), 85-126.; Orr, J. M., Sackett, P. R., & Dubois C. L. 1991. Outlier detection and treatment in I/O psychology: A survey of researcher beliefs and an empirical illustration. *Personnel Psychology*, 44(3), 473-486.

research on the economic importance of natural resources. Southwick Associates made such adjustments in its 2007 study of Alaska fishing values, for example.³⁹

To identify outliers, we analyzed the frequency distribution of the individual responses for each question and looked for natural breaks in the distribution. Quite often outliers are visually apparent from plotting the distribution of values as some observations lie outside the primary distribution of the data. If we identified natural breaks in the set of responses to a question, then we considered the values outside of the primary distribution to be outliers. For the responses to most survey questions, this review of the data found no outliers. Where there were obvious breaks in the data, however, we usually found only a few responses, and often just a single response, outside of the primary distribution. All of the outliers we identified in the responses to the survey questions were above the high end rather than below the low end of the primary distribution of data. Rather than exclude those values completely, for purposes of this analysis we converted the values to the upper end of the primary distribution of values.⁴⁰

Outliers in the responses to a few questions required a more complicated adjustment process. Most notable are outlier responses to the question about the number of wildlife-related visits in 2011.⁴¹ First, there were more than a few outliers. This issue was most prevalent on the question of resident wildlife-viewing visits. Appendix F shows that we identified and adjusted 88 of 1500 responses on total wildlife viewing visits (dispersed across visits in the five regions of Alaska). We suspect that these respondents misinterpreted the question and included activities that would not otherwise be considered a wildlife-viewing visit.

Based on natural breaks in the data, the types and quantities of expenditures reported, comments left by respondents, and natural feasibility constraints, we adjusted the values to fall within the range of up to 200 wildlife-viewing visits per year. There is a natural break in the data at 200, and the vast majority of responses fall at or below this number. Responses above this threshold, including many that indicated a household made 365 or more visits in 2011, suggest a misinterpretation of the question.

Second, although we used the same general method of adjusting these outliers to the upper end of the primary distribution of data, there were a few differences in the mechanics of how we did this when it came to wildlife-related visits. Specifically, we identified outliers by examining the data for individual respondents on both the number of visits to individual regions and the sum of their visits across all regions. In cases where the respondent's total number of visits (across all

³⁹ Economic Impacts and Contributions of Sportfishing in Alaska, Summary Report 2007. Alaska Department of Fish and Game, Division of Sport Fish. January, 2009. Anchorage, Alaska.

⁴⁰ We also employed an alternative approach to identifying outliers. It involved constructing a 95% confidence interval around the mean. That approach yielded similar results to those we present here.

⁴¹ As we describe in Section 2.B.1 (Trip Data), a "trip" refers to an outing which may last an hour, a day, or multiple days. One trip may involve "visits" to more than one region. When the surveys collected data on full trips, we use the term "trip." When the surveys collected data on visits to regions, we use the term "visit" or "regional visit."

regions) was an outlier, we first reduced the total number of visits to the upper threshold in the primary distribution (e.g., 200 trips in the case of wildlife viewing), and then reduced the number of visits to each region proportionally.

2. Categorizing Open-Ended Responses on Expenditures

In the hunting surveys, we asked respondents about their expenditures across 12 categories of hunting gear and equipment. We also asked an open-ended question that provided an option for respondents to identify “other” expenditures on hunting gear and equipment.⁴² We similarly asked detailed questions about the goods and services covered by trip packages and then asked an open-ended question that allowed respondents to identify a good or service covered by the trip package they purchased but that was not included on the list provided on the survey. For these open-ended questions, a respondent could provide a description and the amount of the expenditure. We categorized these open-ended responses using the following criteria:

- The expenditure was moved to an existing gear category if it fit in that category (i.e., we redefined one respondent’s data for “hip boots raincoat thermal jacket” as “personal gear (clothing, shoes, sun glasses, sun screen, bug spray, etc.)”).
- On the hunting surveys, we moved expenditures for dogs, horses, or animal feed into a new category we created for these items. There were 11 respondents listing these expenditures, and they do not fit cleanly into any of the existing gear categories.
- We excluded the expenditure if it was covered elsewhere in the survey (i.e., “air travel,” which was asked in the trip expenditure category) due to the potential for double counting. Most of the “other” responses met this criterion.
- We excluded the expenditure if the description the respondent provided was not clear or would require significant interpretation or speculation in order to categorize the expenditure.
- One respondent inserted a comment instead of an expenditure (“aaa I can't go back ... all wrong..help”). Given the substance of the comment, we excluded all of this respondent’s survey responses.
- On the open-ended package-expenditure questions, we created an additional, miscellaneous category for responses that were not easily categorized.

3. Coding Zeros

In some cases, respondents entered a zero when a zero would not have been a logical response, given the respondent’s other responses. For example, some respondents indicated that they purchased an item but subsequently entered “0” when asked about the amount spent on that item. For such responses, there is no clear indication whether the respondent made the expenditure or not, so we excluded their responses related to those individual expenditures from the data set.

⁴² The wildlife-viewing surveys did not include this option.

