

National Survey of Fishing, Hunting, and Wildlife- Associated Recreation, 2016

Design and Methodology Technical Report

Issued August 2019

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The 2016 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (FHWAR) Design and Methodology Technical Report is a modified version of the 2016 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation Technical Report that was prepared for internal use.

The internal Technical Report was developed under the direction of Lucinda P. Dalzell, FHWAR Survey Director, Associate Director for Demographic Programs-Survey Operations (ADDP-SO). Elke McLaren, FHWAR Team Lead, provided overall management and coordination. David Hornick and Nghiep Huynh developed the chapters describing the survey and sample design, response rates, weighting and estimation and variance estimation. Scott Novell also contributed to the weighting and estimation documentation and documented the editing and cleaning procedures. Tanner Cummings and Melissa Kresin contributed to the Design and Methodology Technical Report. The FHWAR Survey team is under the direction of Eloise K. Parker, Assistant Director for Demographic Programs-Survey Operations and Victoria Velkoff, Associate Director for Demographic Programs.

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Chapter 1. BACKGROUND

The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (FHWAR) is designed to provide information on participation and expenditures related to fishing, hunting, and other wildlife-related activities. The FHWAR has been conducted since 1955 and the 2016 FHWAR is the thirteenth National Survey. The 2016 FHWAR is the sixth National Survey that the U.S. Census Bureau has conducted under an Interagency Agreement (IAA) with the U.S. Department of the Interior, U.S. Fish and Wildlife Service (FWS). The survey is sponsored by the Association of Fish and Wildlife Agencies (AFWA) and funded through the Multistate Conservation Grant Programs, which is authorized by the Wildlife and Sport Fish Restoration Programs Improvement Act of 2000.

The objective of the 2016 FHWAR was to conduct a national-level survey using methods and techniques similar to those for previous National Surveys, from 1991 through 2011. The project was to provide national-level results and state results for Maine, Minnesota, Oklahoma, and Virginia that were directly comparable with the results from earlier National Surveys.

The 2016 FHWAR was administered by the Census Bureau using a multistage probability sample that represented all 50 states and Washington, D.C. The target population for the 2016 FHWAR was the household population. The sampling frame consisted of all valid housing units in the July 2015 Master Address File (MAF).

After sampling, the survey was conducted in three phases: a pre-screener sample, an initial screening of households to identify likely sportspersons and wildlife-watching participants, and a series of follow-up interviews of selected household members to collect detailed data about their hunting, fishing, and wildlife-related recreation during 2016. The FHWAR collects data for a calendar year. In order to reduce recall bias, the data were collected about every four-eight months.

The pre-screener interview consisted of a web-based instrument with a supplemental paper questionnaire, if a web response was not received from the sample address. The screener and detailed phase interviews were conducted in two modes: Computer-Assisted Telephone Interviewing (CATI) and Computer-Assisted Personal Interviewing (CAPI).

The Census Bureau was responsible for processing and disseminating the data, which included editing and imputing certain data items, creating weights and variance estimates, and developing public use microdata files and a national report.

Chapter 2. HISTORY OF THE NATIONAL SURVEY OF FISHING, HUNTING, AND WILDLIFE ASSOCIATED RECREATION

INTRODUCTION

The 2016 National Survey of FHWAR was designed to continue the data collection of the 1955 to 2011 Surveys. While complete comparability between any two Surveys cannot be achieved, this section compares major findings of all the Surveys. The principal characteristics of the 1955 to 2016 Surveys are summarized in Table 2.1, which shows the scope and design of all 13 Surveys.

Table 2.1 Major Characteristics of Surveys: 1955 to 2016

Characteristic	1955	1960	1965	1970	1975	1980	1985	1991	1996	2001	2006	2011	2016
Survey design: Prescreening interview mode and population of interest.....	X	X	X	X	X	X	X	X	X	X	X	X	Web/paper, 6 years and older
Screening interview mode and population of interest.....	Combined with detailed phase	Personal interview, 12 years and older	Personal interview, 9 years and older	Telephone interview, 6 years and older	Telephone/personal interview, 6 years and older	Telephone/personal interview, 6 years and older	Telephone/personal interview, 6 years and older	Telephone/personal interview, 6 years and older	Telephone/personal interview, 6 years and older	Telephone/personal interview, 6 years and older	Telephone/personal interview, 6 years and older	Telephone/personal interview, 6 years and older	Telephone/personal interview, 6 years and older
Detailed interview mode and population of interest.....	Personal interview, 12 years and older	Personal interview, 12 years and older. Substantial participants ¹	Personal interview, 12 years and older. Substantial participants ¹	Personal interview, 12 years and older. Substantial participants ²	Mail questionnaire, 9 years and older	Personal interview, 16 years and older	Personal interview, 16 years and older	Telephone/personal interview, 16 years and older	Telephone/personal interview, 16 years and older	Telephone/personal interview, 16 years and older	Telephone/personal interview, 16 years and older	Telephone/personal interview, 16 years and older	Telephone/personal interview, 16 years and older
Respondent's recall period.....	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year	4-8 months	4-8 months	4-8 months	4-12 months	4-12 months
Sample sizes: Prescreening phase (households).....	X	X	X	X	X	X	X	X	X	X	X	X	22,725
Screening phase (households).....	20,000	18,000	16,000	24,000	106,294	116,025	102,694	102,804	44,000	52,508	66,688	30,400	8,030
Detailed phase (individuals): Fishing and hunting	9,328	10,300	6,400	8,700	20,211	30,291	28,011	23,179	13,222	25,070	21,938	11,330	5,640
Wildlife watching ³	X	X	X	X	X	5,997	26,671	22,723	9,802	15,303	11,279	9,329	6,079
Response rates: Screening phase.....	NA	NA	NA	NA	95 percent	95 percent	93 percent	95 percent	71 percent	75 percent	90 percent	77 percent	83 percent
Detailed phase:													

Characteristic	1955	1960	1965	1970	1975	1980	1985	1991	1996	2001	2006	2011	2016
Fishing and hunting	NA	93 percent	NA	NA	37 percent	90 percent	92 percent	95 percent	80 percent	88 percent	77 percent	67 percent	67 percent
Wildlife watching ³	X	X	X	X	X	95 percent	94 percent	95 percent	82 percent	90 percent	78 percent	66 percent	64 percent
Level of reporting.....	National	National	National	National	State and National	State and National	State and National	State and National	State and National	State and National	State and National	State and National	National
Data collection agent....	Private contractor	U.S. Census Bureau	U.S. Census Bureau	U.S. Census Bureau	Private contractor	U.S. Census Bureau							

NA Not available. X Not applicable; wildlife watching (nonconsumptive) interviews were not conducted prior to 1980. Prescreening interview was introduced in 2016.

¹Spent \$5.00 or more or participated 3 days or more during the year.

²Spent \$7.50 or more or participated 3 days or more during the year.

³Termed "nonconsumptive" in 1980, 1985, and 1991 Surveys.

MAJOR CHANGES IN THE SURVEY

1955 to 1970 Surveys

The 1955 to 1970 Surveys included only substantial participants. Substantial participants were defined as people who participated at least three days and/or spent at least \$5.00 (the 1955–1965 Surveys) or \$7.50 (the 1970 Survey) during the surveyed year. Under most circumstances, the Surveys may be compared for totals, but the effects of differences should be considered when comparing the details of the Surveys.

The 1960, 1965, and 1970 Surveys differed from the 1955 National Survey in classification of expenditures as outlined below.

1. Alaska and Hawaii were not included in the 1955 Survey.
2. Expenditure categories were more detailed in 1970 than in earlier Surveys.
3. The 1960 to 1970 classification of some expenditures differs from the 1955 Survey in the following respects:
 - a. "Boats and boat motors" shown under "auxiliary equipment" were included in "equipment, other" in 1955.
 - b. "Entrance and other privilege fees" asked separately were included in "trip expenditures, other" in 1955.
 - c. "Snacks and refreshments" not included with "food" expenditures in the 1960 to 1970 reports were under "trip expenditures, other" in 1955.
 - d. Starting in 1960, expenditures on equipment, magazines, club dues, licenses, and similar items were classified by the one sport activity for which expenditures were chiefly made. In 1955, these expenditures were evenly divided among all the activities in which the sportsperson took part.
 - e. Compared with 1955, the 1960 to 1970 Surveys reported fewer expenditures within the "other" category because selected items were transferred to more appropriate categories.
 - f. Expenditures on alcoholic beverages were reported separately in the 1970 Survey.

4. The number of waterfowl hunters in the 1970 Survey is not comparable with those reported in the 1960 and 1965 Surveys. In 1960 and 1965, respondent sportspersons were not included in the waterfowl hunter total if they reported that they went waterfowl hunting but did not take the trip chiefly to hunt waterfowl. In 1970, all respondents who reported that they had hunted waterfowl during 1970, regardless of trip purpose, were included in the total. The number of hunters who did not take trips chiefly to hunt waterfowl in 1970 was 1,054,000.

1975 Survey

In contrast to previous Surveys which covered substantial participants 12 years old and older, the 1975 Survey based all the estimates on responses from individuals 9 years of age and older and did not select respondents based upon substantial participation as defined above. As a result, individuals who participated fewer than three days or spent less than \$7.50 on hunting or fishing were included in the estimates of participants, days of activity, and expenditures.

Categories of hunting and fishing expenditures differed from the previous four Surveys in that only major categories were reported. For example, hunting equipment expenditures were not further delineated by subcategory. Similarly, no detail was provided within the category of fishing equipment expenditures. Expenses for items such as daily entrance fees, magazines, club dues, and dogs were categorized as “other” in the 1975 report.

In addition to the above differences, the 1975 Survey gathered data on species sought for the favorite hunting and fishing activity. This data replaced the “chiefly” category where hunting or fishing was the primary purpose of the trip or day of activity. Data omitted in the 1975 Survey that were included in previous Surveys include the respondents’ population density of residence, occupation, and level of education.

1980 to 1985 Surveys

The 1980 and 1985 Surveys were similar. Each measured participants, rather than substantial participants. Questions were incorporated into the 1980 and 1985 Survey questionnaires to facilitate the construction of categories of data for comparisons with earlier Surveys. The use of “chiefly” to delimit primary purpose appeared in the 1970 and prior Surveys, and its use was continued in the 1980 and 1985 Surveys. The expenditure categories in 1980 and 1985 are similar to the 1970 categories with the addition of fish finders, motor homes, and camper trucks as separate categories. The definition of fishing included the use of nets or seines and spearfishing. An extensive wildlife-watching section was added in 1980, necessitating a separate detailed phase subsample.

As in the 1970 and 1975 Surveys, the 1980 and 1985 Surveys used a two-phase process to gather information from households and individuals. In the first phase, household respondents

were asked to identify each participant six years of age and older who resided in their household. In comparison, the 1975 and 1970 Surveys screened households for participants who were nine years of age and older. In the second phase, the detailed interview phase, interviews were conducted in person for the 1985, 1980, and 1970 Surveys and were conducted by mail for the 1975 Survey. Participants were included in the detailed phase of the Survey if they were at least 12 years old in 1970, 9 years old in 1975, and 16 years old in 1980 and 1985. As a result, the population of hunters and anglers was more narrowly defined in 1980 and 1985. However, estimates of sportspersons 6 years old and older, 9 years old and older, and 12 years old and older, derived from the screening phase, are available for comparison with past Surveys.

[Overview of 1991 to 2016 Surveys Significant Methodological Differences](#)

The most significant design differences in the six Surveys are as follows:

1. The 1991 Survey data was collected by interviewers filling out paper questionnaires. The data entries were keyed in a separate operation after the interview. The 1996, 2001, 2006, 2011, and 2016 Survey data were collected by the use of computer-assisted interviews. The questionnaires were programmed into computers, and the interviewer keyed in the responses at the time of the interview.
2. The 1991 Survey screening phase was conducted in January and February of 1991, when a household member of the sample households was interviewed on behalf of the entire household. The screening interviews for the 1996, 2001, and 2006 Surveys were conducted April through June of their survey years in conjunction with the first wave of the detailed interviews. The 2011 Survey also conducted screening interviews and the first detailed interviews April through June of 2011, but furthermore had an additional screening and detailed effort from February 2012 to the end of May 2012. The April–June 2011 screening effort had a high noncontact rate because of poor results using sample telephone numbers obtained from a private firm. The Census Bureau went back to the non-contacted component of the original sample in February–May 2012 and interviewed a subsample, requiring annual recall for those respondents. The Wave 3 screen sample was 12,484 of the total 48,600 household screen sample. A modification of the 2011 sampling scheme was to oversample counties that had relatively high proportions of hunting license purchases. The screening interviews for the 2016 Survey were conducted April 1, 2016 through May 15, 2016 in conjunction with the first wave of the detailed interviews.

The screening interviews for all six Surveys consisted primarily of demographic questions and wildlife-related recreation questions concerning activity in the previous year (1990, 1995, etc.) and intentions for recreating in the survey year.

In the 1991 Survey, an attempt was made to contact every sample person in all three detailed interview waves. In 1996, 2001, 2006, 2011, and 2016 respondents who were interviewed in the first detailed interview wave were not contacted again until the third wave (unless they

were part of the other subsample, i.e., a respondent in both the sportsperson and wildlife-watching subsamples could be in the first and third wave of sportsperson interviewing and the second and third wave of wildlife-watching interviewing). Also, all interviews in the second wave were conducted only by telephone. In-person interviews were only conducted in the first and third waves. The 2011 and 2016 Wave 3 screen phases were composed of both telephone and in-person interviews.

1991 Survey

A significant change was made in 1991 in the recall period used in the detailed phase of the FHWAR Surveys. The recall period in 1991 was shortened from the 12 months used in previous Surveys to 4 months in order to improve the accuracy of the data collected. As a result of that change, the Surveys conducted since 1991 cannot be compared with those conducted earlier.

The 1955 to 1985 Surveys required respondents to recall their recreation activities for the survey year at the beginning of the following year. The 1991 to 2016 Surveys went to the respondents two or three times during the survey year to get their activity information. The change in the recall period was due to a study¹ of the effect of the respondent recall length on Survey estimates. The study found significant differences in FHWAR survey results using annual recall periods versus shorter recall periods. Longer recall periods lead to higher estimates. Even when everything else was held constant, such as questionnaire content and sample design, increasing the respondent's recall period resulted in significantly higher estimates for the same phenomenon.

The recall study also found that the extent of recall bias varied for different types of fishing and hunting participation and expenditures. For example, annual recall respondents gave an estimate of average annual days of saltwater fishing that was 46 percent higher than the trimester recall estimate, while the annual recall estimate of average annual saltwater fishing trips was 30 percent higher than the trimester recall estimate. This means there is no single correction factor for all survey estimates when calculating trends from surveys using different recall periods. Reliable trends analysis needs to use data compiled from surveys in which the important elements, such as the sample design and recall period, are not significantly different.

1996 Survey

1. The 1991 Survey collected information on all wildlife-related recreation purchases made by participants without reference to where the purchase was made. The 1996 Survey asked in which state the purchase was made.
2. In 1991, respondents were asked what kind of fishing they did, i.e., Great Lakes, other freshwater, or saltwater, and then were asked in what states they fished. In 1996, respondents were asked in which states they fished and then were asked what kind of

¹Investigation of Possible Recall/Reference Period Bias in National Surveys of Fishing, Hunting and Wildlife-Associated Recreation, December 1989, Westat, Inc.

fishing they did. This method had the advantage of not asking about, for example, saltwater fishing when they only fished in a noncoastal state.

3. In 1991, respondents were asked how many days they “actually” hunted or fished for a particular type of game or fish and then how many days they “chiefly” hunted or fished for the same type of game or fish rather than another type of game or fish. To get total days of hunting or fishing for a particular type of game or fish, the “actually” day response was used, while to get the sum of all days of hunting or fishing, the “chiefly” days were summed. In 1996, respondents were asked their total days of hunting or fishing in the country and each state, then how many days they hunted or fished for a particular type of game or fish.
4. Trip-related and equipment expenditure categories were not the same for all Surveys. “Guide fee” and “Pack trip or package fee” were two separate trip-related expenditure items in 1991, while they were combined into one category in the 1996 Survey. “Boating costs” was added to the 1996 hunting and wildlife-watching trip-related expenditure sections. “Heating and cooking fuel” was added to all of the trip-related expenditure sections. “Spearfishing equipment” was moved from a separate category to the “other” list. “Rods” and “Reels” were two separate categories in 1991 but were combined in 1996. “Lines, hooks, sinkers, etc.” was one category in 1991 but split into “Lines” and “Hooks, sinkers, etc.” in 1996. “Food used to feed other wildlife” was added to the wildlife-watching equipment section, “Boats” and “Cabins” were added to the wildlife-watching special equipment section, and “Land leasing and ownership” was added to the wildlife-watching expenditures section.
5. Questions asking sportspersons if they participated as much as they wanted were added in 1996. If the sportspersons said no, they were asked why not.
6. The 1991 Survey included questions about participation in organized fishing competitions; anglers using bows and arrows, nets or seines, or spearfishing; hunters using pistols or handguns and target shooting in preparation for hunting. These questions were not asked in 1996.
7. The 1996 Survey included questions about catch and release fishing and persons with disabilities participating in wildlife-related recreation. These questions were not part of the 1991 Survey.
8. The 1991 Survey included questions about average distance traveled to recreation sites. These questions were not included in the 1996 Survey.
9. The 1996 Survey included questions about the last trip the respondent took. Included were questions about the type of trip, where the activity took place, and the distance and direction to the site visited. These questions were not asked in 1991.
10. The 1991 Survey collected data on hunting, fishing, and wildlife-watching by U.S. residents in Canada. The 1996 Survey collected data on fishing and wildlife-watching by U.S. residents in Canada.

2001 Survey

1. The 1991 and 1996 single race category “Asian or Pacific Islander” was changed to two categories “Asian” and “Native Hawaiian or Other Pacific Islander.” In 1991 and 1996,

the respondent was required to pick only one category, while in 2001 the respondent could pick any combination of categories. The next question stipulated that the respondent could only be identified with one category and then asked what that category was.

2. The 1991 and 1996 land leasing and ownership sections asked the respondent to combine the two types of land use into one and give total acreage and expenditures. In 2001, the two types of land use were explored separately.
3. The 1991 and 1996 wildlife-watching sections included questions on birdwatching for around-the-home participants only. The 2001 Survey added a question on birdwatching for away-from-home participants. Also, questions on the use of birding life lists and how many species the respondent can identify were added.
4. "Recreational vehicles" was added to the sportspersons and wildlife-watching special equipment section. "House trailer" was added to the sportspersons special equipment section.
5. Total personal income was asked in the detailed phase of the 1996 Survey. This was changed to total household income in the 2001 Survey.
6. A question was added to the trip-related expenditures section to ascertain how much of the total was spent in the respondent's state of residence when the respondent participated in hunting, fishing, or wildlife-watching out-of-state.
7. Boating questions were added to the fishing section. The respondent was asked about the extent of boat usage for the three types of fishing.
8. The 1996 Survey included questions about the months around-the-home wildlife-watching participants fed birds. These questions were not repeated in the 2001 Survey.
9. The contingent valuation sections of the three types of wildlife-related recreation were altered, using an open-ended question format instead of 1996's dichotomous choice format.

2006 Survey

1. A series of boating questions was added. The new questions dealt with anglers using motorboats and/ or non-motorboats, length of boat used most often, distance to boat launch used most often, needed improvements to facilities at the launch, whether or not the respondent completed a boating safety course, who the boater fished with most often, and the source and type of information the boater used for his or her fishing.
2. Questions regarding catch and release fishing were added. They were whether or not the respondent caught and released fish and, if so, the percent of fish released.
3. The proportion of hunting done with a rifle or shotgun, as contrasted with muzzleloader or archery equipment, was asked.
4. In the contingent valuation section, where the value of wildlife-related recreation was determined, two quality-variable questions were added: the average length of certain fish caught and whether a deer, elk, or moose was killed. Plus the economic evaluation

bid questions were rephrased, from “What is the most your [species] hunting in [State name] could have cost you per trip last year before you would NOT have gone [species] hunting at all in 2001, not even one trip, because it would have been too expensive?”, for the hunters, for example, to “What is the cost that would have prevented you from taking even one such trip in 2006? In other words, if the trip cost was below this amount, you would have gone [species] hunting in [State name], but if the trip cost was above this amount, you would not have gone.”

5. Questions concerning hunting, fishing, or wildlife-watching in other countries were taken out of the Survey.
6. Questions about the reasons for not going hunting or fishing, or not going as much as expected, were deleted.
7. Disability of participants questions were taken out.
8. Determination of the types of sites for wildlife-watching was discontinued.
9. The birding questions regarding the use of birding life lists and the ability to identify birds based on their sight or sounds were deleted.
10. Public transportation costs were divided into two sections, “public transportation by airplane” and “other public transportation, including trains, buses, and car rentals, etc.”.