4. Adjusting Data Based on Open-Ended Comments

At the end of each of the hunting and wildlife-viewing surveys, respondents were given an opportunity to provide additional comments. Most respondents provided anecdotes about their wildlife experiences. In a few cases, the information left in the comment section led us to exclude all of the respondent's survey responses. These include the following:

- Respondents who indicated that they did not participate in the activity (wildlife viewing or hunting) that was the topic of the respective survey or did not participate in the activity in 2011 (3 respondents);
- Respondents who said they stopped answering questions on the survey or entered random digits to move past a question or questions (3 respondents);
- Respondents to the Visitor Survey who stated that they are actually an Alaska Resident (3 respondents);
- Respondents who reported that they did not understand the survey questions (2 respondents);
- Respondents who said they worked for the ADF&G (2 respondents).⁴³

5. Correcting Sampling Anomalies

The Alaska Visitor Statistics Program's (AVSP) surveys are designed to collect a representative sample of visitors to Alaska. Our Visitor Population Survey was intended to apply to a representative sample of the AVSP database of visitors for 2011—and, thereby, be a representative sample of all visitors that year. Due to a clerical mistake, however, the original database provided for drawing the sample differed slightly from the final AVSP database. As a result, of our sample of 708 observations, 34 respondents are not in the final AVSP database. Because this survey was meant to be a representative sample of the AVSP database, we dropped the 34 observations from our sample.

A second anomaly occurred when two different survey responses came from the same household. These respondents registered the same email address and much of the same demographic information, but varied in their responses to some of the contingent valuation, expenditure, and activity questions. In some cases, the gender of the respondents differed, indicating that different people may have filled out the survey questionnaires using the same email address. Alternatively, the same person may have filled out the questionnaire at different times, describing different trips. Therefore, with no clear way to choose between the two responses, we dropped the five instances (ten observations total) of duplicated email addresses.

6. Weighting

We designed each survey to collect data from a representative sample of the corresponding population. When the characteristics of the final sample of survey respondents differed from

⁴³ We excluded these respondents because the ADF&G sponsored the survey and contributed to its development. In addition, ADF&G staff may have had insights into the survey that the rest of the respondents did not have.

the known characteristics of the relevant population, we used statistical techniques to weight the responses of some respondents more than other respondents to yield an adjusted sample whose characteristics better reflected those of the overall population. For example, we increased the weight given respondents from Alaska regions that were underrepresented in the sample and lowered the weight given to respondents from regions that were overrepresented, using statistical techniques to control for respondents' other characteristics. Across the six survey samples, the weighting process varied somewhat, depending on the information available about the characteristics of the relevant population.

Table 2 shows how the survey sample for the Alaska Resident Population Survey compares to the overall population of Alaska, by region. There are slight differences between the distribution of the respondents across the regions of Alaska in the sample and in the population. Because of these differences, we used statistical weighting to adjust the sample to more closely match the population. Specifically, we weighted the survey responses by region of residence. And, within each region, we weighted the survey responses based on the respondent's age, gender, and race (white or non-white) to more closely match the survey respondents' demographics to those of the population. Although we did not weight on every possible demographic variable or on combinations of variables, weighting on this subset of variables helps to bring other demographic variables, such as income and education, into alignment as well. After data cleaning and weighting, the final sample size is 1,500.

Table 2. Geographic Distribution of Alaska Households and Resident Population Survey Respondents (Unweighted)

Region of Residence	Total Households (2010 Census)		Resident Population Survey Respondents	
	Number	Percentage	Number	Percentage
Alaska Total	258,058	100	1,500	100
North	6,763	3	48	3
Interior	42,031	16	262	17
Southwest	15,330	6	116	8
Southcentral	165,283	64	910	61
Southeast	28,651	11	158	11
Region Unknown ¹	0	0	6	<0.5

Source: ECONorthwest, with data from survey results and the U.S. Census Bureau.

Notes: 1. The six undisclosed responses came from the telephone survey, in which the survey respondents declined to reveal their region of residence to the interviewer.

For the Resident Wildlife-Viewing Survey, we used the same weighting factors and weights as in the Resident Population Survey. We did so because the majority of Alaska residents are wildlife viewers and because we are not aware of another reliable source of information describing the characteristics of Alaska wildlife viewers. After data cleaning and weighting, this survey has a sample size of 445.

For the Resident Hunting Survey, we weighted the sample to reflect the distribution of hunters across the five regions of Alaska. To do so we compared the region of residence of the hunters

in our survey to the region of residence of hunters listed in ADF&G's database of hunting licenses. Then we adjusted for differences between the groups by assigning higher weights to respondents from underrepresented regions and lower weights to respondents from overrepresented regions. After data cleaning and weighting, this survey yielded a sample size of 4,964.

We weighted the Visitor Population Survey data using a method similar to the one McDowell Group used to weight the 2011 data for the AVSP, which was based on travel mode and trip purpose, to reflect the population of visitors to Alaska and the trips they took.⁴⁴ After data cleaning and weighting, there are 666 respondents in the sample. In the final weighted sample of visitors, 73 percent are from the rest of the U.S., 9 percent are from Canada, 15 percent are from other foreign countries, and 3 percent did not report their state or country of residence.⁴⁵

We weighted the Visitor Wildlife-Viewing Survey using the same factors and weights as the Visitor Population Survey.⁴⁶ After data cleaning and weighting, this survey has a sample size of 499. The majority of respondents, 73 percent, were from other U.S. states; 6 percent were from Canada; and 21 percent were from other countries.

We weighted the Visitor Hunting Survey to reflect the residence of origin of non-resident hunters based on the home address information in the Hunting License Database. After data cleaning and weighting, this survey set yielded a sample size of 1,383. In the final weighted sample, visitors from other U.S. states comprised nearly 99 percent of the respondents, and Canadian visitors and visitors from other countries each accounted for less than 1 percent.