2011 Survey

1. The series of boating questions added in 2006 was deleted.
2. Questions about target shooting and the usage of a shooting range in preparation for hunting were added. The types of weapon used at the shooting range were quantified.
3. Questions about plantings expenditures for the purpose of hunting were added.
4. “Feral pig” was re-categorized from big game to other animals for all states except Hawaii.
5. “Ptarmigan” was included as its own small game category, instead of lumped in “other.”
6. In previous Surveys, “Moose” was included as its own category only for Alaska. For 2011, “Moose” was included as its own big game category, instead of lumped in “other,” for all 50 states.
7. In previous Surveys, “Wolf” was included as its own category only for Alaska. For 2011, “Wolf” was included as its own other animal category, instead of lumped in “other,” for all 50 states.
8. The household income categories were modified. The top categories were changed from “\$100,000 or more” to “\$100,000 to \$149,999” and “\$150,000 or more.”
9. The “Steelhead” category was deleted from the saltwater fish species section, with the idea that it would be included in “other.”
10. The 2006 around-the-home wildlife-watching category that quantified visitors of “public parks or areas” was rewritten to wildlife-watching at “parks or natural areas.” This change was to make clear that respondents should include recreating at quasigovernmental and private areas.

11. The 2006 wildlife-watching equipment category “Film and developing” was rewritten to “Film and photo processing.”

2016 Survey

1. Recreational archery and target shooting with firearms questions were added to the screening instrument. These questions were not asked only of hunters; they were general population questions.
2. The around-the-home wildlife-watching questions in the screening instrument were changed from asking about four types of wildlife watching (observing, photographing, feeding, and maintaining natural areas or plantings for the benefit of wildlife) to asking one question (wildlife watching around the home).
3. The contingent valuation questions were deleted. These were the valuation questions for moose, elk, and deer hunting, walleye, trout, and black bass fishing, and away-from-home wildlife watching.
4. The questions in the special equipment section asking if the respondent would have bought the item if they had not gone hunting, fishing, or wildlife watching were deleted.
5. The screening instrument was redesigned to ask the 2016 participation of household members 16 years and older at the beginning of the interview. If the household member participated in 2016, the rest of the activity section in the screener, which covered participation in 2015, was skipped. The household member was selected for the detailed interview in the case of fishing and hunting. For wildlife watching, the household member was eligible for selection for the detailed interview.

Chapter 3. DESIGN OF THE NATIONAL SURVEY OF FISHING, HUNTING, AND WILDLIFE ASSOCIATED RECREATION SURVEY SAMPLE

INTRODUCTION

The 2016 FHWAR was designed to provide national-level estimates of the number of participants in recreational hunting and fishing and in wildlife-watching activities (i.e., wildlife observation). Information was collected on the number of participants, where and how often they participated, the type of wildlife encountered, and the amounts of money spent on wildlife-related recreation.

The requirements set forth by AFWA for the 2016 FHWAR dictated that the U.S. Census Bureau collect estimates of fishing, hunting and wildlife-associated activities at the national level as well as for four states (Maine, Minnesota, Oklahoma, and Virginia). In order to achieve statistically sound data outcomes for these geographies within budget, the Census Bureau redesigned the FHWAR sample to be more efficient.

Similar to FHWAR surveys from the past, the 2016 FHWAR required a multistage probability sample that represented all 50 states and Washington, D.C. (a national sample design). The first stage of the survey design involved the formation, stratification, and selection of primary sampling units (PSUs). The second stage involved sampling housing units (HUs) from the Census Bureau's Master Address File (MAF). For the 2016 sample design, the Census Bureau defined the PSUs using information related to hunting rather than using the Current Population Survey's (CPS) PSUs, which had been used in the past. The 2016 FHWAR PSUs targeted high hunter participation areas with the goals of minimizing the variance and minimizing field representatives' (FR) travel costs.

The past FHWAR surveys were designed to produce state-level estimates for each of the 50 states and the national-level estimates. In 2016, the FHWAR survey was designed to produce national-level estimates that are representative of the entire United States and state-level estimates for only Maine, Minnesota, Oklahoma, and Virginia. Thus, the Census Bureau defined the PSUs within these four states and the nine census divisions. The PSUs defined within the four states did not cross state boundaries; however, PSUs within a division and not in the four designated states could cross state boundaries, but did not cross division boundaries.

After sampling, the survey was conducted in three phases: a pre-screener sample, an initial screening of households to identify likely sportspersons and wildlife-watching participants, and a series of follow-up interviews of selected household members to collect detailed data about their wildlife-related recreation during 2016.

The target population for the 2016 FHWAR was the household population, which was similar to the 2011 FHWAR. The sampling frame consisted of all valid HUs in the July 2015 MAF.

THE MASTER ADDRESS FILE (MAF)

The Census Bureau's demographic surveys, including FHWAR, select their samples from two dynamic sampling frames, one for HUs and one for group quarters (GQs)², which are based on the MAF. The MAF is a national inventory of addresses that is continually updated by the Census Bureau to support its decennial programs and demographic surveys. The MAF is maintained by the Census Bureau's Geography Division (GEO).

The MAF replaced a variety of address sources used in the past to construct sampling frames for the demographic surveys. For the sample design based upon the 2000 and earlier censuses, the demographic survey samples were selected from a coordinated set of four sampling frames: the unit frame, the area frame, the GQ frame, and the permit new construction frame. The address sources for these frames included the official address list from the most recent census, block listings, and addresses from building permits.

Creating and Updating The Demographic Sampling Frames

The current HU Frame was created for the first time in 2013 and is updated every six months with the latest MAF data. GEO delivers MAF extracts twice each year, in January and July. A MAF extract is a "snapshot" of the MAF for a given county that reflects six months of Delivery Sequence File (DSF) and other updates.

The MAF filtering is a critical feature of the frame creation process; its outcomes can have an important effect on frame coverage. The MAF extracts contain all records from the MAF for a given county, including many that should not be eligible for the FHWAR HU Frame. The filtering rules designate each MAF record as either "valid" (passed the filter and eligible for the HU Frame) or "invalid" (failed the filter, ineligible for the Frame).

The FHWAR HU Frame takes the form of separate HU universes by county, just as the MAF extracts are separate by county. The HU Frame files are called the Unit Frame Universe Files (UFUFs). The original UFUFs for demographic surveys were created in 2013 and consisted of all the valid and invalid HUs from the MAF at that time. For FHWAR, only valid HUs from the July 2015 MAF were included in the UFUFs since the sample is a one-time sampling operation. Starting with those initial 2013 universe files, the UFUFs are updated every six months with MAF data in two ways:

1. Each existing UFUF record is updated with the most recent MAF data (addresses, block codes, etc.) and its latest filtering status.

²People living in GQs were not in-scope for FHWAR.

2. New growth records are added to the UFUF.

The UFUFs are also updated with sort information from the American Community Survey (ACS) and decennial block-level data as part of the annual sampling process, which takes place once each year as part of the January MAF processing cycle. Each survey participating in annual sampling can sort the frame units in its own way.

ADMINISTRATIVE DATA

To target high hunter participation areas, auxiliary data related to hunting were needed. With assistance from FWS, the Census Bureau received resident hunter license-holder counts for every county, parish, borough, and municipal area in 49 of 50 states from the states' wildlife agencies.^{3,4} FWS requested that the individual state send the most up-to-date data available. West Virginia was unable to produce such hunter counts; however, for the 2011 FHWAR, West Virginia did provide the Census Bureau the hunter counts.⁵ The Census Bureau made the decision to use the 2011 FHWAR hunter counts in West Virginia for the 2016 FHWAR sample design under the assumption that the numbers may not have changed much from 2011 and the counts were the best counts available for the state.

SAMPLE SIZE

2013 FHWAR Pre-Screener Test

The Census Bureau used a pre-screener, self-response questionnaire for the 2016 FHWAR, to determine whether the household members were eligible to participate in the follow-up detail questionnaire. Results from the 2013 FHWAR Pre-Screener Test were used to predict the response rates for the 2016 FHWAR pre-screener. Table 3.1 shows the pre-screener test response and nonparticipation rates used for the sample size calculations.

Table 3.1 2013 Pre-Screener Test Results

Response Status	Results	Rates
Non Respondent	No Return	60.97
Respondent	Nonparticipant	13.07
Respondent	Participant with phone numbers	17.60
Undeliverable	Undeliverable As Addressed (UAA's)	8.36

³State wildlife agencies provided resident hunter license-holder counts for the calendar year or the 12 months prior to purchase of the license for 2012, 2013 or 2014.

⁴Hunter counts were not requested from Washington, D.C. since hunting is not allowed in Washington, D.C. The sample in Washington, D.C. was included with certainty to have representation of the whole country.

⁵For the 2011 FHWAR, Census requested and received the same data from all 50 states, which was used to over/under sample HUs in the CPS defined sample areas to target hunters.

The nonparticipant and the phone number groups both returned their pre-screener test questionnaires, which amounted to approximately a 31% response rate.⁶ The pre-screener test results, the coefficient of variation (CV) requirements, and the cost estimates were used in combination when producing the total pre-screener sample size.

National Pre-Screener Sample Size

The 2016 FHWAR strived for a minimum of 8,000 households to interview for the screener questionnaire, which would result in an estimated CV of 8% for the national hunter estimate. In 2011, the national hunter CV was much lower at 3%. Due to 2016 FHWAR cost constraints, a 3% CV level was determined to be unreachable.

The formula used to calculate the estimated hunter CV was:

$$CV_{hunter} = \sqrt{(1 - p) * \frac{DEFF}{n * p}}$$

where

$$p = \text{proportion of hunters (0.06)}$$

$$n = \text{screener sample size}$$

the proportion of hunters was 0.06 (from the 2011 FHWAR), and the design effect (DEFF) was calculated as:

$$DEFF = DEFF_{subsample\ DEFF} * DEFF_{national\ DEFF}$$

where

$$DEFF_{subsample\ DEFF} = \frac{n * ((n_{CAPI} * (SF_{CAPI} * SI)^2) + (n_{CATI} * (SF_{CATI} * SI)^2))}{((n_{CAPI} * SF_{CAPI} * SI) + (n_{CATI} * SF_{CATI} * SI))^2}$$

$SF = \text{subsampling factor}$

$$SI = \text{Sampling Interval} = \frac{\text{July 2013 MAF Housing Unit Count}}{n}$$

⁶Respondents were given the option to call the Census Contact Center with questions or to complete the interview. The U.S. Government was shut down for two and a half weeks in the middle of the pre-screener test. The effects of the shutdown on the test are unknown, but should be taken into consideration when reviewing the results.

To achieve 4,000 CATI cases with valid phone numbers, the pre-screener sample size was determined to be 22,725.

$$PSS * 0.1760 = 4,000$$

With a sample size of 22,725, this leads to an estimated 13,855 nonrespondent households. A subsample of 1 out of every 3.4635 households would provide 4,000 CAPI cases.

$$22,725 * 0.6097 = 13,855$$

$$\frac{13,855}{SF_{CAPI}} = 4,000$$

Recall from Table 3.1, 0.1760 and 0.6097 were the proportions of the respondents who provided phone numbers and of nonrespondents for the 2013 Pre-Screener Test, respectively. The total estimated screener sample size would then be 8,000 households: 4,000 CAPI and 4,000 CATI.

Four States' Sample Size Calculations

The Census Bureau was required to produce state-level estimates for four states: Maine, Minnesota, Oklahoma, and Virginia. The requirement for these four states was that the hunter CV needed to be no larger than 15%. Using past data and generalized variance parameters, the Census Bureau calculated the sample sizes needed for the four states.

For each of the four states, the following steps were used to determine state samples sizes:

- 1) The 2011 state CV was calculated using 2011 generalized variance function a and b parameters:

$$SE_{state} = \sqrt{a * hunters_{state}^2 + b * hunters_{state}}$$

$$CV_{state} = \frac{SE_{state}}{hunters_{state}}$$

where SE_{state} is the standard error (SE) for the state estimate of the number of hunters, and $Hunters_{state}$ is the state estimate of the number of hunters.

- 2) The estimated number of 2016 cases to be completed using the 2011 completed screeners, the 2011 CV, and the required 2016 CV was calculated:

$$2016 \text{ Cases to Complete} = \left(\frac{2011 CV_{state}}{\text{Target } 2016 CV_{state}} \right)^2 * 2011 \text{ Completed Screeners}$$

- 3) The number of 2016 cases to assign were calculated as:

$$2016 \text{ Assigned Cases} = \frac{2016 \text{ Cases to Complete}}{2011 \text{ Ratio of Complete to Assigned}}$$

- 4) The expected 2016 CV was calculated by starting with a ratio of estimated completed screener interviews in 2016 to the complete screeners in 2011 and calculating the estimated 2016 *a* and *b* parameters as:

$$a = \frac{2011 a}{2016 \text{ Completed Cases} / 2011 \text{ Complete Cases}}$$

$$b = \frac{2011 b}{2016 \text{ Completed Cases} / 2011 \text{ Complete Cases}}$$

With these “new” *a* and *b* parameters the 2016 standard error (SE) for hunters was calculated with the assumption that the total number of hunters per state (*hunters_{state}*) would be the same as 2011. With the 2016 SE, the 2016 CV could also be calculated:

$$2016 SE_{state} = \sqrt{2016 a * hunters_{state}^2 + 2016 b * hunters_{state}}$$

$$2016 CV_{state} = \frac{2016 SE_{state}}{hunters_{state}}$$

Census Divisions’ Sample Size Calculations

The formulas used to calculate the Census divisions’ sample sizes are the same formulas used to calculate the four states’ sample sizes. The *a* and *b* parameters used are not published parameters; these were calculated specifically for this sample size exercise.

Table 3.2 Sample Sizes and Expected CVs for the Sample Areas

Sample Area Code	Sample Area	States	Sample Size	Hunter CV ⁷
01	New England	Connecticut, Massachusetts, New Hampshire, Rhode Island, Vermont	4,106	0.10
02	Middle Atlantic	New Jersey, New York, Pennsylvania	2,128	0.10
03	East North Central	Illinois, Indiana, Michigan, Ohio, Wisconsin	1,315	0.10
04	West North Central	Iowa, Kansas, Missouri, Nebraska, North Dakota, South Dakota	1,123	0.10
05	South Atlantic	Delaware, Florida, Georgia, Maryland, North Carolina, South Carolina, Washington, D.C., West Virginia	2,104	0.10
06	East South Central	Alabama, Kentucky, Mississippi, Tennessee	675	0.10
07	West South Central	Arkansas, Louisiana, Texas	868	0.10
08	Mountain	Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming	1,640	0.10
09	Pacific	Alaska, California, Hawaii, Oregon, Washington	3,015	0.10
23	Maine	Maine	796	0.15
27	Minnesota	Minnesota	352	0.15
40	Oklahoma	Oklahoma	1,210	0.15
51	Virginia	Virginia	3,393	0.15
Total			22,725	

FORMATION AND SAMPLE SELECTION OF PSUs

Sample Areas

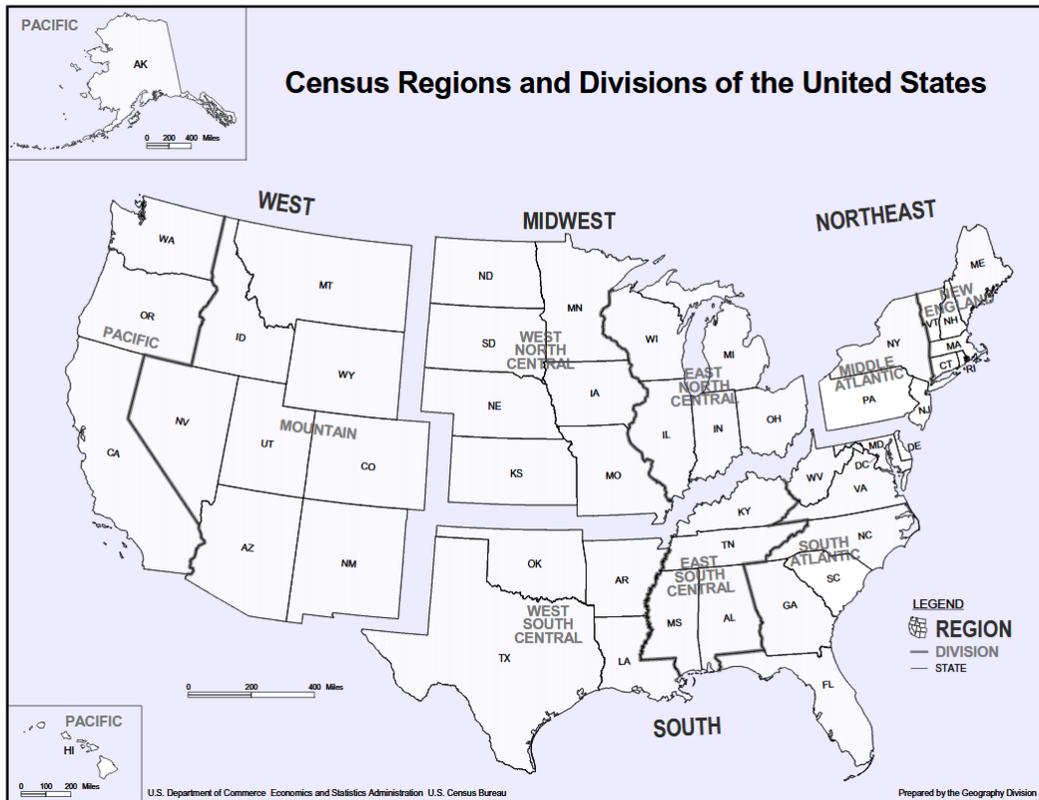
For the 2016 FHWAR, the Census Bureau was required to produce the national fishing, hunting, and wildlife-watching estimates along with individual state estimates for Maine, Minnesota, Oklahoma, and Virginia. The prerequisite HUs sample sizes for the four states were required to result in estimated CVs no larger than 15% for the number of hunters. The other forty-six states and Washington, D.C. received the remaining sample cases to arrive at a national sample of 22,725 HUs.⁸

⁷The estimated weighted CV for all sample areas was 0.08.

⁸The four states' sample sizes are included in the national estimates.

Figure 3.1 shows the four Census regions and nine Census divisions. The Census Bureau divided the balance of the United States into the nine census divisions, resulting in thirteen sample areas as represented in Table 3.2.

Figure 3.1 Census Regions and Divisions



Sample Area Preparation

Within each sample area, the overall sampling interval (SI) was calculated as the ratio of the sample area’s total 2015 Valid Housing Units (VHU) and sample area’s sample size.

$$Sampling\ Interval\ (SI) = \frac{Total\ 2015\ VHU}{Sample\ Size}$$

Percent license and expected sample size were calculated at the county level as follows:

$$Percent\ License = \frac{Hunter\ Count}{2013\ Population\ Count} * 100$$

$$Expected\ Sample\ Size = \frac{Total\ 2015\ VHU}{SI}$$

Percent license shows the percentage of the population per county that obtained a hunting license. The expected sample size shows the number of potential VHUs sampled for the pre-screener in each county, as the sample is proportional to sample size. These values were used in the formation of the PSUs.

Defining the PSUs

Defining of the PSUs occurred in each of the thirteen sample areas. Both self-representing (SR) and non-self-representing (NSR) PSUs were defined for all areas. SR PSUs consisted of individual counties, while NSR PSUs contained one or more counties.⁹

Self-Representing (SR) PSUs

A *combined score* was formulated to assist with the determination of counties to be SR PSUs. The combined score was comprised of the county's number of hunters, percentage of hunters, and 2015 VHU count. The counties within a sample area were ranked 1, 2, ..., n , where n = number of counties, for each of the three variables: number of hunters, percentage of hunters, and 2015 VHU counts. The combined score was calculated as follows:

$$\begin{aligned} \text{Combined Score} = & \text{Number of Hunters Rank} * 0.30 + \\ & \text{Percentage License Rank} * 0.25 + \\ & \text{VHU Rank} * 0.45 \end{aligned}$$

The proportions of 0.30, 0.25, and 0.45 were used for number of hunters rank, percentage license rank, and VHU rank, respectively, for SR PSU selection were chosen for several reasons.¹⁰ The percentage of licenses was important to the sample design but, in many cases, counties with higher percentages of licenses also had lower population counts, particularly in rural counties. The Census Bureau would have liked to include all high-percentage license counties for sampling purposes, but having a county with an expected sample size of less than one HU would be costly and inefficient. This is why the VHU rank proportion was higher, at 0.45. The Census Bureau needed to find the hunters, but also needed to accurately represent the sample area. The number of hunters was also an important measure of hunting participation and was included in the combined score accordingly.

The combined score was then sorted lowest to highest. The lower the combined score, the more likely the PSU would be a SR PSU. Ward's hierarchical clustering method was performed

⁹Bedford County and Bedford City, Virginia were an exception and formed an SR PSU because the Census Bureau did not receive hunter counts from Bedford City. An assumption was made that the counts were combined within Bedford County.