⁴⁴ The AVSP surveys are administered at points of exit from the state of Alaska (domestic and international airlines, cruises, highways, and ferries). Because traffic volumes at each of these points are known, the AVSP is weighted on exit mode to reflect the different types of visitors and trips those travel modes suggest. AVSP also factors in trip purpose (business or pleasure). Likewise, we weighted the Visitor Population Survey on the information on travel (exit) mode and trip purpose that was collected through the original AVSP surveys. Our surveys draw from respondents to both the Summer AVSP and the Fall/Winter AVSP, so we also weighted to reflect that 85 percent of visitors travelled to Alaska in the summer and 15 percent travelled to Alaska in the Fall/Winter. See McDowell Group. 2012. *Alaska Visitor Statistics Program VI: Summer 2011*. March. Retrieved January 2013, from <http://commerce.alaska.gov/ded/dev/toubus/pub/2011AVSP-FullReport.pdf>, and McDowell Group. 2012. *Alaska Visitor Statistics Program VI: Fall/Winter 2011-12*. November. Retrieved January 2013, from http://commerce.alaska.gov/ded/dev/toubus/pub/AVSP_VI_2012_Fall-Winter2011-12.pdf. Also, based on personal communication with McDowell Group.

⁴⁵ The AVSP's 2011-2012 projected visitor totals show 83 percent from the U.S., 7 percent from Canada, and 10 percent from other international locations. We did not use these proportions for weighting our sample because sample size effectively limits the number of weighting factors, and we weighted on the factors that McDowell Group recommended as the most important (travel mode and trip purpose) for representing visitor and trip characteristics.

⁴⁶ We used the same weighting factors as in the Visitor Population Survey both because the majority of visitors to Alaska are wildlife viewers and because we are not aware of another reliable source of information describing the characteristics of these wildlife viewers.

B. IMPLAN Modeling and Impact Analysis

Economists have developed several approaches for measuring the economic activity supported by expenditures on a given set of goods and services. We used the technique called input-output modeling. Input-output models are mathematical representations of the economy and how different parts (or sectors) are linked to one another. Input-output models that rely on survey or primary source data are expensive to construct and are generally not available for state and regional economies. As a result, special modeling techniques have been developed to estimate the necessary empirical relationships from a combination of national relationships and state- and county-level measures of economic activity. These modeling techniques and data have been packaged into the IMPLAN (for IMPact Analysis for PLANning) modeling software.⁴⁷ The IMPLAN modeling system is widely used and, when used correctly, well respected.

As we described in the report, we used the IMPLAN modeling system to calculate the economic activity associated with the expenditure data we derived from the surveys. We mapped each type of expenditure identified in the surveys to the appropriate economic sector, as defined in the IMPLAN modeling software. The IMPLAN model then estimated the overall effects on four categories of economic activity: output, jobs, labor income, and government revenue.

In general terms, the IMPLAN model works by tracing how initial expenditures circulate through an economy or study area. That is, spending in one sector or multiple sectors trigger changes in demand and supply throughout the economy. Initial spending levels in the model propagate through the economy via supply- and demand-chain linkages, altering the equilibrium quantities of inputs and outputs and associated jobs, income, and other value-added components. These “multiplier effects” continue until the initial change in final demand leaks out of the economy.

For this analysis, ECONorthwest built five economic impact models of the different regions of Alaska: Interior, North, Southcentral, Southeast and Southwest. ECONorthwest used the enhanced Multi-Regional Input-Output (“MRIO”) module of the IMPLAN system to link each region’s model to the other four regions in the state. The main purpose of MRIO modeling is to measure the spillover effects (also called leakages or, more precisely, domestic imports) that spill out of one study area—in this case, the region where the spending occurred—only to be captured by another study area—the other four regions in Alaska.

In this section we describe the data analysis required to prepare the data for use in the IMPLAN model. Appendix J contains the complete set of results from IMPLAN.

Given both the complexity of the information collected through the surveys and the practical limits on the number of questions that can be asked of a survey respondent, the data analysis

⁴⁷ For more information about IMPLAN, see www.implan.com.

required that we make some simplifying assumptions, using methods and assumptions commonly used for processing such data. For example, analysts collecting and reporting data on visitor spending in Alaska frequently employ assumptions about the types of goods and services covered by trip-package expenditures and the distribution of the expenditures among those categories of goods and services. Where we found the methods and assumptions reasonable, we adopted them.⁴⁸

In this section we group the data analysis and assumptions that we used to prepare the data for use in IMPLAN into three categories:

1. Trip Data
2. Expenditures
3. Participation

1. Trip Data

In this section we describe the analysis and assumptions involved in processing the trip data for use in IMPLAN.

Trip Definition: The research team, together with ADF&G, developed this definition of a trip: “an outing involving wildlife viewing or hunting, which begins from your home or from another place of temporary lodging, such as a vacation home, hotel, or a relative’s home. A trip may last an hour, a day, or multiple days.”

Whole Trips and Side Trips: We asked respondents to consider the purpose of their trip. The trip data from the survey represents both whole trips and side trips.⁴⁹

Whole Trip: In general, we asked them to answer the survey questions considering their whole trip if the major or only purpose of the trip was to view wildlife or hunt. For non-

⁴⁸ The studies whose treatment of expenditure and activity data we reviewed included Southwick Associates. 2008. *Economic Impacts and Contributions of Sportfishing in Alaska, 2007*. Professional Publication No. 08-01. December; U.S. Fish and Wildlife Service and U.S. Census Bureau. 2013. *2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation—Alaska*. FHW/11-AK. January. Retrieved February 2013, from <http://www.census.gov/prod/2013pubs/fhw11-ak.pdf> (and the same study from previous years); Cui, Y., E. Mahoney, and T. Herbowicz. 2013. *Economic Benefits to Local Communities from National Park Visitation, 2011*. Natural Resource Report NPS/NRSS/EQD/NRTR—2013/631. National Park Service, Fort Collins, Colorado. February. Retrieved April 2013, from <http://www.nature.nps.gov/socialscience/docs/NPSSystemEstimates2011.pdf>; McDowell Group. 2012. *Alaska Visitor Statistics Program VI: Summer 2011*. March. Retrieved January 2013, from <http://commerce.alaska.gov/ded/dev/toubus/pub/2011AVSP-FullReport.pdf>; and McDowell Group. 2012. *Alaska Visitor Statistics Program VI: Fall/Winter 2011-12*. November. Retrieved January 2013, from http://commerce.alaska.gov/ded/dev/toubus/pub/AVSP_VI_2012_Fall-Winter2011-12.pdf.