¹⁰The West North Central division used the following formula for combined score, due to small expected sample sizes:

$$\text{Combined Score} = \text{number of hunter rank} * 0.2 + \text{percentage of hunter rank} * 0.15 + \text{VHU rank} * 0.65$$

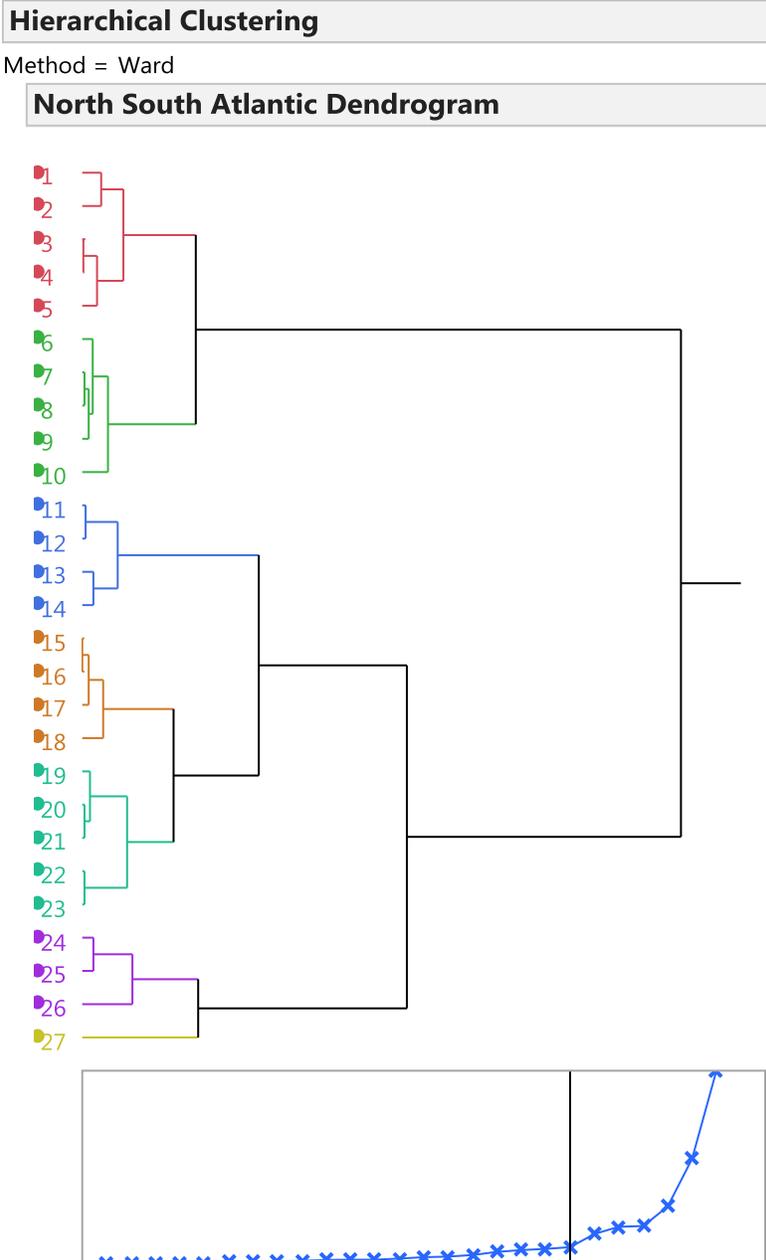
on the combined score using the interactive software JMP.¹¹ The number of PSUs to select as SR is not an exact science. The number of SR counties in the 2010 CPS design was looked at as a guideline, as well as considering the total sample size per sample area and the hunter activity distribution.

Figure 3.2 contains a colored dendrogram and distance graph to represent the results of the clustering analysis for a made-up example. This output, from the Ward's hierarchical clustering, helps guide the selection of a meaningful number of clusters. It is an acceptable practice to pick a point after the line has been flat and right before the graph's line shoots up (from left to right) on the dendrogram as the criteria to identify the SR PSUs. For this example, the first two clusters, made up of 10 counties, were identified as SR PSUs. The SR PSUs were formed from these ten individual counties and selected with certainty into sample. When forming the non-self-representing PSU, these counties were removed.

In Figure 3.2, the counties within the clusters were formed to be as homogeneous as possible based on the Ward's hierarchical clustering. The lines, moving from left to right, indicate the homogeneity of the paired counties. In this example, counties 3 and 4 are very homogeneous; whereas, county 27 is not as homogeneous as the others, and thus, is clustered by itself.

¹¹JMP is an interactive software developed by the SAS institute.

Figure 3.2 Hierarchical Clustering Dendrogram



Non-Self-Representing (NSR) PSUs and Formation of Strata

The NSR PSU creation method included many steps. Using JMP’s mapping software and a list of criteria, strata and NSR PSUs for each sample area were formed.

The geographical makeup of the strata were vital to the FHWAR for a number of reasons. The FHWAR asked specific questions on species of wildlife hunted, fished, and watched. If the stratum contained counties that were far apart from each other or had different types of

environmental makeup, then valuable information could be lost. For example, suppose three counties border saltwater and two other counties within the same stratum are mountainous. If a mountainous county were selected, the potential saltwater anglers could be missed altogether. Thus, in this example, the five counties should be put into two different strata: three saltwater counties in one stratum and the two mountainous counties in a different stratum.

Criteria and Priorities

The following five objectives, in priority order, were set to assist with the PSU selection and stratification:

1st Objective - Minimize the first stage component of variance (within strata, between PSUs); the variables of interest are number of hunters and percentage of hunters

- Between NSR strata hunter/percent score to be as heterogeneous as possible.

Hunter/percent score calculated as:

$$(\text{Number of Hunters Rank} * 0.5 + \text{Percentage License Rank} * 0.50)^{12}$$

- If possible, NSR PSUs within strata to be as homogeneous as possible, with respect to the hunter/percent score and geographic make up.

2nd Objective - At least 15 expected sample HUs per stratum to make FR workloads more efficient.

3rd Objective - Similar size NSR strata, in terms of the number of VHUs, to minimize between strata variance.

4th Objective - Counties of the same PSU need to be contiguous. NSR PSUs can be either single-county or a group of contiguous counties. PSUs should be within similar geographical areas.

5th Objective - Roughly equal PSU VHU sizes within a stratum to attempt to have equal probabilities of selection of PSUs.

Another rule that was applied when forming NSR PSUs was no PSU could be over 3,000 square miles (unless a single county is over 3,000 square miles). This rule was also used in the redesign of demographic surveys to minimize FR travel costs.

¹²The hunter/percent score is a measurement to assist with the mapping and identification of hunter activity. 0.5 was used because the number and percentage of hunters is equally important for forming the NSR PSUs.

PSU Sample Selection

The first stage of the two-stage probability sample involves selecting the PSUs.¹³ All of the SR PSUs were selected with certainty. For the NSR PSUs, one PSU was selected per stratum. The 2016 FHWAR NSR PSUs were selected with probability proportional to the size of the PSUs, where the measure of size is the PSU housing unit count.

Sample Design Summary Tables

Table 3.3 gives the number of strata, PSUs, and counties for the overall PSU sample design and breaks each category down to SR and NSR. One SR PSU in Virginia contains two counties – Bedford County and the City of Bedford,¹⁴ thus the number of counties is one greater than the number of SR PSUs in the tables below. Table 3.3 also provides the number of PSUs and counties in the 2016 FHWAR sample. Notice 753 PSUs were selected, one from each stratum.

Table 3.3 Sample Universe and In-Sample Counts

		Sample Universe	In-Sample
Strata		753	N/A ¹⁵
	SR	540	N/A
	NSR	213	N/A
PSU		2,013	753
	SR	540	540
	NSR	1,473	213
Counties		3,143	945
	SR	541	541
	NSR	2,602	404

¹³The second stage was sampling housing units within the selected PSUs.

¹⁴Independent cities are treated as counties.

¹⁵N/A Not Applicable. There is no “in-sample” for strata, as the sample was selected in PSU and counties.

Table 3.4 provides a breakdown of the sample and the number of SR/NSR PSUs in each sample area.

Table 3.4 Sample Universe, Sample Areas' Strata, County, and PSU Counts with In-Sample SR/NSR Counts

Sample Area	Strata	County	Primary Sampling Unit		
			Count	SR	NSR
01 – New England	21	51	44	9	12
02 – Middle Atlantic	49	150	110	29	20
03 – East North Central	103	437	233	78	25
04 – West North Central	60	531	291	36	24
05 – South Atlantic	110	455	245	73	37
06 – East South Central	79	364	175	59	20
07 – West South Central	93	393	270	83	10
08 – Mountain	72	281	273	56	16
09 – Pacific	57	167	159	44	13
23 – Maine	10	16	14	6	4
27 – Minnesota	24	87	56	18	6
40 – Oklahoma	24	77	51	14	10
51 – Virginia	51	134	92	35	16
Total	753	3,143	2,013	540	213

PRE-SCREENER SAMPLE: SAMPLE SELECTION OF HOUSEHOLDS WITHIN PSUs

The second-stage of FHWAR sample design was selecting valid HUs within the selected PSUs from the MAF/UFUF as defined for FHWAR. The HUs within the PSU UFUFs were selected using a systematic sample procedure. Within each sample area, the HUs were ordered by PSU number, Federal Information Processing Standards (FIPS) state code, FIPS county code, geocode flag, current block state, current block county, current block tract, current block code, ZIP code, and Master Address File Identification (MAFID) number.

A sample area sampling interval (SI) was calculated using the housing unit count within the sampling area divided by the total sample size for the sample area. The sample area was then multiplied by the probability of the PSU that was selected into sample to determine the within-PSU SI. This step ensured a self-weighting design in which each sampled HU had the same weight prior to interviewing.

A random integer was selected between 0 and the within-PSU SI to determine the first HU on the list that was in sample. The SI was added to the random number to identify the next HU in sample. This process, adding the SI to the most recent HU and identifying the sampled HUs, continued until the list of HUs, within the PSU, was exhausted. This sampling process was implemented in all PSUs, both SR and NSR.

A total of 22,725 total housing units were selected into sample. These addresses were mailed a pre-screener sample form.

Subsampling of Pre-Screener Sample

The eligibility of the 22,725 sampled addresses to receive a full detailed questionnaire was based on the mail out and internet results of the pre-screener questionnaire. As described earlier, the plans were to include 8,000 cases in sample split between the CAPI and CATI operations. Addresses that responded indicating that someone in the household had or was planning to participate in fishing, hunting, or wildlife-watching activities throughout the year were eligible to receive a detailed screener interview.

Households were put into five categories based on the response status or combinations of answers to the pre-screener questionnaire. These categories were an Undeliverable/Ineligible group, a Nonparticipant group, a CATI Certainty group, a CAPI Certainty group, and a CAPI Eligible group. These groups were identified as follows:

1. Questionnaires that were returned from the post office due to the addresses being nonexistent, an incomplete address from the MAF, vacant, commercial, or undeliverable for some reason were classified into the **Undeliverable/Ineligible group**. These addresses became out-of-scope for the FHWAR survey.
2. Questionnaires that were returned with sufficient data and indicated that no one in the household was likely to participate in any wildlife-related activities in 2016 were classified into the **Nonparticipant group**. These cases were considered good FHWAR responses and are included in the response rate calculations in Chapter 4.
3. Questionnaires returned with a valid phone number, sufficient demographic data, and indication that someone in the household was likely to participate in fishing, hunting or wildlife-watching activities in 2016 were classified into the **CATI Certainty group**.
4. Questionnaires returned without a valid phone number but containing sufficient data and indicating that someone in the household was likely to participate in fishing, hunting, or wildlife-watching activities in 2016 were classified into the **CAPI Certainty group**. These addresses were included in the detail screener operation with certainty.
5. All other questionnaires were classified into the **CAPI Eligible group** for subsampling.

Table 3.5 provides the results of the pre-screener mailing.

Table 3.5 Eligibility Results of the Pre-screener Mailing

Classified Collection Mode Eligible Group	Frequency
Undeliverable/Ineligible	3,266
Nonparticipant	2,772
CATI Certainty	3,339
CAPI Certainty	268
CAPI Eligible	13,080
Total	22,725

The 2,772 cases reporting on the pre-screener that they were not going to participate in the designated activities in 2016 were considered a complete interview. No further follow-up was conducted at these addresses.

The 3,339 cases classified into the CATI group were sent to the CATI facility in Jeffersonville, IN to collect the detailed screener by phone.

The 268 CAPI certainty cases were sent to the field for data collection by personal visit.

The survey budget allowed for a total of 4,000 CATI cases. Since fewer than 4,000 cases were in the CATI group, a phone number look-up operation took place to find a phone number associated with the address. A sample of 691 cases that had a secondary phone number, one not provided by the respondent, were selected for a CATI interview and sent to the CATI facility to collect the detailed screener by phone.

The remaining CAPI eligible cases were eligible for a personal interview. A subsample of 3,732 cases were selected for a total CAPI workload of 4,000 cases. Table 3.6 provides the results of all the subsampling.

Table 3.6 Mode of Data Collection

Mode	Frequency
CATI	3,339 ¹⁶
CATI/CAPI ¹⁷	691
CAPI	4,000
Nonparticipant (Pre-screener)	2,772
Total	10,802

¹⁶Thirty (30) cases responded to the pre-screener indicating that no one was going to participate. However, they did not provide enough information to include them in the weighting. Therefore, the Census Bureau followed up with these cases but did not count them as part of the 4,000 CATI cases.

¹⁷A phone number was found through a phone number look up operation and a subsample of CAPI eligible cases were selected to be sent to CATI.

Chapter 4. DATA COLLECTION METHODS

INTRODUCTION

This chapter details the 2016 FHWAR data collection methods designed to obtain quality data and optimize response rates within budget and scheduling constraints. The FHWAR collects data for a calendar year. In order to reduce recall bias, the data were collected about every four-eight months. For the 2016 FHWAR, the Census Bureau collected data via a pre-screener web/paper questionnaire, followed by a screener interview. Based on likely participation reported in the screener interview, household members were selected for detail interviews.

PRE-SCREENER INTERNET/PAPER QUESTIONNAIRE

The pre-screener operation consisted of a web-based instrument with a supplemental paper questionnaire, if a web response was not received from the sample address. The Census Bureau introduced the pre-screener internet/paper questionnaire operation based on a test of the process conducted in 2013. Results from the 2013 test and justification for incorporating that test methodology into the 2016 FHWAR are detailed in Chapter 2 of this document.

The pre-screener operation was conducted from January 4, 2016 through February 19, 2016. The first mailout was sent to all households on January 4, 2016 and consisted of the FHW-PS(L1) letter (refer to Appendix A, page 72, for a copy), with an invitation to access the website with the specified username and password. A 2011 QuickFacts brochure (refer to Appendix A, page 79, for a copy), was enclosed with each letter to illustrate the types of data collected in the FHWAR.

On January 15, 2016, the Census Bureau sent the FHW-PS(L2) reminder letter (which was very similar to the first letter) with a new username and password to each household where a response had not been recorded. The username and password from the first mailing were still valid but any entered data were not accessible with the username/password provided in the reminder letter. Included in this mailing was a paper questionnaire and return envelope to allow household respondents the flexibility to respond in a mode that was preferable to them (refer to Appendix B, pages 88-91, for a copy of the paper questionnaire).

On January 29, 2016, the Census Bureau sent a final copy of the FHW-PS(L2) letter with a new username and password to each household where a response still had not been recorded. The username and password from the first and second mailings were still valid but any entered data were not accessible with the username/password provided in the third letter. Included in this mailing was another copy of the paper questionnaire and a return envelope.

In each mailing, a toll-free number was included for respondents to contact the Census Bureau telephone interview staff with questions or concerns. The Census Bureau interviewers

attempted to conduct the interview with respondents who called in with questions. Data were entered through an administrative module of the internet instrument.

The paper questionnaires were returned to the Census Bureau National Processing Center (NPC) in Jeffersonville, Indiana. Once they arrived there, they underwent minor editing as well as keying and were transmitted to the Census Bureau programmer for further editing and processing. Data from internet submission, including data gathered by the Census Bureau interviewers, were transmitted directly to the Census Bureau programmer. Internet interviews were accepted through February 16, 2016. The Census Bureau shut down the internet site as of February 17, 2016. Paper questionnaires were accepted through February 19, 2016 to allow for final paper questionnaires to arrive at NPC. Chapter 5 of this document contains a detailed description of the editing and processing of the data.

WAVE 1 SCREENER AND FIRST DETAIL INTERVIEW

Based on the responses to the pre-screener questionnaire, a Wave 1 sample was selected as outlined in Chapter 2 of this document. The Wave 1 operation was conducted in two modes: Computer-Assisted Telephone Interviewing (CATI) and Computer-Assisted Personal Interviewing (CAPI). Cases with a viable phone number collected through the pre-screener or through vendor research (described in detail in Chapter 5) were assigned to CATI and cases without a phone number or nonresponsive to the pre-screener mailings were assigned to CAPI.

On March 23, 2016, all sample households were mailed the FHW-W1(L) advance letter, a 2011 QuickFacts brochure and FH-1 Reference Aid (refer to Appendix A, pages 73, 79, and 80-87, respectively, for copies). The Reference Aid was a collection of response options from a variety of questions in the questionnaire. The Aid was used to inform the household of the types of questions they would be asked in the upcoming interview and to help remind them of activity they participated in or purchases they may have made since January 1, 2016.

CATI and CAPI interviewing began on April 1, 2016 and continued through May 15, 2016 (refer to Appendix B, pages 92-94, for an abridged list of the questions asked). Both the CATI and CAPI instruments were designed to interview one respondent for a screener interview and the responses covered all members of the household. This household-level interview included the household roster, basic demographic information for each household member (age, sex, marital status, Hispanic origin, race, etc.), household income, and whether or not the household member had participated in fishing, hunting, or wildlife-related activities such as observing, feeding, or photographing wildlife so far in 2016. The screener interview also included questions on how likely current nonparticipants would be to participate in any of these activities during the remainder of the year.

Based on the responses to the screener questionnaire, the instrument sampled household members for a detail interview (refer to Appendix B, pages 95-126, for an abridged list of the questions asked). Eligible household members 16 years and older who had hunted or fished between January 1, 2016 and the date of the screener interview were selected for a sportsperson detail interview. Approximately 20% of household members 16 years and older who had observed, fed, or photographed wildlife between January 1, 2016 and the date of the screener interview were selected for a wildlife-watching detail interview. Household members could be selected for both the sportsperson and wildlife-watching sample – this is referred to as the “combo” sample.

WAVE 2 CATI DETAIL INTERVIEW AND WAVE 2 CAPI SCREENER AND DETAIL INTERVIEW

Wave 2 CATI Detail Interview

Once the Wave 1 screener data were processed, the Census Bureau subsampled household members for a Wave 2 sportsperson, wildlife-watching participant, or combination detail interview, based on criteria outlined in Chapter 3 of this document. If a household member was selected for a detail interview in Wave 1, they could not be selected for a Wave 2 interview for that sample (sportsperson or wildlife-watching). It was possible that a household member could be selected for a detail interview in one of the samples in Wave 1 and then be selected for a detail interview in the other sample for Wave 2. In 2016, 83.6% of the sample was selected for both samples.

The instrument was updated to conduct a person-based interview for Wave 2. Each household member selected for a Wave 2 interview was a unique case. Therefore, the Wave 2 workload included multi-unit households where a household had more than one case assigned to it. The Census Bureau systems were adjusted to accommodate linking multi-unit cases so that the interviewer could ask for all appropriate respondents with one call attempt. Wave 2 was conducted in CATI only. The questions and flow of the interview in the Wave 2 person-based instrument were identical to the Wave 1 detail instrument questions and interview flow.

On August 25, 2016, household members selected for a Wave 2 interview were mailed the FHW-W2(L) advance letter (refer to Appendix A, page 74, for a copy) with an FH-1 Reference Aid. The Reference Aid was the same document that was mailed in the Wave 1 mailing. The Census Bureau CATI interviewers began contacting respondents on September 1, 2016 by telephone. Interviewing concluded on October 16, 2016. If a respondent had moved or changed phone numbers since the Wave 1 interview, the interviewer was instructed to collect the new address and phone number and attempt the case at the new contact number.

Wave 2 CAPI Screener Interview

During Wave 1, the Census Bureau CATI interviewers experienced difficulty reaching households for a fairly large portion of the Wave 1 CATI sample. To decrease the nonresponse rate, the Census Bureau incorporated a Wave 2 CAPI screener interview into the methodology and sent a subsample of the Wave 1 CATI nonresponse cases for a CAPI personal visit. To accomplish this additional operation, the CAPI Wave 1 instrument was updated to allow for additional months of activities. Materials used in Wave 1 were provided to the field representatives (FRs), along with the notes from the unsuccessful Wave 1 CATI interview attempt, to increase the potential of a successful personal interview. As in Wave 1, households were mailed the FH-W1(L) advance letter with the 2011 QuickFacts brochure and the FH-1 Reference Aid. The Wave 2 CAPI screener operation ran concurrent with the Wave 2 CATI detail interview (September 1, 2016 through October 16, 2016).

WAVE 3 CATI AND CAPI DETAIL INTERVIEW

The Wave 3 interview was paramount to the success of the 2016 FHWAR. If a respondent did not complete a Wave 3 interview, the case was considered a non-interview and all prior detail interview responses could not be used to produce estimates, since a full year's worth of data had not been collected. Due to the importance of this last wave of interviewing, the Census Bureau scheduled a longer interview period and authorized more attempts to get a complete interview.

All detail sample persons from Wave 1 and Wave 2 were included for a Wave 3 interview. If a respondent had been selected for a sportsperson or wildlife-watching interview in Wave 1 and then selected for the other interview (wildlife-watching or sportsperson, respectively) for Wave 2, the respondent was included in both samples for the Wave 3 interview. As a reminder, 83.6% of the sample was selected for both samples in the 2016 survey.