⁴⁹ Although we asked respondents to answer the survey questions based on their whole trip or side trip, as described in the text, respondents did not indicate whether they were reporting information about whole trips or side trips. The distinction between whole trips and side trips was included on all of the expenditure surveys and on the Visitor Population Survey.

residents whose main purpose of the trip was not for hunting or wildlife viewing, but who came to Alaska instead of some other location because of Alaska's wildlife, we asked them to answer the questions considering their whole trip.

Side Trip: We asked them to answer the survey questions based on only the portions of the trip that involved wildlife-viewing or hunting when the main purpose of the trip was not for hunting or wildlife-viewing, but when they took a side trip for this purpose.

Regional Visits: In both the Resident Population Survey and the Visitor Population Survey, we asked respondents to report the number of times they or members of their household viewed wildlife in each of the five regions of the state in 2011. We also asked them the number of times they or members of their household hunted in each of the five regions of the state in 2011. We refer to these as "regional visits" as opposed to "trips" because the survey data indicate that individual trips may involve visits to more than one region.⁵⁰

This distinction is important because the expenditure data respondents reported on the expenditure surveys correspond to trips that may include visits to more than one region. For example, on the Visitor Population Survey, a visitor might have indicated she or he visited Alaska once to view wildlife in 2011 and visited both the Southeast and the Southcentral Regions. On the Visitor Wildlife-Viewing Survey, she or he would have provided total expenditure data for the trip, which included visits to both regions. Therefore, the surveys provide some data that relates to trips and some data that relates to visits.

Overlap of Hunting and Wildlife Viewing: Survey respondents often reported taking both wildlife viewing and hunting trips, with 33 percent of residents (and 2 percent of visitors) reporting taking trips for both activities in 2011. To prevent the possibility of double counting, when a respondent reported hunting in a region and also wildlife viewing in the same region we assumed he or she was reporting the same visit. We further assumed that hunting was the primary purpose.⁵¹

Thus, when calculating the number of wildlife viewing visits we reduced the initial number of wildlife viewing visits by the number of hunting visits for each respondent when he or she reported visits in the same region. For example, if a respondent said his or her household made 10 wildlife-viewing visits and 3 hunting visits to the North Region, we reduced the number of wildlife-viewing visits to the North Region to 7. The effect of such reductions was to decrease

⁵⁰ For example, in the Visitor Population Survey, there was an additional question that asked how many visits to Alaska the respondent and members of his/her household had taken.

⁵¹ It is not likely that all respondents who reported a wildlife viewing visit and a hunting visit in the same region were reporting on the same visit, but our inspection of the data revealed a pattern of reporting the same number of hunting and wildlife-viewing visits in the same region. Although we expect that this assumption results in a lower number of wildlife-viewing visits than the actual amount, we make this assumption to avoid the possibility of over-estimating the number of visits.

the overall number of wildlife viewing visits by 8 percent for residents and 4 percent for visitors.

Calculation of Total and Adjusted Number of Trips: We asked respondents directly about the number of trips they took. We developed the combination of surveys, however, to collect additional trip information to allow us to calculate the subset of trips that met the economic criteria for ultimate inclusion in our study.⁵² To do so, we examined regional visitation data—that is, how many different regions of the state respondents visited on each trip—and other information associated with the trips and converted the total regional visits into an adjusted number of trips, using the average number of regional visits for each type of trip.⁵³

As we describe in more detail in Section 2.B.2 (Expenditure data), below, we excluded certain trip expenditures from the IMPLAN analysis. For some trips that do not meet the economic criteria for inclusion, we excluded almost all expenditures. In the end we have two trip totals for each type of a trip: 1- total trips, which includes virtually all trips reported on the surveys and 2- an adjusted (lower) number of trips, which excludes trips that would have been taken even without the wildlife-related activities. Although the lower, adjusted number of trips is the most relevant for the IMPLAN analysis, both trip totals are used at various steps in the analysis. As we explain in more detail in Section 2.B.2, most expenditures are included for only for the “adjusted trips.” Some expenditures, however, are included for “total trips.” Table 3 shows both the total and adjusted number of trips for each type of trip.

Table 3. Number of Hunting and Wildlife-Viewing Trips in Alaska in 2011

Activity	Residents		Visitors	
	Total Number of Trips	Adjusted Number of Trips	Total Number of Trips	Adjusted Number of Trips
Hunting	1,052,000	770,000	15,000	12,000
Wildlife Viewing	5,991,000	988,000	970,000	345,000
Total	7,042,000	1,758,000	985,000	357,000

Source: ECONorthwest, Survey results and the ADF&G Hunting License Database
 Notes: All values are rounded to thousands.

⁵² We excluded data for trips that respondents claimed they would have taken without plans to view wildlife or hunt. We did not, however, exclude visitor wildlife-viewing trips when respondents also reported that the wildlife-viewing activities comprised 75 percent or more of the reason the trip was made. We also made adjustments to avoid double counting of trips that may have been reported as both a wildlife-viewing and hunting trip.

⁵³ To convert the total number of regional visits into total trips for use in this analysis, we examined data from the expenditure surveys to estimate the average number of regions respondents visited on each trip. Based on those data, we use 1.6 regions per trip for visitor wildlife viewing, 1.2 regions per trip for resident wildlife viewing, and 1.1 regions per trip for resident hunting. As we have described, we calculated the number of visitor hunting trips separately.

Extrapolating Regional Visits from the Samples to the Total Populations: The population surveys also provide data on the number of visits each household made to each region of Alaska in 2011 for hunting or wildlife viewing.⁵⁴ Because the population surveys are representative of the sampled populations (except visitor hunters), we multiply the number of visits per region per household from the survey samples by the total number of participating households of Alaskans and visitors to Alaska in 2011.⁵⁵ This calculation yields an estimate of the total number of household visits to each region of Alaska for these activities.

For visitor hunting, we rely on the regional visits reported in the visitor hunting survey rather than in the Visitor Population Survey, in which too few respondents indicated they had hunted in 2011 to yield reliable data. We assume each visitor hunting household made one trip to Alaska, represented by the trips and regional visits reported on the visitor hunting survey. We multiply the number of regional visits per household from this survey by the total number of visitor hunting households to produce an estimate of the total regional visits.

2. Expenditure Data

In this section we describe the analysis and assumptions involved in processing the expenditure data for use in IMPLAN.

Categorization of Package Expenditures: Some wildlife viewers and hunters purchase trip packages. Trip packages usually cover a set of trip-related expenditures, such as transportation, lodging, and guide fees. Survey respondents indicated which types of expenditures were included in the trip package purchased and the overall cost of the package. To divide the cost of the package across the categories of expenditures that respondents reported were included in each package, we allocated the package cost among the categories using the proportions of expenditures in each category reported for the non-package trip expenditures. Additional analysis of package expenditures involved estimating the within-Alaska portion, as described below.

Alaska-Only Expenditures: Although the surveys collected data on expenditures within Alaska, some additional processing was required to estimate the within-Alaska portion of the cost of trip packages. For packages that included airfare to and from Alaska, we assumed these costs occurred outside the state and deducted the average cost of round-trip airfare between Seattle and Anchorage.⁵⁶ We made a similar assumption and excluded all package expenses for

⁵⁴ Although the Visitor Population Survey collected data on visitor hunting trips, we did not rely on this survey for such data due to the small sample size for the sub-population of hunters.

⁵⁵ Because only 1 percent of visitor households engaged in hunting, the Visitor Population Survey does not provide statistically significant data about this sub-population. Instead, we rely on the Visitor Hunting Survey of approximately 1500 visitor hunters to describe this population and their trips.

⁵⁶ This calculation was based on data on 2011 airfares between Seattle and Anchorage from the U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics. See <http://www.transtats.bts.gov/>.

cruises. These assumptions are consistent with those frequently made by others that have analyzed visitor spending in Alaska. They may cause our results to underestimate or overestimate the within-Alaska expenditures, depending on the extent to which some portion of visitors' expenditures on airfare and cruises support purchases of goods and services from workers and businesses inside Alaska, the extent to which other packages cover purchases of goods and services outside of Alaska, and the extent to which the average airfare from Seattle to Anchorage reflects the actual expenditure. The magnitude of these differences is not known.

Wildlife-Related-Only Expenditures: Some respondents indicated they would have taken the trip that constitutes the basis for their responses to the survey even if they had not planned on hunting or viewing wildlife. Approximately 27 percent of resident hunters, 21 percent of visitor hunters, 84 percent of resident wildlife viewers, and 75 percent of visitor wildlife viewers responded that they would have taken their trip even if they had not planned on the wildlife-related activity. We excluded most of the expenditures reported by these respondents because their responses indicate that they would have made such expenditures without regard for the state's wildlife and, hence, they do not represent an economic impact of wildlife.

We did not, however, exclude certain expenditures—those with a clear wildlife connection—reported by those respondents. Specifically, we did not exclude hunting guide fees paid by hunters in such instances. Also, for visitor wildlife viewers who said they would have taken the trip even without viewing wildlife but who also indicated that wildlife viewing was 75 percent or more of the reason for deciding to take the trip, we did not exclude the trip expenditures at all.⁵⁷ After accounting for the wildlife viewers in this group, we reduced the percentage of visitor wildlife viewers who would have taken their trip anyway—and, therefore, the percentage of related expenditures excluded from the analysis—from 75 percent to 64 percent.⁵⁸ This assumption may reflect situations where a visitor decided to take a cruise for other reasons, but chose a cruise to Alaska, rather than to another destination, largely because of a desire to view the state's wildlife.

We similarly reduced expenditures on gear and equipment reported by respondents to reflect just the percentage of time that they indicated the gear would be used for wildlife-related activities in Alaska. The percentages varied. For example, respondents to the resident hunting survey indicated, on average, that the hunting equipment they purchased in 2011 would be

⁵⁷ Respondents who indicated that they would have taken the trip even if they had not planned on viewing wildlife or hunting may have had other trip purposes contributing to the reason they took the trip (business, visiting family, other recreation in Alaska, etc.). Such trips generally are excluded from an economic impact analysis, since the trip would have been taken, the money spent, and the local impacts generated without the activity (wildlife viewing or hunting) in question occurring. We elected to include, however, the visitor wildlife-viewing trips with the strongest connection to the activity: those for which respondents indicated that, although they would have taken the trip anyway, wildlife viewing was 75-100 percent of the reason for taking the trip.