Data from Waves 1 and 2 were provided in the Wave 3 input file to remind the respondent of prior responses and reduce double-reporting of participation and expenditures. In addition, questions regarding licenses and tags, land leasing and ownership, and big-ticket items, such as a motor boat purchase, were added to this wave of interviewing (refer to Appendix B, pages 95-126, for an abridged list of questions asked in Wave 3).

The Wave 3 interview was conducted in both CATI and CAPI. As in Wave 2, the Wave 3 workload included multi-unit households where a household had more than one case assigned to it. The Census Bureau CATI system accommodated linking multi-unit cases so that the interviewer could ask for all appropriate respondents with one call attempt. The CAPI interviewers grouped their cases by address so they could complete multi-unit cases in minimal visits or follow-up phone calls.

As in Wave 2, if the CATI or CAPI interviewer determined that the respondent had moved, they attempted to get the new address and phone number for the respondent and attempted to contact the respondent at the new number or address.

On December 21, 2016, all Wave 3 respondents were mailed one of three advance letters. Cases where an initial detail interview had not been completed were mailed an FHW-W3 NI(L), CAPI cases where an initial interview was completed were mailed the FHW-W3(L2) advance letter, and CATI cases where an initial interview was completed were mailed the FHW-W3(L1) advance letter (refer to Appendix A, pages 75-77, for copies). The FHW-W3 NI(L) letter explained that the household was contacted earlier in the year and stressed the importance of the survey. The FHW-W3(L2) and FHW-W3(L1) advance letters thanked the respondent for their previous participation and stressed that this would be the last interview for the survey. The FHW-W3(L1) advance letter also included a toll-free number for respondents to contact the telephone interviewer to complete their interview. Each advance letter included the FH-1.3 Reference Aid which was similar to the Reference Aid mailed in Waves 1 and 2. The FH-1.3 Reference Aid included some additional collections of response options due to the addition of large equipment purchase questions to the Wave 3 instrument. Similar to the FH-1 Reference Aid, this Aid was used to inform the respondent of the types of questions they would be asked in the upcoming interview and to help remind them of activity they participated in or purchases they may have made since their last interview.

The Census Bureau interviewers began contacting respondents on January 3, 2017 by telephone and personal visit. The Census Bureau CATI interviewers attempted each CATI case at least once through January 22. On January 23, the Census Bureau programmer and survey methodologist subsampled CATI cases that had not had any contact. These subsampled cases were recycled to the CAPI operation for a personal interview. The CATI interviewers continued to attempt the remaining CATI cases through closeout. CATI and CAPI interviewing concluded on February 28, 2017.

SUMMARY OF COMPLETE AND SUFFICIENT PARTIALS BY MODE OF INTERVIEW AND NUMBER OF CONTACTS

Table 4.1 describes the criteria for defining surveys as complete. Tables 4.2 through 4.5 detail the number of cases completed by mode of interview and number of contact attempts per case.

Each questionnaire had a separate criteria for determining a sufficient partial or complete. The pre-screener was the only questionnaire a respondent was given an option of completing on paper (versus one done on a computer, even if the respondent did a phone interview). As such, for the pre-screener at the minimum a specific section had to be completely filled out to be classified as a sufficient partial. In the computer assisted screener/detail sportsperson/detail

wildlife-watching questionnaires, since the questions had to be answered in the order the computer dictated a specific question had to be reached/answered (even if the answer was a refusal/don't know response).

Table 4.1 Criteria for Defining Returned Surveys as Complete

	<i>Sufficient Partial</i>	<i>Complete</i>
Pre-Screener	All questions in the demographic section (Step 5 – household composition) completed OR all questions in the avidity section (Step 6 – did anyone in household hunt/fish/wildlife-watch) completed.	All sections, including providing a phone number, were answered (Don't Know (D) and Refused (R) were considered valid responses).
Screener	N/A – No sufficient partials at this stage.	The household income question contained a response, which was the last survey question asked of the household respondent (D and R were considered valid responses).
Wave Surveys		
Detailed Sportsperson (includes fishing and hunting)	Completed questions up to and through the yes/no questions for the equipment primarily used for fishing (F_EQP2_J – “any other purchases” - which signified 80% of the survey had been completed) or hunting equipment if the respondent did not fish.	Completed the FH_OBSRV question (did sportsperson respondent participate in wildlife-watching activities at least 1 mile from home since last interview? – D and R were considered valid responses). This question came after all fishing and hunting questions; thus, all fishing and hunting questions were administered and answered.
Wildlife	Completed the yes/no questions for the wildlife-watching equipment purchases (NCUEQP2_H – “any other purchases” - which signified at least 80% of the survey had been completed).	Completed NCU_FISH (did wildlife-watching respondent participate in fishing activities?).
Combination (sportsperson & wildlife watching)	Completed the yes/no questions for the wildlife-watching equipment purchases (NCUEQP2_H – “any other purchases” - which signified at least 80% of the survey had been completed).	The interviewer reached the THANKYOU field. Because the combination cases did not receive the NCU_FISH or FH_OBSRV crossover questions.

Table 4.2 details screener cases by mode. The screener interview did not have a sufficient partial classification so values are reported for completed cases only.

Table 4.2 Summary of Complete Screener Cases by Mode of Interview

Screener Cases	Mode of Interview	
	CATI	CAPI
Wave 1 – Complete	2,241	2,641
Wave 2 – Complete	N/A ¹⁸	1,232
Total	2,241	3,873

Table 4.3 details the number of complete and sufficient partial sportsperson and wildlife-watching cases by mode. Note that respondents could be in both the sportsperson and wildlife-watching samples. Thus, it is not possible to sum the sportsperson total and wildlife-watching total to calculate the total respondents as there would be double-counting of respondents.

Table 4.3 Summary of Complete and Sufficient Partial Detail Cases by Mode of Interview

Detail Cases	Mode of Interview		
	CATI	CAPI	
WAVE 1	Sportsperson, Total	371	259
	Complete Interview	360	259
	Sufficient Partial Interview	11	0
	Wildlife Watching, Total	296	181
	Complete Interview	293	180
	Sufficient Partial Interview	3	1
Wave 1, Total¹⁹		629	414
WAVE 2	Sportsperson, Total	1,840	371
	Complete Interview	1,830	369
	Sufficient Partial Interview	10	2
	Wildlife Watching, Total	1,933	94
	Complete Interview	1,923	94
	Sufficient Partial Interview	10	0
Wave 2, Total		2,004	440
WAVE 3	Sportsperson, Total	1,370	2,579
	Complete Interview	1,361	2,570
	Sufficient Partial Interview	9	9
	Wildlife Watching, Total	1,509	2,509
	Complete Interview	1,497	2,500
	Sufficient Partial Interview	12	9
Wave 3, Total		1,598	2,741

¹⁸Wave 2 Screener was CAPI only.

¹⁹Note that the wave totals are not the sum of the sportsperson total and wildlife-watching total because a respondent could be in both the sportsperson and wildlife-watching samples. Rather, these totals represent the number of respondents in each wave by mode of interview.

Tables 4.4 and 4.5 summarize the number of contacts for complete or sufficient partial cases by interview period. Table 4.4 summarizes the number of contacts for complete and sufficient partial cases for household-level cases (pre-screener and screener). Note that the pre-screener paper questionnaire had a maximum of two contacts as a paper questionnaire was only included in the second and third mailings.

Table 4.4 Number of Contacts for Complete or Sufficient Partial Household-level Cases by Wave and Mode of Interview

Pre-Screener		Number of Contacts		
		<i>1</i>	<i>2</i>	<i>3</i>
<i>Internet</i>	Complete Interview	694	736	782
	Sufficient Partial Interview	26	32	36
<i>Paper</i>	Complete Interview	3,455	78	N/A
	Sufficient Partial Interview	542	1	N/A
Screener²⁰		<i>1-5</i>	<i>6-10</i>	<i>11+</i>
Wave 1 CATI		1,537	442	262
Wave 1 CAPI		1,695	463	120
Wave 2 CAPI ²¹		940	219	72

Table 4.5 summarizes the number of contacts for complete and sufficient partial cases for person-level cases (Wave 2 CATI, Wave 3 CATI, and Wave 3 CAPI). There were 363 Wave 1 CAPI and one Wave 2 CAPI households that had no contact attempt information. There were 12 Wave 3 CAPI cases that had no contact attempt information.

²⁰There were no sufficient partials in the Screener interview, therefore the number of contact attempts are for complete interviews.

²¹The Wave 2 screener workload was a subset of cases which were unsuccessfully attempted in Wave 1 CATI. The values in the Wave 2 screener rows indicate the number of contacts made during Wave 2 only and do not include any contact attempts made during Wave 1.

Table 4.5 Number of Contacts for Completed or Sufficient Partial Detail Cases by Mode of Interview

Person-Level Cases		Number of Contacts ²²		
		1-5	6-10	11+
WAVE 2 CATI	Single-Unit Cases, Total	488	118	64
	Complete Interview	485	116	62
	Sufficient Partial Interview	3	2	2
	Multi-Unit Cases, Total	619	582	133
	Complete Interview	617	580	132
	Sufficient Partial Interview	2	2	1
WAVE 3 CATI	Single-Unit Cases, Total	485	82	38
	Complete Interview	482	82	38
	Sufficient Partial Interview	3	0	0
	Multi-Unit Cases, Total	599	227	167
	Complete Interview	596	224	164
	Sufficient Partial Interview	3	3	3
WAVE 3 CAPI	Originated in CAPI, Total	1,638	361	62
	Complete Interview	1,634	358	61
	Sufficient Partial Interview	4	3	1
	Recycled from CATI, Total	571	78	19
	Complete Interview	570	78	19
	Sufficient Partial Interview	1	0	0

RESPONSE RATES

Several response rates for the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation can be calculated. Presented here are the response rates for the Wave 1 screener operations, Wave 2 screener operations, and Wave 3 operations. The Wave 1 and 2 screener operations are household-level response rates while the Wave 3 operation was based on person-level response rate.

²²For the Wave 2 Multi-Unit, Wave 3 Multi-Unit and Wave 3 CAPI (both Originated and Recycled) cases, the amount of contacts was averaged between household members in sample. The total number of contacts recorded for each household member in sample was combined and divided by the total number of household members in sample. That calculated sum (rounded to a whole number) was then set as the amount of contacts for each sample person in that household.

AAPOR Response Rate Calculator

Calculations for the 2016 FHWAR response rates were based on the AAPOR response rate calculator (Version 3.1, created in November 2010) found on the AAPOR website.²³ The CATI and CAPI outcome codes were mapped to the closest definable rows in the response rate calculator.

National Screener Response Rates

Table 4.6 provides the AAPOR response rate calculator with the results of the household data collections for both Wave 1 and Wave 2. Two columns are provided for each wave for the different modes of data collection. The Wave 2 columns combine all screener interviews for both screener waves. The cases that were considered recycled from Wave 1 had the outcome code overwritten with the Wave 2 CAPI outcome.^{24,25} These counts are included in the Wave 2 CAPI outcome column. The last column of the calculator is the sum of the CATI and CAPI operations that include the 2,772 pre-screener households that said that no one in the household was going to participate in any type of FHWAR activities.

Table 4.6 AAPOR Outcome Rate Calculator -- Household Screener Response Rates

	Wave 1		Wave 2		Final
	CATI	CAPI	CATI	CAPI	
Total phone numbers used	4030	4000	2333	5697	10802
Complete Interviews (I)	2103	2630	2103	3842	8717
Partial Interviews (P)	138	11	138	31	169
Refusal and break off (R)	565	528	79	778	857
Non-Contact (NC)	990	162	0	220	220
Other (O)	211	0	13	0	13
Unknown Household (UH)	0	0	0	0	0
Unknown other (UO)	0	0	0	0	0
Estimated proportion of cases of unknown eligibility that are eligible (e) ²⁶	0.994	0.833	1.000	0.855	0.924
Response Rates					
Response Rate 1: $I / (I+P) + (R+NC+O) + (UH+UO)$	0.525	0.790	0.901	0.789	0.874
Response Rate 2: $(I+P) / ((I+P) + (R+NC+O) + (UH+UO))$	0.559	0.793	0.961	0.795	0.891
Response Rate 3: $I / ((I+P) + (R+NC+O) + e(UH+UO))$	0.525	0.790	0.901	0.789	0.874
Response Rate 4: $(I+P) / ((I+P) + (R+NC+O) + e(UH+UO))$	0.559	0.793	0.961	0.795	0.891
Cooperation Rates					
Cooperation Rate 1: $I / (I+P+R+O)$	0.697	0.830	0.901	0.826	0.894

²³The AAPOR website is www.aapor.org, accessed on May 10, 2016.

²⁴CATI recycled cases switching mode of data collection from CATI to CAPI included outcome codes 020, 181, 183, 188, 193, 194, and 195 from the Wave 1 CATI operation.

²⁵See Appendix E on pages 141-142 for a list of CATI and CAPI outcome codes.

²⁶Enter a different value or accept the estimate in this line as a default. This estimate is based on the proportion of eligible units among all units in the sample for which a definitive determination of status was obtained (a conservative estimate). This will be used if you do not enter a different estimate. For guidance about how to compute other estimates of e, see AAPOR's 2009 *Eligibility Estimates*.

	Wave 1		Wave 2		Final
	CATI	CAPI	CATI	CAPI	
Cooperation Rate 2: $(I+P)/((I+P)+R+O)$	0.743	0.833	0.961	0.833	0.911
Cooperation Rate 3: $I/((I+P)+R)$	0.749	0.830	0.906	0.826	0.895
Cooperation Rate 4: $(I+P)/((I+P)+R)$	0.799	0.833	0.966	0.833	0.912
Refusal Rates					
Refusal Rate 1: $R/((I+P)+(R+NC+O) + UH + UO)$	0.141	0.159	0.034	0.160	0.086
Refusal Rate 2: $R/((I+P)+(R+NC+O) + e(UH + UO))$	0.141	0.159	0.034	0.160	0.086
Refusal Rate 3: $R/((I+P)+(R+NC+O))$	0.141	0.159	0.034	0.160	0.086
Contact Rates					
Contact Rate 1: $(I+P)+R+O / (I+P)+R+O+NC+ (UH + UO)$	0.753	0.951	1.000	0.955	0.978
Contact Rate 2: $(I+P)+R+O / (I+P)+R+O+NC + e(UH+UO)$	0.753	0.951	1.000	0.955	0.978
Contact Rate 3: $(I+P)+R+O / (I+P)+R+O+NC$	0.753	0.951	1.000	0.955	0.978

Final Wave 3 Detail Person Interview Response Rates

Table 4.7 provides the AAPOR response rate calculator with the results of the person-level detail questionnaire results from Wave 3. Two columns are provided for the two modes of data collection. The last column of the calculator is the sum of the CATI and CAPI operations.

Table 4.7 AAPOR Outcome Rate Calculator -- Wave 3 Detail Person Interview Response Rates

	CATI	CAPI	Total
Total phone numbers used	2907	3797	6704
Complete Interviews (I)	1586	2732	4318
Partial Interviews (P)	12	9	21
Refusal and break off (R)	521	572	1093
Non-Contact (NC)	532	401	933
Other (O)	178		178
Unknown Household (UH)			0
Unknown other (UO)			0
Estimated proportion of cases of unknown eligibility that are eligible (e) ²⁷	0.973	0.978	0.976
Response Rates			
Response Rate 1: $I/((I+P) + (R+NC+O) + (UH+UO))$	0.561	0.736	0.660
Response Rate 2: $(I+P)/((I+P) + (R+NC+O) + (UH+UO))$	0.565	0.738	0.663
Response Rate 3: $I/((I+P) + (R+NC+O) + e(UH+UO))$	0.561	0.736	0.660
Response Rate 4: $(I+P)/((I+P) + (R+NC+O) + e(UH+UO))$	0.565	0.738	0.663
Cooperation Rates			
Cooperation Rate 1: $I/((I+P)+R+O)$	0.690	0.825	0.770
Cooperation Rate 2: $(I+P)/((I+P)+R+O)$	0.696	0.827	0.773
Cooperation Rate 3: $I/((I+P)+R)$	0.748	0.825	0.795
Cooperation Rate 4: $(I+P)/((I+P)+R)$	0.754	0.827	0.799
Refusal Rates			

²⁷Enter a different value or accept the estimate in this line as a default. This estimate is based on the proportion of eligible units among all units in the sample for which a definitive determination of status was obtained (a conservative estimate). This will be used if you do not enter a different estimate. For guidance about how to compute other estimates of e, see AAPOR's 2009 *Eligibility Estimates*.

	CATI	CAPI	Total
Refusal Rate 1: $R/((I+P)+(R+NC+O) + UH + UO)$	0.184	0.154	0.167
Refusal Rate 2: $R/((I+P)+(R+NC+O) + e(UH + UO))$	0.184	0.154	0.167
Refusal Rate 3: $R/((I+P)+(R+NC+O))$	0.184	0.154	0.167
Contact Rates			
Contact Rate 1: $(I+P)+R+O / (I+P)+R+O+NC+ (UH + UO)$	0.812	0.892	0.857
Contact Rate 2: $(I+P)+R+O / (I+P)+R+O+NC + e(UH+UO)$	0.812	0.892	0.857
Contact Rate 3: $(I+P)+R+O / (I+P)+R+O+NC$	0.812	0.892	0.857

Chapter 5. DATA PREPARATION AND PROCESSING

INTRODUCTION

The main purpose of data preparation and processing is to take the response data gathered from each survey collection mode and survey wave to the point where it can be used to produce survey estimates. Data returned from the field and telephone center typically arrive in various stages of completion, from a completed interview with no problems to one with most or all of the data items left blank. There can be inconsistencies within the interviews, such that one response contradicts another.

Many processing procedures were necessary to prepare the 2016 FHWAR data for tabulation. This chapter details each data preparation procedure separately. There were procedures that occurred before each interview period, after the pre-screener, and after each of the three main waves of interviewing. Additional procedures were executed once all interviewing was completed. The final products produced were statistical tables and publicly released data text files (with codebooks and SAS conversion programs).

PREPARATION TO CREATE LABEL FILES AND INPUT FILES

Address Standardization

The initial sample was selected from MAF. To identify blank or incomplete addresses that should not be selected for use in the FHWAR survey, the sample was run through the NPC address standardization process. The process identified addresses that were deemed nonexistent/unmailable and they were removed from the sample. The remaining addresses were standardized to all have consistent formatting (i.e., placement of directional character in street name, similar spelling/abbreviations for street endings).

Telephone Research

Since the MAF did not contain phone numbers, the Census Bureau conducted a phone number lookup operation before the Wave 1 data collection operation. The MAFID for each sample case was sent to the Census Bureau's Center for Administrative Records Research and Applications (CARRA) where a phone number matching that location was returned if available. If a phone number was provided by a respondent in the pre-screener operation and the household was selected for Wave 1, that phone number was used as the primary contact number and any researched phone number was used as a secondary contact. If no phone number was returned in the pre-screener operation, the researched phone number, if available, was used as primary contact.

Input Files

Input files providing information for the instrument during interviewing were created for each wave. Wave 1 and Wave 2 screener input files were household-based and contained

information including case identification number, household address, phone number (if present), and some geographic information (if present, helpful to find an address if the case was assigned for a personal visit). The Wave 2 CATI input file included the same information as the Wave 1 and Wave 2 screener files, plus the respondent name/age/sex, any previous interviewer notes, and contact information (to aid in locating the respondent in a future interview). The Wave 3 input file included everything in the Wave 2 CATI input file plus select dependent data collected from previous Wave 1 and Wave 2 interviews to aid in recall of previous activity and purchases to avoid double-reporting of participation and expenditures.

DATA PROCESSING PER WAVE OF INTERVIEWING

The 2016 FHWAR had four set interviewing periods. The pre-screener, used to collect a phone number for the household and basic household composition, was conducted between January 4, 2016 and February 19, 2016. Wave 1 interviewing took place April 1, 2016 through May 15, 2016. Wave 2 interviewing took place September 1, 2016 through October 16, 2016. Wave 3 interviewing took place January 3, 2017 through February 28, 2017.

Pre-screener Interview Data Processing

The pre-screener interview was conducted both by paper questionnaire and internet response. Paper questionnaires were processed and keyed at NPC, with data transmitted back to the Census Bureau programmer. Consistency edits were performed on both paper and internet responses. Invalid phone numbers (i.e., all same digits, such as 333-333-3333 and obvious fake phone numbers, such as 123-456-7890) were blanked out.

Responses for the household composition section (total number of household members, number of people per age/sex group) were compared for consistency. If the total household member count was blank but individual member counts were provided, the summed member count was stored in the household count variable. If the household member count deviated from individual/summed member counts or all member counts were blank, individual member counts were adjusted.

An overall outcome status code was created for the pre-screener based on presence of phone number(s), presence of data in the household roster section, and presence of data in the basic avidity sections (did anyone in household hunt/fish/wildlife watch). The pre-screener outcome code was used to determine sample eligibility for a Wave 1 interview.