⁵⁸ Ultimately, we handle these various assumptions by using the "total trips" and "adjusted trips" data reported in Table 3. Most trip expenditures are multiplied by the adjusted number of trips. Guide fees are multiplied by the total number of trips.

used for hunting in Alaska 90 percent of the time. In contrast, respondents to the resident wildlife viewing survey indicated, on average, that the airplanes and accessories they purchased in 2011 would be used for wildlife viewing in Alaska 23 percent of the time.⁵⁹

Regional Spending: For all expenditure categories except package expenditures, the questionnaires asked respondents to indicate the region or regions in Alaska where the expenditure occurred. This distinction is important because trip-related spending does not necessarily occur in the same region as the trip. Because of its role as a commercial hub, residents of the other four regions, for example, might purchase in the Southcentral Region goods and services they use on trips in these other regions. For both residents and visitors, trip spending may also occur en route to their destination.

If a respondent indicated that expenditures on a particular category of goods and services occurred in more than one region, we divided the expenditure evenly among the regions indicated. When a respondent failed to identify the region(s) of expenditure, we did not insist on this information because doing so likely would have caused an unacceptable number of respondents to refuse to complete the questionnaire. Instead, we report the amount in the “Region Unknown” category, excluding the amount of the expenditure from the regional calculations but including it in the state-level calculations.

We calculated package expenditures at only the state level, reflecting the absence of data for allocating them at a regional level.⁶⁰ As a consequence, the statewide totals for expenditures, economic activity, labor income, jobs, and governmental revenue exceed the sums of the corresponding regional numbers.

We examined the trip data in detail for respondents who purchased trip packages to investigate whether trip packages are more likely to involve visits to some regions more than visits to other regions. Respondents often visit more than one region on a trip, and a trip package may cover a particular outing as opposed to an entire trip. Therefore, we could not tell from the data where the specific outing that was covered by the trip package occurred (or exactly where the dollars were spent, as they are not necessarily spent in the same region as the visit). We examined the data, though, to see if any patterns emerged. The data showed that survey respondents who purchased trip packages visited, on average, more than one region on their trip. Of all the regional visits made by those respondents, 25 percent occurred in the Southcentral, 24 percent in the Southeast, 21 percent in the Interior, 20 percent in the Southwest, and 9 percent in the North. Although there is no direct relationship between package expenditures and the regions of trips that included package expenditures, it is possible that more of the in-state portions of

⁵⁹ See Appendix E for the percentages for each gear category on each survey.

⁶⁰ It is possible that package expenditures are more likely to be made in some regions more than others. Therefore, if we were able to distribute the package spending at the regional level, it may affect the regional spending totals for some regions more than others. We were unable to distribute the spending, though, because we do not have data on how the spending on package trips is distributed, either into categories of expenditures or by region.

the package expenditures occurred in the Southcentral Region and the Southeast Region and less in the North Region.

Extrapolating Expenditure Data from the Survey Samples to the Total Populations: The hunting and wildlife-viewing surveys provide detailed information on the characteristics and expenditures of households that engaged in hunting and wildlife-viewing activities in 2011. Based on these surveys, we developed separate estimates of the average expenditures per household per trip (by region of expenditure) for resident hunters, resident wildlife viewers, visitor hunters, and visitor wildlife viewers.⁶¹ Then, we extrapolated these average expenditures to the corresponding populations, using data from the population surveys (or, for visitor hunters, ADF&G hunting license database), to estimate the total expenditures for the entire resident or visitor population.

For trip expenditures, we multiplied the average trip expense (broken out by type of expense and region of spending) by the number of trips in 2011.⁶² For annual gear expenditures, we multiplied the average annual expenditures (disaggregated by type of gear and region of spending) by the number of participating households.⁶³

For example, resident hunters spent an average of about \$56 per trip on meals purchased at restaurants and bars (including fast food). We multiply that amount by the number of hunting trips,⁶⁴ yielding approximately \$43.2 million in expenditures on such meals. On average, about \$4 of every \$56 (approximately 7 percent) spent by hunters for meals at restaurants and bars (including fast food) are spent in the North. This accounts for approximately \$3.2 million in expenditures by resident hunters in the North.

As we describe below, there were instances where the average expenditures in a spending category were not statistically significant; therefore, extrapolating those data to the full population would not be appropriate. In the next sections, we describe how we treated those data.

⁶¹ Appendices H and I contain the average expenditure data per trip, at the regional level.

⁶² Recall that we exclude most of the spending on trips that would have occurred even without the wildlife-related activity. So, for most categories of trip spending we use a total trip number that excludes trips that would have been taken anyway. For a few categories of trip spending such as hunting licenses and guide fees, we include those amounts even on trips that respondents indicated would have been taken even without the wildlife-related activity. We do this because these types of expenditures have a clear connection to the wildlife-related activity and would not have been made if the wildlife activity had not occurred. Therefore, for those categories of expenditures, we use a total trip number that does not exclude trips that would have been taken anyway.

⁶³ Again, for visitor hunters we used the average expenditures from the Visitor Hunting Survey and the number of trips based on the one trip per hunting household for each visitor hunter in ADF&G's data.

⁶⁴ We calculate that Alaskans took approximately 1 million hunting trips in 2011. For purposes of calculating the economic impact of hunting, we exclude the trips that respondents said they would have taken even without the hunting activity. This amounts to approximately 770,000 hunting trips, which is the value we use in this calculation.