Screener Interview Data Processing

One household respondent provided the screener data for each member of the household. Data collected for the majority of questions were stored in arrays at the household level. Each member of the household was assigned a line number in the household roster. Post data-collection editing recoded the responses into person-level records. Fields where a household member's line number was reported for various avidity questions were recoded to reflect the

answer to the lead-in question (i.e., “Did you/anyone in the household hunt last year?”), so the line number response would be recoded to “1” (for yes) for that specific person record. Wave 2 (CATI) and Wave 3 interview operations were person-based so no data needed to be recoded in that manner.

If a person usually resided at an alternative address, they were deleted from the household roster and were ineligible for any further screener questions or sampling into a detail interview.

Detail Interview Data Processing

Detail interviews for all three waves generated similar output files from the computer instrument, with Wave 3 having additional files for annual expenditures and license/cost data. Each section of the detail interview instrument that had rostered data (i.e., states hunted in and related information, types of game hunted in each state) generated a separate output file. The end result of processing for each wave was a single combined data file, with one record per person where rostered information was collapsed in arrays.

Shifting Responses

Certain questions in the instrument were multiple choice entries, where the numbered answer categories were initially stored in the order they were provided by the respondent, even if that order was different than displayed in the instrument question. To aid in the use of the public data, each respondent answer choice was recoded to the value “1” for the specific answer category (i.e., answer choice “4” was recoded to “1” for slot/array position four of that variable/question name). This shifting of answers happened for the following interview questions:

- Which Great Lakes fished in (WHCHGL);
- Which type of fish (Saltwater, Freshwater, Great Lakes) fished for, with each type collected in a separate question in the instrument (SLTYP, FRTYP, GLTYP);
- Did respondent observe/photograph/feed wildlife in trips in/to state (FH_OBSRV – national question, for states: TRP1_Q1 - observe, TRP1_Q2 - photograph, TRP1_Q3 - feed);
- Did the birds the respondent (observed/photographed/fed) in state include birds of prey, waterfowl, other water birds, songbirds, and/or other birds (TYPBRD1 - birds of prey, TYPBRD2 - waterfowl, TYPBRD3 - other water birds, TYPBRD4 - songbirds, TYPBRD5 - other birds); and
- Did the respondent on trips to state observe/photograph/feed fish, large land mammals, small land mammals, marine mammals, and/or other wildlife (ANIMLS1 - fish, ANIMLS2 - large land mammals, ANIMLS3 - small land mammals, ANIMLS4 - marine mammals, ANIMLS5 - other wildlife).

The types of game hunted were stored both in the original order given by the respondent for the original variable/question name, and also recoded for ease of public data use to a value of “1” for specific slot/array positions in newly created variable names. All four types of game hunted (big game, small game, migratory birds, and other animals) were collected in one instrument question. For each type of game, a separate group of variables (named for the type of game) were created where a “1” was stored if that specific game type was hunted.

Recoding “Other Specify” for Species

In addition to providing a set list of hunting/fishing species a respondent could choose from, the instrument also provided “other specify” choices in which a text answer could be filled in. Using an automated process, if that response exactly matched the spelling of any of the set species already listed, the “other specify” response was blanked, the matched set species was filled, and any information tied to the other specify (i.e., days hunted, trips taken to hunt other specify species) was reallocated. In the final sportsperson public use data file only the fact that the respondent indicated an “other specify” species is provided. The exact text response was not provided for confidentiality reasons.

Filling Skipped Questions

If a question’s response could be exactly derived from other responses the respondent provided, that question was skipped during interviewing and filled in automatically during data processing. For example, respondents who fished in freshwater only states, or fished only for freshwater fish in other states, were not asked for number of freshwater days in that state. The value was taken from the respondent’s answer to the number of days fished in state overall or, if the respondent only fished in one state, the number of days fished in the United States.

Backfilling Day Values

The survey asked multiple questions related to how many days a respondent did hunting/fishing/wildlife-related activities. The days questions became more detailed as the interview progressed into the specific areas of participation, such as big game hunting. To ensure consistency among all answers in a direct logical chain, the more specific value was compared to the more general one. Preference was always given to the more specific values over the general values. If the more specific value was greater than the general value, the general value was changed to the specific value. If the sum of a group of more specific day values was less than a more general value and all specific day values had an entry (not including Don’t know and Refused), the general value was reduced to the calculated sum.

Renaming Variables

Each wave produced a number of output text files. In order to combine all those files into one main data file (one record per person), many of the variable names were renamed into arrays. For each sample (sportsperson, wildlife watching) there could be up to two interviews for the entire survey period. In most cases an “a” (for first interview) or “b” (for the second interview)

were added to the variable name, along with an array number whose maximum value represented the amount of responses from the most avid respondent receiving that question.

Blanking Don't Know/Refused Responses

Don't Know (D) and Refused (R) responses were included in the instrument to allow the respondent to bypass a question if they were uncertain of the response or were unwilling to give one. Those responses were blanked out in data processing.

DATA PROCESSING AFTER THREE WAVES OF INTERVIEWING

After all three waves of interviewing were completed, additional processing occurred to combine all the information collected in the three waves into one master record per person for the entire survey. The objective was to have a consolidated file that was easy to use in creating the statistical tables to be included in the National Report.

Renaming Variables

Variables that did not need to be renamed after each wave needed to be renamed when merging the three waves to create a consolidated file. High-level variables such as whether or not a respondent hunted in the United States in 2016 were given a “_1” or “_2” extension (indicating the data were collected in either the first or second interview, the second interview always referring to Wave 3). The final variable on the consolidated file maintained the original variable name. For yes/no questions, if the respondent answered “1” (for yes) in either wave, the final answer was “1”. If the respondent answered “2” (for no) in either wave and the other wave's response (if present) was “2”, “D” (for don't know), or “R” (for refused), the final answer was “2”. Day values for identical variables in each wave were summed, with the resulting value limited to the maximum days in 2016, which was 366 as it was a leap year.

For variables previously renamed by adding an “a” or “b” (for interview wave), final versions of those variables were created with a “d” extension of their original instrument name. All variables of that type were arrays of variables so also have an array number after the added letter ending. Information was copied into the “d” variables from the data for the first successful interview. If there was a second successful interview, corresponding matching variables (usually based on the state activity occurred in) were combined into one “d” entry. New “d” array positions were used to store data from the second interview that could not be merged with data from the first interview.

Some data in each interview wave had to be kept separate. For example, if a respondent bought equipment items in the same category in both interviews, all associated variables (i.e., cost, primary use of equipment, state(s) equipment bought in) were stored in variable names identified by the interview it was collected in. This was to allow the cost of the equipment to be divided correctly by the number of state(s) entered for that interview wave alone. These variables kept the names they were renamed to in each of the interview waves (a or b, 1 or 2).

Converting Percentages

For interview questions where the respondent was asked how much of their total trip cost to a particular state was spent in their resident state, the instrument gave the option of either providing a percentage or an exact dollar amount. During merging of the data for each wave, any percentage figure given was converted to the equivalent dollar amount.

Recoding 1/2 (Yes/No) to 1/0

Researchers using the public use data in the past had expressed the desire to easily tabulate how many positive answers a group of questions contained. “No” responses were changed from 2 to 0 to allow the researcher to simply sum up all the variable values to achieve their result, instead of having to individually test for “1” in each variable.

EDITING AND IMPUTATION

Once the data were combined, selected screener variables, if blank, were imputed. Those variables were age, race, sex, relationship to household respondent, marital status, and maximum schooling achieved (AGE, SCRACE, SEX, RELATION, MARITAL, and SCHOOL). The imputation process was a mixture of relational imputation (infers missing value from other persons/household characteristics) and “hot deck” allocation (assigns missing value from a record with similar characteristics). Age was imputed based on spousal relationship, parental/child relationship, or relationship to other household members, or it was assigned a hot deck value based on other households in related geographic areas. Race was imputed based on parental/child relationship, spousal relationship, relationship to other household members, or assigned a hot deck value based on other households in related geographic areas. Sex was imputed based on spousal relationship, or assigned to keep imputed gender counts equal. Relationship to household respondent was imputed based on presence of a spousal relationship in the household and age of person missing household relationship. Marital status was imputed if there was a spouse indicated in the household relationship question, presence of parents in household, or a household member was less than sixteen years old. Schooling was only imputed for people aged 16 years and older based on schooling level of other household members or assigned a hot deck value based on other households in related geographic areas.

Further imputation was conducted on demographic variables of the non-participant respondents from the pre-screener questionnaire. Age, race, sex, Hispanic origin, education, and household income were imputed for these cases since the collection of these data were not included on the pre-screener form and further contact to non-participating respondents did not occur. Therefore, distribution of these variables at the national level for all persons would not have been achievable. Thus, the imputation looked at the distribution of the detailed demographic variables and distributed the pre-screener respondents to the demographic groups to match the distribution for these variables to the ACS distribution at the national level.

After the imputation process, the screener, sportsperson, and wildlife-watching weights were calculated based on specifications from the Census Bureau's Demographic Statistical Methods Division (DSMD). The weights were used in creating the statistical tables and other values reported in the National Report. Weighting and estimation are described in more detail in Chapter 6 of this document.

Using the weighted master data file, the FWS reviewed special equipment expenditures and land leasing/ownership values to identify outliers at the national level. Only those values were examined due to their big impact on total expenditures. This step took place before topcoding was implemented. Even though identifying outliers was a manual process, there was a specific process/criteria on identifying values to be blanked.

Observations that had cost values above \$100,000 were examined. For those cases/respondents, records were flagged for further review if the household income was less than the individual cost/purchase, if the respondent had other big purchases, or if the other household members had high reported spending (especially if they reported identical values). A value was deleted if the weighted expenditure was flagrantly outside the normal range of values or the weighted observation made up a majority of the state's total expenditures (more common when a person from a big weight state bought something in a small weight state). A total of eighteen outlier values were identified for the 2016 survey year.

The Census Bureau's mandate to ensure confidentiality of released public data required a process to topcode select types of variables. For those variables, the top three entries, or the top three percent of entries if more than 100 entries in total, were averaged together. Since questions in the 2016 FHWAR survey asking for the number of days for any activity had a natural upper bound of 366 (since 2016 was a leap year) they were exempted from being topcoded. The majority of values topcoded were expenditure values and some land leasing and ownership values (i.e., number of acres, amount of members in group owning/leasing land).

Variances were created for select variables for the screener, sportsperson, and wildlife-watching samples separately. Refer to Appendix C for a list of the variables in each sample where direct variance values were calculated. Variances are covered in-depth in Chapter 7.

CREATING FINAL DATA PRODUCTS

To improve the usability of the public data, various summation variables were created. For example, a variable was created to represent the total number of days a respondent hunted big game in the United States in 2016. The value sums the entries for the instrument question regarding number of big game hunting days by state, or, if no other type of game was hunted in that state, the total number of hunting days for that state.

The 2016 FHWAR publicly-released data products were produced from a nationally-representative sample²⁸ unlike previous survey cycles which were both nationally and state representative. The initial sample was drawn based on thirteen nationally-represented sample areas (refer to Table 3.2 on page 17). Individual state values (i.e., state where the activity occurred, state that the expenditure was attributed to) collected during the survey were recoded to one of the first nine sample areas listed in Table 3.2. For the four test states where the Census Bureau selected state-representative samples, the states were recoded as follows:

- Maine was included with the “New England” sample,
- Minnesota was included with the “West North Central” sample,
- Oklahoma was included with the “West South Central” sample, and
- Virginia was included with the “South Atlantic” sample.

To further guard against the possible identification of a single respondent, certain variables/values released on the public use data files were suppressed. Some values of the geographic variables (population density, population size) were suppressed if weighted counts were less than a certain threshold when crossed with Census division. Even though a single race category was selected for use in creating the statistical tables in the National Report, all five multiple-choice race categories were provided on the public use file. For respondents that had selected certain combinations of race categories, the five individual race categorical values were suppressed, but the created single-race category/variable was kept in place. The data suppression of geography and race was applied after the data presented in the National Report was created, so not all values computed in the statistical tables can be recreated exactly using the public use data.

From the master data file used for the National Report, three separate public use files were created – a screener file, a file of sportsperson activity, and a file of wildlife-watching activity. Certain screener variables were also included in the sportsperson/wildlife-watching files for ease of data use. All three files were text files and SAS programs were created and released to the public for use in converting the text files into SAS data sets. For each file, a codebook listing all variable names, their sizes, start/stop locations on the flat file, and descriptions was created.

²⁸The Census Bureau also selected state-representative sample for four test states: Maine, Minnesota, Oklahoma, and Virginia. However, the data from these states were for analysis purposes only and not publicly released.

Chapter 6. WEIGHTING AND ESTIMATION

INTRODUCTION

A probability sample is defined as a sample that has a known non-zero probability of selection for each sample unit. With probability samples, unbiased estimators can be obtained. These are estimates that on average, over repeated samples, yield the population's true values. An unbiased estimator of the population total for any characteristic investigated in the survey may be obtained by multiplying the value of that characteristic for each sample unit (person or household) by the reciprocal of the probability with which that unit was selected and summing the products over all units in the sample (Hansen, Hurwitz, and Madow, 1953). By starting with unbiased estimates from a probability sample, various kinds of estimation and adjustment procedures (such as for non-interview) can be applied with reasonable assurance that the overall accuracy of the estimates will be improved. In the FHWAR sample, not all units responded, and this nonresponse is a potential source of bias. This nonresponse rate was 10.9 percent²⁹ for household units.

Other factors, such as occasional errors caused by the sample selection procedure or the omission of households or individuals missed by interviewers, can also introduce bias. These omitted households or people can be considered as having zero probability of selection. The probability of selecting each unit in the FHWAR is known, and every attempt is made to keep departures from true probability sampling to a minimum.

To produce FHWAR national estimates from survey data, a statistical weight for each person in the sample was developed through the following steps. The first step created a screener weight for all persons in the sampled households. The second step created a participation weight for those who were eligible to answer the detail questionnaires. Two participation weights were created, one for the sportspersons and the second for the wildlife-watching participants.

Creation of screener household weights involved the following steps:

1. Preparing a base weight derived from the FHWAR sampling probabilities;
2. Adjusting for subsampling of pre-screener units;
3. Adjusting for screener nonresponse;
4. Applying a first-stage ratio adjustment to reduce variances due to the sampling of PSUs;
5. Applying a second-stage ratio adjustment to reduce variances by controlling FHWAR estimates of the population to independent estimates of the current population – to create the final screener weight.

²⁹Using the American Association for Public Opinion Research (AAPOR) Response Rate calculator formula Response Rate 2. See Chapter 4.

Creation of the detailed sportsperson and wildlife-watching weights involved the following steps:

1. Applying an adjustment for detail interview nonresponse to the final screener weight;
2. Applying a ratio adjustment to screener person within defined participation strata.

Each of these steps is explained below.

SCREENER WEIGHTS

Base Weights

The sample designated in the FHWAR survey was selected with probabilities equal to the inverse of the required region/state sampling intervals. These sampling intervals are called the base weights. All sample households within the same region/state have the same probability of selection. The base weight is assigned to every person in the sampled housing unit (HU).

Pre-screener Subsampling Factor

As described in Chapter 3, a subsampling operation was implemented to subsample the addresses that did not respond to the pre-screener questionnaire. The pre-screener subsampling factor adjusted the base weights of the case eligible for this subsampling operation. The subsampling factor (SSF) was calculated as:

$$SSF = \frac{\text{Number of eligible pre-screener nonrespondents}}{\text{Desired number of CAPI interviews}^{30}}$$

This factor was applied to only those addresses that did not respond to the pre-screener questionnaire. All other cases received a pre-screener subsampling factor of 1.

The weight after this step is: (base weight) x (pre-screener subsampling factor)

Adjustment for Nonresponse

Nonresponse arises when households or other units of observation that have been selected for inclusion in a survey fail to provide all or some of the data that were to be collected. This failure to obtain complete results from all the units selected can arise from several different sources, depending upon the survey situation. There are two major types of nonresponse: item nonresponse and complete (or unit) nonresponse. Item nonresponse occurs when a cooperating HU/person fails or refuses to provide some specific items of information. Procedures for handling this type of nonresponse are discussed in Chapter 4. Unit nonresponse refers to the failure to collect any survey data from an occupied sample HU. For example, data

³⁰The desired number of CAPI interviews (4,000) in the denominator was reduced by the number of cases that responded in the pre-screener reporting that someone in the household was going to participate in an activity but did not provide a phone number to use in the CATI screener operation.

may not be obtained from an eligible household in the survey because of impassable roads, a respondent's absence or refusal to participate in the interview, or unavailability of the respondent for other reasons.

In the FHWAR estimation process, the weights for all interviewed households are adjusted to account for occupied sample households for which no information was obtained because of unit nonresponse (Type A non-interviews). This non-interview adjustment is made separately for four areas within each region/state. These areas are within:

1. The central city of a Metropolitan Statistical Area (MSA)
2. Balance of an MSA
3. Urban areas outside an MSA
4. Rural areas outside an MSA

The non-interview factor, NRF_{Aj} , is computed as:

$$NRF_{Aj} = \frac{I_{Aj} + NR_{Aj}}{I_{Aj}}$$

where

- I_{ij} = the weighted count of interviewed households in cell j of region/state A , and
- NR_{ij} = the weighted count of Type A non-interviewed households in cell j of region/state A .

At the completion of the non-interview adjustment procedure, the weight for each interviewed person is: (base weight) x (pre-screener subsampling factor) x (non-interview adjustment factor)

First-Stage Ratio Adjustment

The purpose of the first-stage ratio adjustment is to reduce the variance of region/state-level estimates caused by the sampling of PSUs; that is, the variance that would still be associated with the region/state-level estimates even if the survey included all households in every sample PSU. This is called the between-PSU variance.

There are a couple of factors to consider in determining what information to use in applying the first-stage adjustment. The information must be available for each PSU and correlated with as many of the statistics of importance published from the FHWAR as possible. By using the licensed hunter count, the first-stage ratio adjustment compensates for the fact that the licensed hunter count composition of a NSR sample PSU could differ from the licensed hunter

count composition of the stratum it is representing. This adjustment is not necessary for SR PSUs since they represent only themselves.

Computing First-Stage Ratio Adjustment Factors

The first-stage adjustment factors are based on hunter license information provided by the states and are applied only to sample data for the NSR PSUs. Factors are computed for each region/state containing NSR PSUs. The following formula was used to compute the first-stage adjustment factors for each region/state:

$$FSF_A = \frac{\sum_{i=1}^{PSU_A} Hunter\ Count_{Ai}}{\sum_{k=1}^{PSU_S} Hunter\ Count_{Ak} \left(\frac{1}{\pi_{Ak}} \right)}$$

where

FSF_A	=	the first-stage factor for region/state
$Hunter\ Count_{Ai}$	=	the number of licensed hunters in NSR PSU i (sample or nonsample) in region/state A
$Hunter\ Count_{Ak}$	=	the number of licensed hunters in NSR sample PSU k in region/state A
π_{Ak}	=	probability of selection for sample PSU k in region/state A
PSU_A	=	total number of NSR PSUs (sample and nonsample) in region/state A
PSU_S	=	number of sample NSR PSUs in region/state A

The estimate in the denominator of each of the ratios is obtained by multiplying the number of licensed hunters for each NSR sample PSU by the inverse of the probability of selection for that PSU and summing over all NSR sample PSUs in the region/state.

At the completion of the first-stage ratio adjustment, the weight for each responding person is the product of: (base weight) x (pre-screener subsampling factor) x (non-interview adjustment factor) x (first-stage ratio adjustment factor).

The weight after the first-stage adjustment is called the first-stage weight.

Second-Stage Ratio Adjustment

The purpose of the second-stage factor is to ensure that the sample-based estimates of population match independent population controls. The target population for the 2016 FHVAR is the household population aged 16 years and older. However, prior year participation data are

collected for children aged 6 through 15 as reported in Appendix D of the National Report, and so data were collected on the screener for all people aged 6 years old and older. Therefore, the population controls for FHWAR were divided into two groups: those aged 6-15 and aged 16 and older living in housing units.

For each region/state, the second-stage factor is:

$$SSF_{Ai} = \frac{P_{Ai}}{W_{Ai}}$$

where

- i = age group 6 to 15 years or age group 16 years and older
- A = is the region/state
- P_{Ai} = the independent estimate of the population in region/state
- W_{Ai} = the weighted survey estimate of the population in region/state. This is the sum of all first-stage person weights

At the completion of the second-stage ratio adjustment, the weight for each responding person is the product of: (base weight) x (pre-screener subsampling factor) x (non-interview adjustment factor) x (first-stage ratio adjustment factor) x (second-stage ratio adjustment factor).

After this adjustment, this is the final screener weight. All persons within the sampled households, regardless of participation status, receive a final screener weight.

DETAIL PERSON WEIGHTS

Two separate weights were created for the detail person weights. These weights are for the two detail subject matter sections of the questionnaire: one for the sportsperson sample questionnaire and the second for the wildlife-watching sample questionnaire. Details of each are provided below.

Sportspersons Sample

Information provided in the screener questionnaire allows stratification of the household members into strata based on their expected participation in sportspersons activities. For the 2016 FHWAR, the sportsperson strata were defined as:

- If the person already fished or hunted in 2016, the person was a sportsperson and assigned to **stratum 1**. These people received a detail interview right after completing the screener questionnaire – also referred to as Wave 1 interviewing.