Statistical Significance and Data Aggregation at the Regional Level: As we describe above, we initially divided up the survey data on trip and gear expenditures by region of expenditure using the five regions of the state based on information that the respondents provided about where the expenditures occurred.⁶⁵ After all of the expenditures were divided into the regions, we calculated the average expenditure in each region for each type of trip. For some categories of expenditures, however, the average expenditure amounts at the regional level were not statistically significant. An average is not statistically significant if, given the variance of the sample, there is a high probability that the population average is equal to zero. We looked at the data at two levels of significance, 0.05 and 0.10. If the average was not significant at the 0.10 level—meaning we could not be 90 percent confident that the average was different from zero—then we aggregated the variable into a larger category, as described below. If the average was significant at the 0.10 level (90 percent confident), but not significant at the 0.05 level—meaning we could not be 95 percent confident that the average was different from zero— we flagged the result but did not aggregate the data into a larger category.⁶⁶

The lack of statistical significance in a spending category resulted from a low number of respondents with expenditures in that category, wide distributions in expenditures per trip reported by respondents, or both. In most cases, the results that were not statistically significant were isolated to one or two regions within the expenditure category—most often the North and the Southwest—although across the surveys, the lack of statistical significance occurred in the data for some variables in each region.

We preserved the detailed expenditure data where possible by lumping data that were not statistically significant at the regional level into a “Region Unknown” category within the same overall spending category.⁶⁷ For example, we calculated the average lodging expenditures by resident wildlife viewers in each region of the state. If the average expenditure was statistically significant in each region except in the North Region, we excluded the North expenditures from the regional analysis and, instead, lumped them with other unassigned lodging expenditures in a Region Unknown group. The lodging expenditures in all the other regions remained statistically significant, and we included them in the regional analyses. In the event that the lumping of data into the Region Unknown group produced an average that was not statistically significant, we removed the data from the analysis.

⁶⁵ In cases where respondents failed to identify the region of the state where the expenditure was made, we classified those expenditures as “Region Unknown.”

⁶⁶ The results of the significance testing are reported in Appendices G and H.

⁶⁷ There are other ways the data could have been lumped, but we found this method to minimize the loss of detailed data. Because most of the expenditures were statistically significant, if we had grouped expenditures together within a region, we would have lost a great deal of detail about the nature of the expenditures. And such lumping would not have eliminated the lack of statistical significance. Such changes in expenditure categories would also have had implications for the expenditure-multiplier analyses.

The effect of lumping data into the Region Unknown group varies. To illustrate, we provide two examples. First, the weighted but unextrapolated results from the Resident Wildlife-Viewing Survey show that, in total, respondents spent about \$10,011 on a category labeled “registration and fees” as part of their annual gear and equipment purchases.⁶⁸ The respondents provided information about where they purchased all but approximately \$1,300 of that amount. Therefore, in our calculations, the \$1,300 falls into the Region Unknown category. Where they did identify the region of purchase, the data were statistically significant except for approximately \$58 in purchases in the North, which were not statistically significant at either the .05 (95 percent confidence) or the .10 (90 percent confidence) level. After extrapolation from the sample to the entire population of resident wildlife viewers, the effect of lumping these purchases from the North region into the Region Unknown category was to increase the amount in that category from approximately \$580,000 to approximately \$606,000.

A second example: moving approximately \$56,000 of weighted but unextrapolated visitor hunters’ souvenir purchases from the North Region to Region Unknown to achieve statistical significance had a larger effect. After extrapolation from the sample to the population, it increased the amount of souvenir purchases lumped in the Region Unknown category (for which respondents provided no information about the region of purchase) from approximately \$400,000 to approximately \$900,000.

The total expenditures that we identify at the regional level in this report should be interpreted with confidence at, minimally, the 90 percent confidence level as the lower bound on expenditures in each region. That is, we assume the expenditures lumped into the Region Unknown category were actually made in regions of the state. With more information, we could allocate those expenditures into regions. We expect that the regions are not affected equally, so the actual spending in each region, accounting for this allocation, would not be proportional to these lower amounts.

Statistical Significance and Data Aggregation across Gear Categories: The surveys collected data on expenditures in many different categories of gear and equipment. The average expenditures in many of the categories were not statistically significant, so we aggregated them into several broader categories.⁶⁹ This had the effect of producing statistically reliable average expenditure data for the majority of gear and equipment categories. Any remaining data that were not statistically significant at the regional level were lumped into the Region Unknown group as described above.

⁶⁸ This category included “Registration and license fees (vehicle, boat, airplane, etc.)” and “other vehicle expenditures (storage fees, license, training, etc.)”

⁶⁹ These categories are Equipment (including hunting equipment, personal gear, camping gear, photographic equipment, defensive gear, and other gear); Vehicle (including terrestrial and aquatic vehicles, airplane and airplane accessory, and maintenance and repairs for vehicles); Registration and Fees (including other vehicle expenditures (storage fees, license, training, etc.) and registration and license fees), and Taxidermy.

3. **Participation Data**

In this section we describe the analysis and assumptions involved in processing the participation data for use in IMPLAN.

Extrapolating Household Participation in Hunting and Viewing from the Samples to the Total Populations: The Resident Population Survey and the Visitor Population Survey provide representative, i.e., statistically reliable, data on the percentage of Alaska households and visitors to Alaska that participated in wildlife viewing. In addition, the Resident Population Survey provides representative data on the proportion of Alaska households that participated in hunting. The Visitor Population Survey, however, does not provide representative data on visitor hunters because the number of visitors in this sample who reported they hunted was too small to yield reliable information. Therefore, for all activities except hunting by visitors, we multiply the percentage of households that participated in each activity from the survey samples by the total number of households in the corresponding population (Alaskans or visitors), yielding estimates of the total number of households that participated in each activity in 2011.

To calculate participation in visitor hunting, we did not extrapolate from the survey data. Instead, we relied on information from ADF&G's license database, which shows approximately 15,000 licensed visitor hunters in 2011.