- If the person last fished or hunted in 2015 for 10+ days or spent \$100+, the person was defined as an avid sportsperson participant and assigned to **stratum 2**.
- If the person last fished or hunted in 2015 for less than 10 days and spent less than \$100, the person was defined as an average sportsperson participant and assigned to **stratum 3**.
- If the person did not fish or hunt in 2015, but has fished or hunted since 2011 and was very likely to in 2016, the person was defined as an infrequent sportsperson participant and assigned to **stratum 4**.
- If the person did not fish or hunt in 2015, but has fished or hunted since 2011 and was somewhat likely to in 2016, the person was defined as an inactive sportsperson participant and assigned to **stratum 5**.
- If the person did not fish or hunt in 2015, but has fished or hunted since 2011 and was somewhat unlikely to in 2016, the person was defined as a nonparticipant and assigned to **stratum 6**.
- If the person was very unlikely to fish or hunt in 2016 or has not fished or hunted since 2011, then the person was assigned to **stratum 7**. Households from the pre-screener that indicated that no one was going to participate were included in this stratum.

All people in strata 2 through 7, due to small sample sizes, were eligible to be interviewed in Waves 2 and 3. In past surveys, a subsample of people were selected for Wave 2 and 3 interviewing.

Every interviewed person in the sportspersons detail sample, after wave 3 interviewing, received a weight that is the product of the following factors:

1. *Screening Weight*. This is the person's final weight from the screening sample.
2. *Sportsperson Stratum Adjustment*. This factor inflates the weights of persons selected for the detail sample to account for the subsampling done within each sportsperson stratum. For 2016, this factor was set to 1 because there was no subsampling.
3. *Sportsperson Non-interview Adjustment*. This factor adjusts the weights of the interviewed sportspersons to account for sportspersons selected for the detail sample for whom no interview was obtained. A person was considered a non-interview if he or she was not interviewed in the third wave of interviewing.

As shown in Table 6.1, eighteen nonresponse cells were formed within each region/state defined by the location of the address (MSA or non-MSA), age and sex (3 groups: 16-44 and 45+ for males and 16+ for females) and sportsperson stratum (Fished/Hunted in

Wave 1 – stratum 1, Likely to Fish/Hunt – strata 2, 3, and 4, and Unlikely/Very Unlikely to Fish/Hunt – strata 5, 6, 7).

Table 6.1 Non-interview Cells for Sportspersons

CBUR Status ³¹									
Stratum	Fished/Hunted in 2016		Likely to Fish/Hunt in 2016			Unlikely/Very Unlikely to Fish/Hunt in 2016			
Sex	M	F	M	F	M	F	M	F	
Age	16-44	45+	16+	16-44	45+	16+	16-44	45+	16+
C or B									
U or R									

4. *Sportspersons Ratio Adjustment Factor*. This is a ratio adjustment of the detail sample to the screening sample within the sportspersons sampling strata. This adjustment brings the population estimates of persons aged 16 years and older from the detail sample into agreement with the same estimates from the screening sample, which was a much larger sample. After this adjustment was applied, the final sportsperson weight was defined.

Wildlife-Watching Sample

Information provided in the screener questionnaire allows stratification of the household members into strata based on their expected participation in wildlife-watching activities. For the 2016 FHWAR, the wildlife-watching strata were defined as:

- If the person already participated in wildlife-watching activities in 2016, the person was a wildlife-watching participant and assigned to **stratum 0**. These people received a detail interview right after completing the screener questionnaire – also referred to Wave 1 interviewing.
- If the person participated in wildlife-watching activities already in 2016 but was not selected for a Wave 1 wildlife-watching interview, the person was a participant and assigned **stratum 1**.

³¹Census-defined code assigned to each person based on where the sample housing unit is located – C-Central City of a CBSA, B-Balance of a CBSA, Urbanized Area outside a CBSA, and R-Rural Area outside a CBSA. A CBSA is a Core Based Statistical Area which is a U.S. geographic area defined by the Office of Management and Budget (OMB) that consists of one or more counties (or equivalents) anchored by an urban center of at least 10,000 people plus adjacent counties that are socioeconomically tied to the urban center by commuting.

- If the person last took trips to participate in wildlife-watching activities in 2015 for 21+ days or spent \$300+, the person was defined as an avid participant and was assigned to **stratum 2**.
- If the person last took trips to participate in wildlife-watching activities in 2015 for less than 21 days and spent less than \$300, the person was defined as an average participant and assigned to **stratum 3**.
- If the person did not participate in wildlife-watching activities in 2015 but was very likely to in 2016, the person was defined to be an infrequent participant and assigned to **stratum 4**.
- If the person did not participate in wildlife-watching activities in 2015 but was somewhat likely or somewhat unlikely to in 2016, then they were assigned to **stratum 5**.
- If the person was very unlikely to participate in wildlife-watching activities, the person was defined to be a nonparticipant and assigned to **stratum 6**. Households from the pre-screener that indicated that no one was going to participate were included in this stratum.

Every interviewed person in the wildlife-watching detail sample received a weight that was the product of the following factors:

1. *Screening Weight*. This is the person's final weight from the screening sample.
2. *Wildlife-Watching Strata Adjustment*. This factor inflates the weights of persons selected for the detail sample to account for the subsampling done within each wildlife-watching strata.
3. *Wildlife-Watching Non-interview Adjustment*. This factor adjusts the weights of the interviewed wildlife-watching participants to account for wildlife-watching participants selected for the detail sample for whom no interview was obtained. A person was considered a non-interview if he or she was not interviewed in the third wave of interviewing.

As shown in Table 6.2, eight nonresponse cells were formed within each region/state defined by the location of the address (MSA or non-MSA), age (2 groups: 16-44 and 45+) and wildlife-watching stratum (Participated before screener interview 1 – strata 0 and 1, Very Likely, Somewhat Likely, or Unlikely/Very Unlikely to Participate – strata 2, 3, 4, 5, and 6).

Table 6.2 Non-interview Cells for Wildlife Watching

CBUR Status				
Stratum	Participated in 2016		Very Likely, Somewhat Likely, or Unlikely/Very Unlikely to Participate in 2016	
Age	16-44	45+	16-44	45+
C or B				
U or R				

4. *Wildlife-Watching Ratio Adjustment Factor.* This is a ratio adjustment of the detail sample to the screening sample within the wildlife-watching sampling strata. This adjustment brings the population estimates of persons aged 16 years and older from the detail sample into agreement with the same estimates from the screening sample, which was a much larger sample. After this adjustment was applied, the final wildlife-watching person weight was defined.

Chapter 7. VARIANCE ESTIMATION

INTRODUCTION

Since the estimates for the 2016 FHWAR come from a sample, they may differ from an enumeration of the entire population using the same questionnaires, instructions, and interviewers. For a given estimator, the difference between an estimate based on a sample and the estimate that would result if the sample were to include the entire population is known as sampling error. Variance and standard error (the square root of the variance) are statistical tools that take into account the magnitude of the sampling error. Although it is imperfect, the current variance estimation procedure is accurate enough for practical uses of data.

The current approach to estimate the design variances is the successive difference replication method. The theoretical basis for the successive difference method was discussed by Wolter³² and extended by Fay & Train³³ to produce the successive difference replication method, which has been used widely in most surveys conducted by the Census Bureau.

In the successive difference replication method, the first step in creating a variance estimate is constructing the replicate factors. The second step is to multiply base weights with replicate factors to create replicate base weights. The weighting process is then rerun by using each set of replicate base weights to create final replicate weights. Replicate estimates are created by using the same estimation method as the original estimate, but applying each set of replicate weights instead of the original weights. Finally, the replicate and original estimates are used to compute the variance estimate based on the variability of the replicate estimates and the original sample estimates. For the FHWAR, the Census Bureau used 160 replicates to calculate the variance estimates. For additional information on determining the number of replicates, see <http://www.census.gov/prod/2006pubs/tp-66.pdf>.³⁴ This chapter describes the methodology used to produce the direct variance estimates, such that forming 160 replicate factors and weights and using those weights to compute variance estimates.

Another way to produce variance estimates is to compute generalized variances by using GVFs. The GVF is a simple model that expresses the variance as a function of the expected value of the survey estimate. The model's parameters are estimated by using the direct replicate variances that are mentioned above. Although the replicate weights have advantages over GVF models, GVF models are easier to use than replicate weights because these models provide an easy way to obtain an approximate standard error on numerous characteristics. In addition,

³²Wolter, Kirk (1985), *Introduction to Variance Estimation*, New York: Springer-Verlag New York Inc.

³³Fay, Robert, and Train, George (1995), "Aspects of Survey and Model-Based Postcensal Estimation of Income and Poverty Characteristics for States and Counties," *Proceedings of the Section on Government Statistics*, American Statistical Association, Alexandria, VA, pp. 154-159.

³⁴Demographic Statistical Methods Division (October 2006), *The Current Population Survey: Design and Methodology*, U.S. Department of Commerce, U.S. Census Bureau, Technical Paper 66, Washington, D.C.

these GVF models have the stability in variance estimation and are more efficient in computation than using replicate weights. This chapter discusses the GVF models that the Census Bureau used in the FHWAR survey and estimating generalized standard errors.

REPLICATE FACTORS AND WEIGHTS

The Census Bureau computed replicate weights to estimate variances. In general, the unbiased weights are products of multiplying base weights with special weighting factors, then multiplying these unbiased weights with replicate factors to produce unbiased replicate weights. In addition, the unbiased replicate weights were adjusted by multiplying by non-interview adjustment factors, first-stage adjustment factors, and second-stage ratio adjustment factors to produce the full sample weights. Multiplying these adjustment factors represented the impact of the weighting adjustments on the variance.

The replicate factors and weights were created differently for the SR strata and the NSR strata. The Census Bureau derived both sets of replicate weights from methods known as “balanced half-sample” methods. Wolter discussed this methodology and Fay & Train extended the theory. The SR weights were created using the successive difference replication and the NSR weights were created using the modified half sample technique.

Replicates for the FHWAR survey were formed through a five-step process:

1. The first step was the construction of a $k \times k$ Hadamard matrix, where k is the number of replicates that will be formed.
2. In the second step, each SR case was assigned two rows of the Hadamard matrix and each NSR case one row.
3. In the third step, each sample case used the assigned rows from the Hadamard matrix to calculate its replicate factors.
4. In the fourth step, the replicate factors were multiplied by the full-sample weights to produce the replicate weights.
5. Finally, the full sample and each of the replicate samples went through the weighting process.

Refer to the end of this section for an example to reinforce the steps of the replication method used for FHWAR survey’s replicate weights.

Step 1: Construct the Hadamard Matrix

The first step in creating the replicate weights for the FHWAR survey was the construction of a Hadamard matrix. A Hadamard matrix \mathbf{H} is a $k \times k$ matrix with all elements either equal to +1 or -1. Hadamard matrices are unique in that they satisfy $\mathbf{H}_k \mathbf{H}_k^T = k \mathbf{I}_k$, where \mathbf{I} is the identity matrix of order k , \mathbf{H}_k is a $k \times k$ Hadamard matrix, and \mathbf{H}_k^T is the transpose of the $k \times k$ Hadamard matrix. The order k is necessarily 1, 2, or $4t$, where t is a positive integer. An example of a 2×2 Hadamard matrix is as follows:

$$\mathbf{H}_2 = \begin{vmatrix} +1 & +1 \\ +1 & -1 \end{vmatrix} \quad (1)$$

Note that:

$$\mathbf{H}_2 \mathbf{H}_2^T = \begin{vmatrix} +1 & +1 \\ +1 & -1 \end{vmatrix} \times \begin{vmatrix} +1 & +1 \\ +1 & -1 \end{vmatrix}^T = \begin{vmatrix} +1 & +1 \\ +1 & -1 \end{vmatrix} \times \begin{vmatrix} +1 & +1 \\ +1 & -1 \end{vmatrix} = \begin{vmatrix} 2 & 0 \\ 0 & 2 \end{vmatrix} = 2\mathbf{I}_2.$$

The Hadamard matrix allows the selection of certain replicate samples so that an unbiased estimate of the variance can be calculated with significantly fewer calculations than other half-sample methods. For the FHWAR survey, 160 replicates are used, and thus a 160×160 Hadamard matrix is used to form the replicate factors. See Plackett and Burman³⁵ for information on the construction of 160×160 Hadamard matrices.

Step 2: Assign Row Values

Assignment of the row values depends on whether the sample case is SR or NSR. As mentioned earlier, replicate weights are formed differently for SR and NSR sample. Each SR case in the full sample will use two rows of the Hadamard matrix and the NSR cases are assigned to one row.

a. Assignment of Row Values for SR Cases

Since the first row of most Hadamard matrices consists entirely of +1s, it is not assigned to a sample case. Therefore, the assignment process for the SR cases begins with the assignment of Rows 2 and 3 of the Hadamard matrix to the first sample case. The remaining row assignments are set up to ensure that consecutive sample cases share one row of the Hadamard matrix. Following this algorithm, Rows 3 and 4 are assigned to the second sample case. This row assignment continues until you reach the k^{th} row of the $k \times k$ Hadamard matrix. At this point, you skip over the first row and return to the second row for the next assignment. After assigning all the row numbers incrementing by one, continue assigning the row numbers starting from Row 2, but increase the increment interval to two. Using an increment of two, the assignment process will continue with Rows 2 and 4 for the next sample case, followed by Rows 4 and 6, Rows 6 and 8, and so on. Under an increment of two, cycle through the rows twice to pick up all the row numbers. After assigning all increments of two, assign the row numbers with an increment of three. Use three cycles while incrementing by three. Continue to increase the increment and number of cycles up to a maximum increment of ten and then start the assignments over with the increment of one (if the independent sample is large enough to make this necessary). This provides 1,590 unique row assignment pairs.

³⁵ Plackett, R.L. and Burman, J.P. (1946), "The Design of Optimal Multifactorial Experiments," *Biometrika*, 33, pp. 305-325.

b. Assignment of Row Values for NSR Cases

The NSR sampled strata are combined into pseudo-strata within each state to form paired strata. Each pseudo-stratum is assigned to a row of the Hadamard matrix. Within the pseudo-strata, one of the NSR Primary Sampling Units (PSU) is randomly assigned the replicate factor 1.5 and the other NSR PSU receives the factor of 0.5. These values are assigned based on the Hadamard matrix. When the value of the Hadamard matrix changes, the assigned replicate factor changes. For example, if the value of the Hadamard matrix is 1 and the first NSR PSU receives the replicate value of 1.5, the other NSR PSU receives a replicate factor of 0.5. When the value from the Hadamard matrix is -1, the first NSR PSU receives a replicate value of 0.5 and the second NSR PSU receives a replicate value of 1.5. These values are further adjusted to account for the unequal sizes of the original strata within pseudo-stratum.

In most cases the pseudo-strata consist of a pair of strata except where an odd number of strata within the state requires that a triplet be formed. In this case two rows of the Hadamard are assigned to the pseudo-stratum resulting in replicate factors of about 0.5, 1.7, and 0.8; or 1.5, 0.3, and 1.2 for the three PSUs assuming roughly equal sizes of the original strata. These values are further adjusted to account for the unequal sizes of the original strata within pseudo-stratum.

At the completion of the row assignment, each sample case will have *k* replicate factors - one factor for each replicate sample.

Step 3: Calculation of the Replicate Factors for the FHWAR Survey

The unique assignment of the row values to the SR sample cases ensures that the replicate factors take on one of three values: 0.3, 1.0, or 1.7. The replicate factors are calculated using the following formula:

$$\text{Replicate Factor}_{ir} = 1 + \left[(2)^{\frac{-3}{2}} \times h_{(RI,r)} \right] - \left[(2)^{\frac{-3}{2}} \times h_{(RII,r)} \right]. \quad (2)$$

where

- i = The sample case (i = 1, 2, ..., n)
- r = The replicate (r = 1, 2, ..., k)
- RI = The first row value assigned to sample case i
- RII = The second row value assigned to sample case i
- $h_{(RI,r)}$ = The (RI, r)th cell of the Hadamard matrix
- $h_{(RII,r)}$ = The (RII, r)th cell of the Hadamard matrix

NOTE: The Hadamard cell to use is determined by the assigned row values and the column number corresponding to the replicate number. For example,

when calculating a replicate factor for replicate 4, use the following cells from the Hadamard matrix: (RI, 4) and (RII, 4).

Step 4: Calculation of the Replicate Weights for the FHWAR Survey

Each case within a probability sample has a sample weight that reflects the inverse of its probability of selection (i.e., the base weight). The weight can be viewed as the number of population members this sample case represents. The fourth step in the replication method calculates the replicate weights for each replicate sample. The replicate weights are calculated using the following formula:

$$\text{Replicate Weight}_{ir} = \text{Replicate Factor}_{ir} \times \text{Basewt}_i \quad (3)$$

where

i	=	The sample case ($i = 1, 2, \dots, n$),
r	=	The replicate sample ($r = 1, 2, \dots, k$),
$\text{Replicate Factor}_{ir}$	=	The replicate factor for the r^{th} replicate of sample case i , and
Basewt_i	=	The full-sample base weight of sample case i .

Step 5: Perform the Weighting Process

The final step to create replicate weights for the FHWAR survey involved sending the full sample and each replicate sample through the weighting process. The weighting process involved a series of adjustments to ensure the final estimates were representative of the target population. After the weighting adjustments, the Census Bureau was able to calculate estimates of variance for any FHWAR estimate.

The base weights of the FHWAR survey's sample cases went through the following adjustments:

- FHWAR non-interview adjustment.
- First-stage ratio adjustment to reduce variances due to the sampling of NSR PSUs.
- Second-stage ratio adjustment to reduce variances by controlling to independent estimates of the current population.

Example of the Replication Method

In an attempt to reinforce the steps of the replication method used for the FHWAR survey, the Census Bureau created replicate samples for a sample data set. The sample data set consisted of five cases, all from an SR PSU. Four replicates were created for each sample case. The sample cases and their corresponding full-sample weights were as follows (assume the cases in this example were ordered in a manner reflective of the sample design):

Table 7.1 Sample Data for the Replication Method Example

Sample Case	Sample Weight
Case #1	15.00
Case #2	23.00
Case #3	19.00
Case #4	16.00
Case #5	21.00

Since four replicates need to be created, a 4×4 Hadamard matrix must be constructed. An example of a 4×4 Hadamard matrix is as follows:

$$H = \begin{pmatrix} +1 & +1 & +1 & +1 \\ +1 & -1 & +1 & -1 \\ +1 & +1 & -1 & -1 \\ +1 & -1 & -1 & +1 \end{pmatrix} \tag{4}$$

Recall that each sample case is assigned two rows of the Hadamard matrix. This assignment of rows begins with the second row and allows consecutive sample cases to share a row. The row assignments for the five sample cases are as follows:

Table 7.2 Assignment of Rows for Sample Data

Sample Case	Sample Weight	Row I	Row II
Case #1	30.00	2	3
Case #2	22.00	3	4
Case #3	15.00	4	2
Case #4	20.00	2	4
Case #5	25.00	4	3

Applying the Row I and Row II values into formula (2) for case #1, the following replicate factors are calculated:

$$RF_{11} = 1 + \left[(2)^{\frac{-3}{2}} \times h_{(2,1)} \right] - \left[(2)^{\frac{-3}{2}} \times h_{(3,1)} \right] = 1 + \left[\frac{1}{2\sqrt{2}} \times (1) \right] - \left[\frac{1}{2\sqrt{2}} \times (1) \right] = 1.0$$

$$RF_{12} = 1 + \left[(2)^{\frac{-3}{2}} \times h_{(2,2)} \right] - \left[(2)^{\frac{-3}{2}} \times h_{(3,2)} \right] = 1 + \left[\frac{1}{2\sqrt{2}} \times (-1) \right] - \left[\frac{1}{2\sqrt{2}} \times (1) \right] = 0.3$$

$$RF_{13} = 1 + \left[(2)^{\frac{-3}{2}} \times h_{(2,3)} \right] - \left[(2)^{\frac{-3}{2}} \times h_{(3,3)} \right] = 1 + \left[\frac{1}{2\sqrt{2}} \times (1) \right] - \left[\frac{1}{2\sqrt{2}} \times (-1) \right] = 1.7$$

$$RF_{14} = 1 + \left[(2)^{\frac{-3}{2}} \times h_{(2,4)} \right] - \left[(2)^{\frac{-3}{2}} \times h_{(3,4)} \right] = 1 + \left[\frac{1}{2\sqrt{2}} \times (-1) \right] - \left[\frac{1}{2\sqrt{2}} \times (-1) \right] = 1.0$$

Recall that the row value assigned in Table 7.2 and the column number corresponding to the replicate number determines the Hadamard matrix cell to use. Applying the Row I and Row II values in formula (2) for the remaining cases, the replicate factors will be as shown below in Table 7.3.

Table 7.3 Replicate Factors for Sample Data

Sample Case	Sample Weight	Replicate Factors			
		Replicate 1	Replicate 2	Replicate 3	Replicate 4
Case #1	30.00	1.0	0.3	1.7	1.0
Case #2	22.00	1.0	1.7	1.0	0.3
Case #3	15.00	1.0	1.0	0.3	1.7
Case #4	20.00	1.0	1.0	1.7	0.3
Case #5	25.00	1.0	0.3	1.0	1.7

Now that the replicate factors for each sample case have been calculated, the replicate weights can be calculated by using formula (3).

Table 7.4 Replicate Weights for Sample Data

Sample Case	Sample Weight	Replicate Weights			
		Replicate 1	Replicate 2	Replicate 3	Replicate 4
Case #1	30.00	30.00	9.00	51.00	30.00
Case #2	22.00	22.00	37.40	22.00	6.60
Case #3	15.00	15.00	15.00	4.50	25.50
Case #4	20.00	20.00	20.00	34.00	6.00
Case #5	25.00	25.00	7.50	25.00	42.50
Total	112.00	112.00	88.90	136.50	110.60

The last step in the creation of the replicate weights is the implementation of any weighting adjustments. In this example, a ratio adjustment is used to control the sample to the population total of 100.00.

Therefore, a separate ratio adjustment factor for the full sample and for each replicate sample is calculated. In this example, the ratio adjustment factor formula is as follows:

$$RAF_r = \frac{100.00}{\sum_{i=1}^5 w_i} \tag{5}$$

where

- i = The sample case (i = 1, 2, ..., 5),
- r = The replicate sample (r = 0, 1, ..., 4)
NOTE: Replicate 0 refers to the full sample,
- w_i = The weight for sample case i (either the full-sample weight or a replicate weight), and
- RAF_r = The ratio adjustment factor for replicate sample r.

Using formula (5), the ratio adjustment factors for the full sample and each replicate sample are calculated as follows:

- Full Sample RAF = (100.00 ÷ 112.00) = **0.8929**
- Replicate 1 RAF = (100.00 ÷ 112.00) = **0.8929**
- Replicate 2 RAF = (100.00 ÷ 88.90) = **1.1249**
- Replicate 3 RAF = (100.00 ÷ 136.50) = **0.7326**
- Replicate 4 RAF = (100.00 ÷ 110.60) = **0.9042**

To perform the ratio adjustment, multiply the full-sample and replicate weights by the corresponding ratio adjustment factor. The following table provides the ratio adjusted weights.

Table 7.5 Ratio Adjusted Weights for Sample Data

Sample Case	Full Sample Weight	Replicate Weights			
		Replicate 1	Replicate 2	Replicate 3	Replicate 4
Case #1	26.79	26.79	10.12	37.36	27.12
Case #2	19.64	19.64	42.07	16.11	5.97
Case #3	13.39	13.39	16.87	3.30	23.06
Case #4	17.86	17.86	22.50	24.91	5.42
Case #5	22.32	22.32	8.44	18.32	38.43
Total	100.00	100.00	100.00	100.00	100.00

Using these ratio-adjusted weights, the estimates of variance for survey estimates are ready to be calculated. The next section discusses the calculation of variance estimates using replicates from the replication method.

VARIANCE ESTIMATES

Once the replicate weights of the FHWAR survey were formed, estimates of variance for the full-sample estimate were calculated by using the Fay’s Balanced Repeated Replication (BRR) method³⁶ with the following formula:

$$\text{Var}(y_o) = \frac{4}{k} \sum_{r=1}^k (y_r - y_o)^2 \tag{6}$$

where

- r = The replicate sample (r = 1.....k)
- o = The full sample
- k = The total number of replicate samples (k = 160)
- y_o = The survey estimate using the full-sample weights
- y_r = The survey estimate using the replicate weights from replicate r

This variance estimate is the product of a constant and the sum of squared differences between each replicate survey estimate and the full-sample survey estimate. Note that the value of 4 in the equation above arises from the use of successive difference replication.

The following example illustrates how a statistic is estimated, replicated, and combined to form a variance estimate. In general, the Census Bureau uses 160 replicate weights to estimate the

³⁶Judkins, D. (1990) “Fay’s Method for Variance Estimation,” Journal of Official Statistics, Vol. 6, No. 3, 1990, pp.223-239.

variance, but four replicate weights will be shown in this example to incorporate with the previous example of the replication method.

Example of Replicate Variance Estimation

Recall that the sample consists of five sample cases and four replicates per sample case. The goal of this section is to estimate the total number of hunters in the population and its corresponding estimate of variance.

Assume that the five sample cases had the responses shown below in Table 7.6 when asked if they participated in hunting activities during the time of interview.

Table 7.6 Variance Estimation Using Sample Data

Sample Case	Hunting Activities	Sample Weight	Replicate Weights			
			Replicate 1	Replicate 2	Replicate 3	Replicate 4
Case #1	Yes - 1	26.79	26.79	10.12	37.36	27.12
Case #2	No - 0	19.64	19.64	42.07	16.11	5.97
Case #3	Yes - 1	13.39	13.39	16.87	3.30	23.06
Case #4	Yes - 1	17.86	17.86	22.50	24.91	5.42
Case #5	No - 0	22.32	22.32	8.44	18.32	38.43

To calculate the full-sample survey estimate of the number of people who participate in hunting activities, the full-sample weights of the sample cases that responded “YES” are added to the hunting activities question. Therefore, the total estimate for the number of people who participate in hunting activities is calculated as follows:

- Full-Sample of “YES” Responses = $26.79 + 13.39 + 17.86 = 58.04$

In order to calculate the variance estimate for this survey estimate, calculate the same survey estimate for each of the replicate samples was required. The replicate survey estimates are as follows:

- Replicate 1 of “YES” Responses = $26.79 + 13.39 + 17.86 = 58.04$
- Replicate 2 of “YES” Responses = $10.12 + 16.87 + 22.50 = 49.49$
- Replicate 3 of “YES” Responses = $37.36 + 3.30 + 24.91 = 65.57$
- Replicate 4 of “YES” Responses = $27.12 + 23.06 + 5.42 = 55.60$

Now use these survey estimates in formula (6) to calculate the variance estimate for the number of people who participate in hunting activities. The calculation of this variance estimate is as follows:

$$\begin{aligned}\text{Var}(y_o) &= \frac{4}{k} \sum_{r=1}^k (y_r - y_o)^2 \\ &= \frac{4}{4} \times [(58.04 - 58.04)^2 + (49.49 - 58.04)^2 + (65.57 - 58.04)^2 + (55.60 - 58.04)^2] \\ &= 73.1025 + 56.7009 + 5.9536 = 135.757.\end{aligned}$$

Thus $\text{Var}(y_o) = \mathbf{135.757}$.

Therefore, the survey estimate of “YES” responses to the number of people who participate in hunting activities is **58.04**. This survey estimate has an estimated variance of **135.757**, or a standard error of **11.65**, which is the square root of the estimate of variance.

GENERALIZED VARIANCE FUNCTIONS (GVF)

A GVF is a way to summarize the variances of many different estimates in a simple expression. A GVF assumes that variances for many possible estimates that can be derived from the survey data have the same functional form. The GVF used to estimate the variance of an estimated population total \hat{X} is of the form:

$$\text{Var}(\hat{X}) = a\hat{X}^2 + b\hat{X} \quad (7)$$

where a and b are two parameters estimated using least squares regression. The rationale for this form is the assumption that the variance $\text{Var}(\hat{X})$ can be expressed as the product of the variance form of a simple random sample for a binomial random variable and a *design effect*. Denote design effect as *deff*; the design effect accounts for the effect of a complex sample design relative to a simple random sample.

Let $P = \frac{X}{N}$ as the proportion of the population having the characteristic X , where N is the population size, and let $Q = 1 - P$. The variance of the estimated total \hat{X} , which is based on a sample of n individuals from the population is:

$$\begin{aligned}\text{Var}(\hat{X}) &= \frac{N^2 PQ(\text{deff})}{n} \\ &= \frac{N^2 \frac{X}{N} \left(1 - \frac{X}{N}\right) (\text{deff})}{n}\end{aligned}$$

$$\begin{aligned}
 &= -(def f) \frac{X^2}{n} + \frac{(def f)NX}{n} \\
 &= -(def f) \left(\frac{N}{n}\right) \frac{X^2}{N} + \frac{N(def f)}{n} X
 \end{aligned}$$

Letting $a = \frac{-b}{N}$ and $b = \frac{N(def f)}{n}$

Hence:

$$Var(\hat{X}) = a\hat{X}^2 + b\hat{X}$$

where N is a control total, so that the variance will equal zero when $\hat{X} = N$. To estimate parameters a and b , the Census Bureau used the model for relative variance (denote Relvar as relative variance), which is shown as below:

$$Relvar(\hat{X}) = \frac{Var(\hat{X})}{\hat{X}^2} = \frac{a\hat{X}^2 + b\hat{X}}{\hat{X}^2} = a + \frac{b}{\hat{X}}$$

Since $a = \frac{-b}{N}$ the relative variance equation is:

$$Relvar(\hat{X}) = b \left(\frac{1}{\hat{X}} - \frac{1}{N} \right)$$

Using variance estimates obtained directly by using the formula (6), the variance estimates data were fit to the model of relative variance above to estimate parameters a and b by using a regression line.

In the FHWAR survey, besides using the equation (7) to estimate hunting and fishing participants in the U.S. population, the following equation was also used to estimate expenditures, days, and trips that relate to hunting and fishing activities:

$$Var(\hat{X}) = a\hat{X}^2 + b\hat{X} + \frac{c\hat{X}^2}{y} \quad (8)$$

where \hat{X} is the size of estimate of expenditures, trips or days, y is the base of the estimate, and a , b and c are the parameters that can be estimated by a relative variance model.

After the parameters a , b and c of equations (7) and (8) are determined, the approximate standard error, which is discussed in the next section, can be computed.

ESTIMATING STANDARD ERRORS

The approximate standard error $S_{\hat{X}}$ of an estimate \hat{X} can be obtained with generalized variance parameters a , b and c of equations (7) and (8) and following formulas:

$$S_{\hat{X}} = \sqrt{a\hat{X}^2 + b\hat{X}} \quad (9)$$

$$S_{\hat{X}} = \sqrt{a\hat{X}^2 + b\hat{X} + \frac{c\hat{X}^2}{y}} \quad (10)$$

Formula (9) is used to calculate the standard errors of levels of hunting, fishing, and wildlife watching. Formula (10) is used for standard errors of aggregates (i.e., trips, days, and expenditures).

The sample estimate and its standard error are used to construct a confidence interval. For the FHWAR survey, the Census Bureau constructed 95% confidence intervals for sample estimates \hat{X} . The 95% confidence interval indicates that, if the same sampling method was used to select different samples and an interval estimate for each sample was computed, the true population parameter can be expected to fall within the interval estimates 95% of the time.

Example of Estimating Standard Errors and Confidence Intervals

A good example is the previous cycle of the FHWAR; the 2011 survey. Generalized variance parameters are provided in the table below.

Table 7.7 Parameters for Computation of Standard Errors for United States Detail Sportspersons Sample

Characteristic	a	b	c
Sportspersons 16 years and older	-0.000070	16,823	-
Days or Trips for Hunters 16 years and older	-0.000284	-127,863	46,699

Suppose there were an estimate $\hat{X} = 37,397,000$ persons age 16 years and older who either fished or hunted in the U.S in 2011. Using formula (9) and generalized variance parameters in Table 7.7, the approximate standard error of the estimate $\hat{X} = 37,397,000$ sportspersons age 16 years old and older is

$$S_{\hat{X}} = \sqrt{-0.000070 * 37,397,000^2 + 16,823 * 37,397,000} \approx 728,857$$

The 95% confidence interval for the estimate $\hat{X} = 37,397,000$ sportspersons age 16 years and older is computed as:

$$37,397,000 \pm 1.96 * 728,857 \approx 35,968,000 \text{ to } 38,826,000$$

Suppose there were an estimate $y = 13,674,000$ hunters age 16 years and older who engaged in $\hat{X} = 281,884,000$ days of participation in 2011. Using formula (10) with generalized variance parameters in Table 7.7, the approximate standard error of this estimate is:

$$S_{\hat{X}} = \sqrt{-0.000284 \times 281,884,000^2 - 127,863 \times 281,884,000 + \frac{46,699 \times 281,884,000^2}{13,674,000}}$$
$$\approx 14,586,000$$

The 95% confidence interval on the estimate $\hat{X} = 281,884,000$ days of hunting activities is computed as:

$$281,884,000 \pm 1.96 \times 14,586,000 \approx 253,295,000 \text{ to } 310,473,000$$

In addition, hypothesis tests can be conducted by using standard errors, but hypothesis tests are not covered in the FHWAR survey.

GLOSSARY AND DESCRIPTIONS OF ACRONYMS

AAPOR	American Association for Public Opinion Research
ACS	American Community Survey
AFWA	Association of Fish and Wildlife Agencies
CAPI	Computer Assisted Personal Interview
CATI	Computer Assisted Telephone Interview
CARRA	Center for Administrative Records Research and Applications
CAUS	Community Address Updating System
CBUR	Census-defined code assigned to each person based on where the sample housing unit is located – C-Central City of a CBSA, B-Balance of a CBSA, Urbanized Area Outside a CBSA, and R-Rural Area outside a CBSA.
CBSA	Core Based Statistical Area. A U.S. geographic area defined by the Office of Management and Budget (OMB) that consists of one or more counties (or equivalents) anchored by an urban center of at least 10,000 people plus adjacent counties that are socioeconomically tied to the urban center by commuting.
CPS	Current Population Survey
CV	Coefficient of Variation
DAAL	Demographic Area Address Listings
DEFF	Design Effects
DSF	Delivery Sequence File
DSMD	Demographic Statistical Methods Division
EDS	Exclude from Delivery Statistics
FHWAR	National Survey of Fishing, Hunting, and Wildlife-Associated Recreation
FIPS	Federal Information Processing Standards
FR	Field Representative. The Census Bureau staff assigned to one of the six Census Bureau regional offices. FRs conduct interviews primarily in person (personal visit) utilizing either paper questionnaires or a CAPI instrument.
FWS	U.S. Department of the Interior, Fish and Wildlife Service
GEO	Geography Division
GIS	Geographic Information System
GPS	Geographic Positioning System
GQ	Group Quarters
GVF	Generalized Variance Function
HU	Housing Unit
IAA	Interagency Agreement
IDS	Include in Delivery Statistics
LACS	Locatable Address Conversion System
LUCA	Local Update of Census Addresses
MAF	Master Address File
MAFID	Master Address File Identifier
MSA	Metropolitan Statistical Area
MTdb	MAF/TIGER Database

NPC	National Processing Center – Division of the Census Bureau that processes letter mailouts, labeling operations, and editing and keying of paper questionnaires. Located in Jeffersonville, Indiana.
NSR	Non Self-Representing
PSU	Primary Sampling Unit
SAS	Software used to edit, clean, estimate, and analyze the data
SI	Sampling Interval
SR	Self-Representing
TIGER	Topologically Integrated Geographic Encoding and Referencing System
UAA	Undeliverable As Addressed
UFUF	Unit Frame Universe Files
USPS	United States Postal Service
VHU	Valid Housing Units

APPENDIX A. 2016 FHWAR MATERIALS

ADVANCE LETTERS

Advance letters were mailed to respondents to invite them to participate in the survey.

FHW-PS(L1) (11-2015)		UNITED STATES DEPARTMENT OF COMMERCE Economics and Statistics Administration U.S. Census Bureau Washington, DC 20233-0001 OFFICE OF THE DIRECTOR
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Your household has been selected to participate in an important survey – the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (FHWAR). The U.S. Census Bureau conducts this survey for the U.S. Fish and Wildlife Service.

The U.S. Fish and Wildlife Service uses your responses to the FHWAR survey to evaluate federal and state programs that manage wildlife populations and assist wildlife-related recreationists. The survey results also help identify the impact of environmental disasters on our Nation's wildlife resources.

Your participation in this survey is essential; however, you may choose to decline to answer any particular question. Federal law authorizes the collection of this information (Titles 13 and 29 of the United States Code), and Sections 9 and 214 of Title 13 require us to keep all information about you and your household strictly confidential, and to use that information for statistical purposes only.

Please complete the online questionnaire **within the next two weeks** by following the two easy steps listed below:

1. Go to <https://respond.census.gov/fhw/login>
2. Enter the following information on the opening screen –

Login ID:
Password:

On the back of this letter are answers to questions that survey participants ask most frequently. Also enclosed are "Quick Facts" from the last FHWAR survey. If you have any additional questions about the survey or the questionnaire, please contact the U.S. Census Bureau by calling our toll-free number at 1-888-369-1081.

Thank you for your participation in this important survey.

Sincerely,



John H. Thompson
Director
U.S. Census Bureau

Enclosure

census.gov

FHW-W1(L)
(1-2016)



UNITED STATES DEPARTMENT OF COMMERCE
Economics and Statistics Administration
U.S. Census Bureau
Washington, DC 20233-0001
OFFICE OF THE DIRECTOR

Your household has been selected for participation in the *2016 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*. The U.S. Census Bureau conducts this survey for the U.S. Fish and Wildlife Service every five years; we last conducted the survey in 2011. We will be collecting information about people's involvement in fishing, hunting, and wildlife-watching activities (feeding, observing, or photographing wildlife) during 2016. Fish and wildlife agencies and organizations will use the information to improve management of fish and wildlife resources.

We selected your address, not you personally, as part of a scientifically determined national sample. Your participation is voluntary, and there are no penalties for not answering any questions. Your help, however, is very important. Your household represents hundreds of other households in your state, and your responses will provide valuable information that will help improve the national survey.

Sometime in the next few weeks, a Census Bureau representative will contact you to ask if members of your household have participated in fishing, hunting, or wildlife-watching activities since January 1, 2016, or if they are likely to participate before the end of the year. Your participation is essential to ensure that the survey results are complete and accurate. Your answers will be completely confidential.

On the back of this letter are answers to questions that survey participants ask most frequently. We have enclosed a reference aid, which will assist you in answering the survey questions. *Please keep this reference aid handy for the interview.*

Thank you for your cooperation. The U.S. Census Bureau and the U.S. Fish and Wildlife Service appreciate your help.

Sincerely,

A handwritten signature in blue ink, appearing to read "John H. Thompson".

John H. Thompson
Director
U.S. Census Bureau

Enclosure

United States
Census
Bureau

census.gov

FHW-W2(L)
(6-2016)



UNITED STATES DEPARTMENT OF COMMERCE
Economics and Statistics Administration
U.S. Census Bureau
Washington, DC 20233-0001
OFFICE OF THE DIRECTOR

A few months ago, a U.S. Census Bureau representative contacted your household about the *2016 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*. This sample survey collects information from people about their fishing, hunting, or wildlife-watching activities (feeding, observing, or photographing wildlife) throughout 2016.

Census Bureau representatives will begin contacting respondents by telephone in early September to ask about fishing, hunting, or wildlife-watching activities during 2016. We will ask questions about where and how often you participated in these activities, the amount you spent, and the equipment you purchased. Your participation is extremely important to ensure that the survey results are complete and accurate. Your answers will be completely confidential.

The Census Bureau collects data for this survey in two ways: by telephone or by personal visit to your residence. Personal visits are very expensive. You can help us keep our costs down by calling us toll free at 1-888-369-1081 to complete a telephone interview at a time convenient for you. Our telephone center will be open seven days a week between 9:00 a.m. and 9:00 p.m. Eastern Time, beginning September 1, 2016.

On the back of this letter are answers to questions that survey participants ask most frequently. We have also enclosed a reference aid, which will assist you in answering the survey questions. *Please keep this reference aid handy for the interview.*

Thank you for your cooperation. The U.S. Census Bureau and the U.S. Fish and Wildlife Service appreciate your help.

Sincerely,

A handwritten signature in blue ink, appearing to read "John H. Thompson".

John H. Thompson
Director
U.S. Census Bureau

Enclosure

United States
Census
Bureau

census.gov

FHW-W3 NI(L)
(11-2016)



UNITED STATES DEPARTMENT OF COMMERCE
Economics and Statistics Administration
U.S. Census Bureau
Washington, DC 20233-0001
OFFICE OF THE DIRECTOR

Dear

Early last year, we contacted your household to participate in a national survey. The U.S. Census Bureau conducts this survey for the U.S. Fish and Wildlife Service whose mission is to work with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people. The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation is important because the data collected are used to evaluate programs that support wildlife refuges, habitats, endangered species, and national parks. The survey results also help to identify the impact of environmental disasters, such as the recent oil spills on our Nation's wildlife and natural resources.

Your participation is voluntary but extremely important to ensure that the final survey results are complete and accurate. We will ask you questions about your wildlife-associated activities such as where and how often you participated, how much you spent, and what equipment you purchased. Because this is a sample survey, you represent hundreds of people in your state. Your answers will be completely confidential.

On the back of this letter are answers to questions that survey participants ask most frequently. We have also enclosed a reference aid, which will assist you in answering the survey questions. *Please keep this reference aid handy for the interview.*

Thank you for your cooperation. The U.S. Census Bureau and the U.S. Fish and Wildlife Service appreciate your help.

Sincerely,

John H. Thompson
Director
U.S. Census Bureau

Enclosure

census.gov

**FHW-W3(L1)
(11-2016)**



UNITED STATES DEPARTMENT OF COMMERCE
Economics and Statistics Administration
U.S. Census Bureau
Washington, DC 20233-0001
OFFICE OF THE DIRECTOR

Dear

Thank you for participating in the *2016 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*. Sometime in the next few weeks, a U.S. Census Bureau representative will contact you for one final interview.