Applied to the total population of Alaska, the survey results indicate that, of the 258,058 Alaska households in 2010,⁷⁰ approximately 199,000, or more than 75 percent, took one or more wildlife-viewing trips and approximately 95,500 took one or more hunting trips. Likewise, when applied to the total population of visitors (based on information from the AVSP showing an estimated 1.8 million visitors in 2011),⁷¹ the survey results indicate that approximately 670,000 visitor households engaged in wildlife viewing in 2011. The number of non-residents in ADF&G's hunting-license database (with an assumption that only one person per household hunted in 2011) indicates that approximately 15,000 visitor households engaged in hunting activities.

C. **Contingent Valuation Model and Analysis**

Analysis of the data from the contingent valuation questions generally involved calculating the average, additional dollar amount per household that respondents indicated they would have

⁷⁰ This household number comes from the 2010 Census.

⁷¹ Based on information from McDowell Group. 2012. *Alaska Visitor Statistics Program VI: Summer 2011*. March. Retrieved January 2013, from <http://commerce.alaska.gov/ded/dev/toubus/pub/2011AVSP-FullReport.pdf>; McDowell Group. 2012. *Alaska Visitor Statistics Program VI: Fall/Winter 2011-12*. November. Retrieved January 2013, from http://commerce.alaska.gov/ded/dev/toubus/pub/AVSP_VI_2012_Fall-Winter2011-12.pdf; and personal communication with McDowell Group.

been willing to pay for each of the wildlife-related trips and programs, and then extrapolating the average amounts to all relevant households or trips.

To calculate the average values, we used statistical methods specifically designed for the contingent valuation approach we employed: double-bounded dichotomous choice contingent valuation, which we describe above, in Section 1. In short, this method asks respondents whether they would have been willing to pay a given dollar amount. Then, they are asked a follow-up question asking about a different dollar amount—either half the original amount or double the original amount, depending on their response to the first dollar amount.

In general, these methods involved using regression analysis to create a model of the relationships between the responses to each set of dichotomous-choice questions, the given dollar amounts, and the demographic characteristics of the survey respondents.⁷² Using the income level of each respondent, for example, as a factor or “covariate”⁷³ in the regression model helped identify any potential relationship between respondents’ incomes and their willingness to pay. The covariates that were included varied by specification and depended on their significance in the regression and any estimation issues that arose, such as multicollinearity.^{74,75} That is, where a covariate was found to have a significant effect on mean willingness to pay, we controlled for this relationship by keeping the covariate in the regression model and then estimating mean willingness to pay at the mean value of each covariate.⁷⁶ We then evaluated each regression model at the mean values of each variable to yield a mean willingness to pay.

⁷² Specifically, we used a method economists call “probit regression” to estimate the mean amount respondents were willing to pay on each of these sets of questions. For more details on probit models see Gujarati, D. N. 2003. *Basic Econometrics*. Fourth Edition. pp. 608-615. We included control variables for a range of demographics. The model was implemented using the statistics software “Stata” with a user-created module named “doubleb.” The doubleb module implements the double-bounded model proposed by Hanemann, Loomis and Kanninen (1991). The module add-on for Stata can be found here: <http://ideas.repec.org/c/boc/bocode/s457168.html>. For guidance in conducting contingent valuation analyses in Stata and, specifically, applying double-bounded techniques see Lopez-Feldman, A. 2012. “Introduction to contingent valuation using Stata.” Munich Personal RePEc Archive. <http://mpra.ub.uni-muenchen.de/41018/2/>

⁷³ Also referred to as independent or explanatory variables, covariates are used to “explain” or “cause” changes in the dependent variables, in this case the value of the willingness to pay for that individual. See Gujarati, D.N. 2003. *Basic Econometrics*. Fourth Edition. p. 15.

⁷⁴ Multicollinearity refers to a situation where two covariates are highly correlated with each other or may “explain” each other and thus the relationship between either of these variables and the dependent variable cannot be ascertained. See Gujarati, D. N. 2003. *Basic Econometrics*. Fourth Edition. p. 342-345.

⁷⁵ The random value asked of each respondent was included in every specification and was significant in all the results presented here. The significance and behavior of other covariates differed depending on the survey and on the dependent variable. The demographic covariates we used were income, gender, education, ethnicity, age, and membership in conservation organizations. When specific demographic covariates were not significant in one of the models, we excluded them from the final specification of the model.

⁷⁶ For more guidance on this technique see Lopez-Feldman, A. 2012. “Introduction to contingent valuation using Stata.” Munich Personal RePEc Archive. <http://mpra.ub.uni-muenchen.de/41018/2/>

Once the modeling was complete, we extrapolated the results. Two of the questions involved the additional amount a household would have been willing to pay for trips. One asked hunters and wildlife-viewers to consider the trip taken during 2011, the other asked wildlife viewers to consider a hypothetical trip to an area managed to ensure seeing a desired species. For these questions, we extrapolated the results to the total trips in 2011.⁷⁷ The other two questions involved the amount a household would be willing to contribute to conservation funds, without regard to trips. For these questions, we extrapolated the results to the corresponding number of households. Appendix K contains the mean values from the CV analyses.

⁷⁷ For purposes of the contingent valuation analysis we did not exclude trips that would have been taken even without wildlife, as we did in the IMPLAN analysis. They are two different approaches to measuring related but distinct aspects of economic value, and they require different assumptions. The IMPLAN analysis is designed to isolate the spending and impacts related to wildlife by including only spending that would not have happened anyway. This contingent valuation analysis is designed to measure the gross and net economic value of trips regardless of whether respondents would have taken trips even without the wildlife-related activities. Therefore, the trips and spending relevant to each of the analyses differs.