The information collected for this survey helps to evaluate programs that support wildlife refuges, habitats, endangered species, and national parks. The survey results also help to identify the impact of environmental disasters such as the recent oil spills on our nation's wildlife and natural resources.

We will ask questions about where and how often you participated in wildlife-associated activities, the amount you spent, and the equipment you purchased since we last interviewed you. Your answers will be completely confidential.

Your help is voluntary and there are no penalties for not answering any questions. Your participation is extremely important to ensure that the final results are complete and accurate.

The U.S. Census Bureau collects data for this survey in two ways: by telephone or by personal visit to your residence. Personal visits are very expensive. You can help us keep our costs down by calling us toll free at 1-888-369-1081 to complete a telephone interview at a time convenient for you. Our telephone center will be open seven days a week between 9:00 a.m. and 9:00 p.m. Eastern Time, beginning January 4, 2017.

On the back of this letter are answers to questions that survey participants ask most frequently. We have also enclosed a reference aid, which will assist you in answering the survey questions. *Please keep this reference aid handy for the interview.*

Thank you for your cooperation. The U.S. Census Bureau and U.S. the Fish and Wildlife Service appreciate your continued participation.

Sincerely,

John H. Thompson
Director
U.S. Census Bureau

Enclosure

census.gov

**FHW-W3(L2)
(11-2016)**



UNITED STATES DEPARTMENT OF COMMERCE
Economics and Statistics Administration
U.S. Census Bureau
Washington, DC 20233-0001
OFFICE OF THE DIRECTOR

Dear

Thank you for participating in the *2016 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*. Sometime in the next few weeks, a U.S. Census Bureau representative will contact you for one final interview.

The information collected for this sample survey helps to evaluate programs that support wildlife refuges, habitats, endangered species, and national parks. The survey results also help to identify the impact of environmental disasters such as the recent oil spills on our nation's wildlife and natural resources.

We will ask questions about where and how often you participated in wildlife-associated activities, the amount you spent, and the equipment you purchased since we last interviewed you. Your answers will be completely confidential.

Your help is voluntary, and there are no penalties for not answering any questions. Your participation is extremely important to ensure that the final results are complete and accurate.

On the back of this letter are answers to questions that survey participants ask most frequently. We have also enclosed a reference aid, which will assist you in answering the survey questions. *Please keep this reference aid handy for the interview.*

Thank you for your cooperation. The U.S. Census Bureau and the U.S. Fish and Wildlife Service appreciate your continued participation.

Sincerely,

John H. Thompson
Director
U.S. Census Bureau

Enclosure

census.gov

FREQUENTLY ASKED QUESTIONS

The Frequently Asked Questions were included with all advance letter mailings.

FREQUENTLY ASKED QUESTIONS

What is this survey all about?

The U.S. Fish and Wildlife Service is charged with the overall federal responsibility for the Nation's fish and wildlife resources. Its mission is to assure the conservation, protection, and enhancement of fish and wildlife for the continuing benefit of the American people. To assist in carrying out its responsibilities, the U.S. Fish and Wildlife Service has sponsored national surveys of fishing and hunting at about five-year intervals since 1955. This survey, the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (FHWAR), is authorized by the Wildlife and Sport Fish Restoration Programs Improvement Act of 2000.

How will the information be used?

In addition to the U.S. Fish and Wildlife Service, state, local, and other federal agencies use the survey results to provide essential information on present recreation demand and to project future demand both nationally and on a state-by-state basis. The information is used to track trends in fish and wildlife-related recreation and to help develop plans and projects that enhance sport fish and wildlife-related recreation activities.

How will this survey benefit me?

The information you provide will help identify trends in fishing, hunting, and wildlife watching. Policymakers and natural resource managers will use this information to address your recreational needs and to plan resources, education, and recreation programs to meet your community's future needs.

Why can't you select someone else?

Through a scientific sampling process, we selected your address, not you personally. Your answers are very important to this study because your household was selected to represent many other households. It would cost too much and take too long to survey all households in the country. We cannot substitute another address for your household because it would harm the quality of the data we collect. The survey's success depends on your voluntary participation.

How long will this interview take? Where can I find out more about the survey?

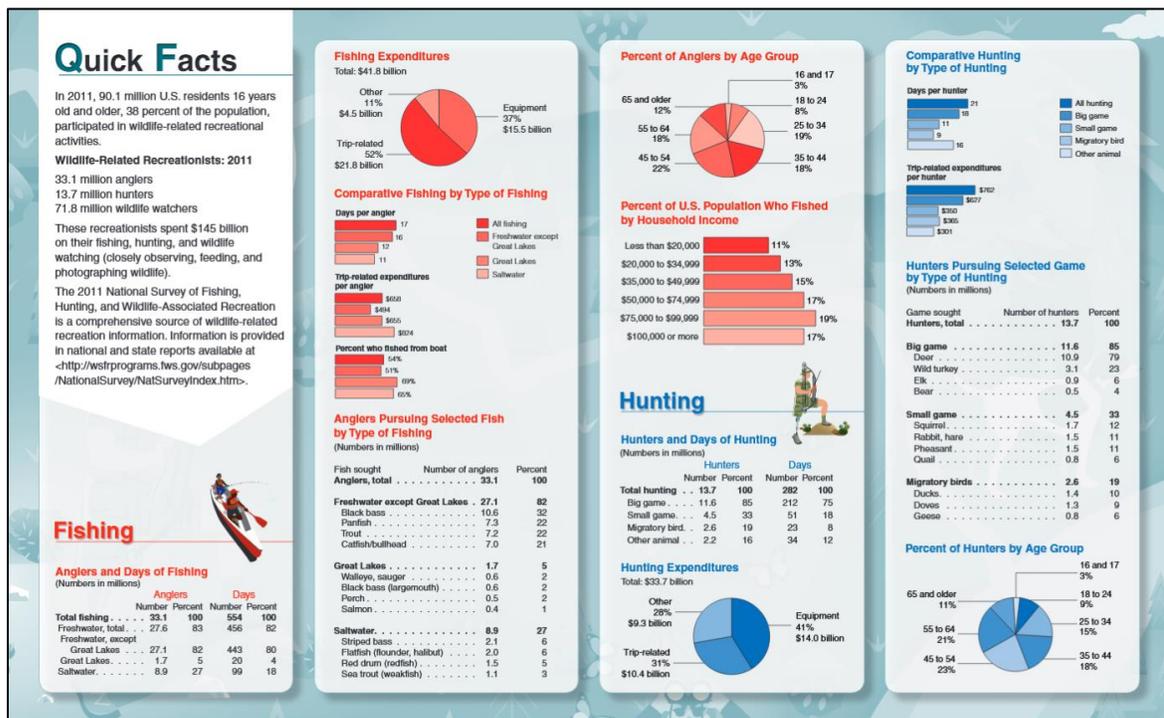
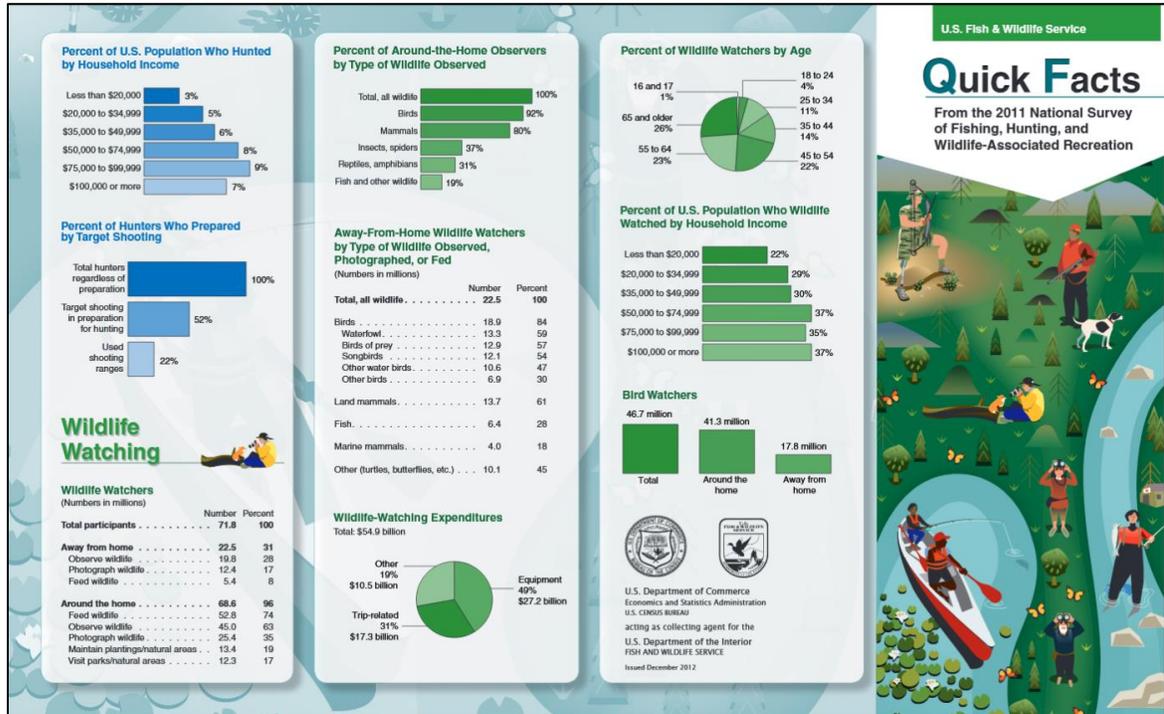
For each person, we expect the interview to take from 11 to 26 minutes, with an average of 15 minutes per person. The Office of Management and Budget has approved this survey and assigned OMB Control Number 1018-0088, which expires 12/31/2018. We may not conduct or sponsor and you are not required to respond to an information collection unless it displays a currently valid OMB Control Number. You may send comments on any aspect of this information collection to the Information Collection Clearance Officer, U.S. Fish and Wildlife Service, 5275 Leesburg Pike, MS: BPHC, Falls Church, VA 22041-3803. The FHWAR Web site also has information about the survey. The address is:
http://wsfrprograms.fws.gov/Subpages/nationalsurvey/National_Survey.htm.

What confidential protection do I have?

We are conducting this survey under the authority of Title 13, United States Code, Section 8. Section 9 of Title 13 requires us to keep all information about you and your household strictly confidential. We may use the information only for statistical purposes. Every Census Bureau employee takes an oath and is subject to a jail penalty, a fine, or both if he or she discloses any information that would identify an individual.

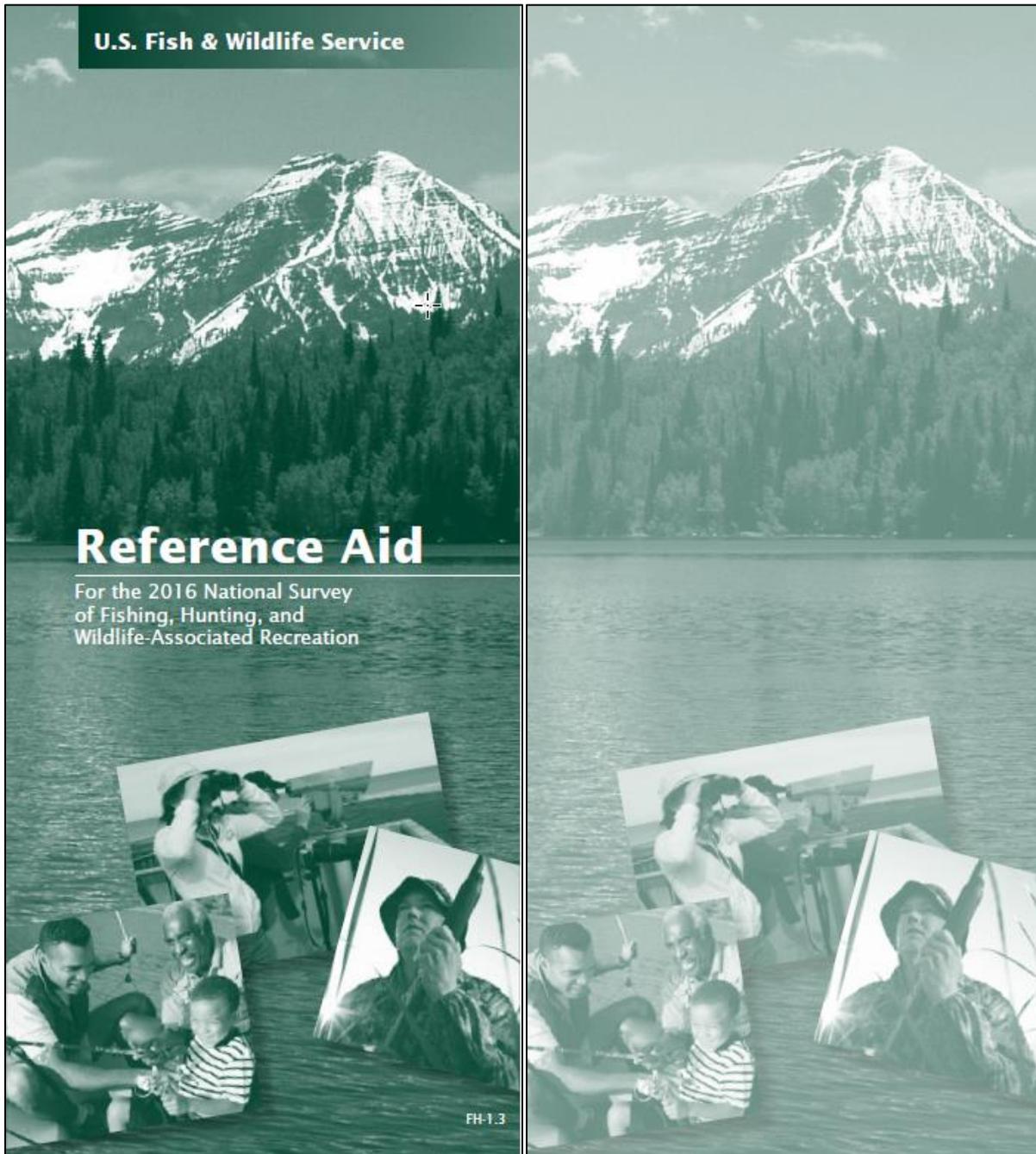
QUICK FACTS

The Quick Facts brochure was included with the advance letter mailings for the pre-screener, Wave 1, and Wave 2.



REFERENCE AID

The Reference Aid was included with the advance letter mailings for Waves 1, 2, and 3. The Reference Aid was a collection of response options from a variety of questions in the questionnaire. The Aid was used to inform the household of the types of questions they would be asked in the upcoming interview and to help remind them of activity they participated in or purchases they may have made since January 1, 2016.



2016

<p>JANUARY</p> <table border="0"> <tr><td>S</td><td>M</td><td>T</td><td>W</td><td>T</td><td>F</td><td>S</td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td>1</td><td>2</td></tr> <tr><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr> <tr><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td></tr> <tr><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td></tr> <tr><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td></tr> <tr><td>31</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table> <p>FEBRUARY</p> <table border="0"> <tr><td>S</td><td>M</td><td>T</td><td>W</td><td>T</td><td>F</td><td>S</td></tr> <tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr> <tr><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td></tr> <tr><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td></tr> 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1

REFERENCE

Game That People Hunt

Big Game

- Deer
- Elk
- Bear
- Wild Turkey
- Moose
- Wild Sheep
- Feral Goat (*in Hawaii only*)
- Feral Pig (*in Hawaii only*)
- Other (*e.g., Antelope, Bison, Caribou, Mountain Goat, Musk Ox, etc.*)

Small Game

- Rabbit, Hare
- Quail
- Grouse/Prairie Chicken
- Squirrel
- Pheasant
- Ptarmigan
- Other (*e.g., Francolin, Chukar/Partridge, etc.*)

Migratory Birds

- Geese
- Duck
- Dove
- Other (*e.g., Coot, Rail, Gallinule, Woodcock, Crane, Black Brant, Snipe, Band-tailed Pigeon, etc.*)

Other Animals

- Groundhog (*Woodchuck*)
- Raccoon
- Fox
- Coyote
- Wolf
- Mongoose (*in Hawaii only*)
- Feral Pig
- Other (*e.g., Crow, Prairie Dog, Lynx, etc.*)

2

REFERENCE _____

Great Lakes Fishing

- Lake Ontario, including Niagara River
- Lake Erie, including Detroit River
- Lake Huron, including St. Mary's River
- Lake St. Clair, including St. Clair River
- Lake Michigan
- Lake Superior
- St. Lawrence River, south of the bridge at Cornwall
- Tributaries to the Great Lakes used for Smelt, Steelhead, or Salmon fishing

3

_____ REFERENCE

Types of Great Lakes Fish

- Perch
- Black Bass (*Largemouth, Smallmouth, Spotted Bass, etc., excluding White Bass, Striped Bass, Striped Bass hybrids, Rock Bass, etc.*)
- Walleye
- Sauger
- Salmon
- Steelhead
- Lake Trout
- Other Trout (*Rainbow, Brown, etc.*)
- Northern Pike, Pickerel, Muskie, Muskie hybrids
- Another type of Great Lakes fish
- Anything

4

REFERENCE _____

Types of Non-Great Lakes Freshwater Fish

Crappie
 Panfish (*Bluegill, Sunfish, Rock Bass, Perch, etc.*)
 White Bass, Striped Bass, and Striped Bass hybrids
 Black Bass (*Largemouth, Smallmouth, Spotted Bass, etc., excluding White Bass, Striped Bass, Striped Bass hybrids, Rock Bass, etc.*)
 Catfish and Bullheads
 Walleye
 Sauger
 Northern Pike, Pickerel, Muskie, Muskie hybrids
 Trout (*Rainbow, Brown, Brook, Lake, etc.*)
 Salmon
 Steelhead
 Another type of freshwater fish
 Anything

5

_____ REFERENCE

Types of Saltwater Fish

Salmon
 Striped Bass
 Bluefish
 Flatfish (*Flounder, Halibut*)
 Red Drum (*Redfish*)
 Seatrout (*Weakfish*)
 Mackerel
 Marlin
 Tuna
 Wahoo (*Ono in Hawaii*)
 Mahi-mahi (*Dolphinfish*)
 Jack (*Ulua in Hawaii*)
 Lingcod
 Another type of finfish
 Shellfish
 Anything

6

REFERENCE

Recently Purchased Hunting Equipment

Rifles
 Shotguns
 Muzzleloaders
 Pistols, handguns
 Bows, arrows, or other archery equipment
 Telescopic sights
 Decoys, game calls
 Ammunition
 Hand loading equipment and components
(e.g., powder, shot, etc.)
 Hunting dogs and associated costs
 Any other purchases *(such as cases and carriers for equipment or game, hunting knives, etc.)*

7

REFERENCE

Recently Purchased Fishing Equipment

Rods, reels, poles, and rod making components
 Lines and leaders
 Artificial lures, flies, baits, and dressing for flies or lines
 Hooks, sinkers, swivels, and other items attached to a line, except lures and baits
 Tackle boxes
 Creels, stringers, fish bags, landing nets, and gaff hooks
 Minnow traps, seines, and bait containers
 Depth finders, fish finders, and other electronic fishing devices
 Ice fishing equipment *(such as tip-ups and tilts, ice fishing houses, etc.)*
 Any other purchases *(such as scales, knives, fishing hook disgorgers; fish fighting chairs; outriggers, downriggers; rod holders and rod belts; fishing vests, and spear fishing and scuba equipment)*

8

REFERENCE

Recently Purchased Fishing and Hunting Equipment and Items

Camping equipment (*e.g., sleeping bags, packs, duffel bags, tents, etc.*)

Binoculars, field glasses, telescopes, etc.

Special fishing or hunting clothing, foul weather gear, boots, waders, etc.

Processing and taxidermy costs

Books, magazines, and DVDs devoted to fishing or hunting

Dues or contributions to national, state, or local organizations

Any other purchases (*such as GPS devices, snowshoes, skis, and maintenance and repair of equipment.*) Do **not** include boats or vehicles.

9

REFERENCE

Fishing and Hunting Big Ticket Equipment Purchased in 2016

Bass boat

Other type of motor boat

Canoe, other non-motor boat

Boat motor, boat trailer/hitch, or other boat accessories

Pickup, camper, van, travel or tent trailer, motor home, house trailer, recreational vehicle (RV)

Cabin

Trail bike, dune buggy, 4 x 4 vehicle, ATV, 4-wheeler, snowmobile

Anything else, including airplanes, freezers, etc.

A

REFERENCE _____

Recently Purchased Wildlife-Watching Equipment

Binoculars, spotting scopes, etc.
 Cameras, special lenses, video cameras, or other photography equipment, including memory cards
 Film and photo processing
 Commercially prepared and packaged wild bird food
 Other bulk food used to feed wild birds
 Food used to feed other wildlife
 Nest boxes, bird houses, feeders, or baths
 Any other purchases (*such as field guides, maps, etc.*)

B

_____ REFERENCE

Recently Purchased Wildlife- Watching Equipment and Items

Tents, tarps
 Frame packs, backpacking equipment
 Other camping equipment
 Day packs, carrying cases, or special clothing (*e.g., foul weather gear, camouflage clothing, boots, etc.*)
 Books, magazines, and DVDs specifically devoted to fish or wildlife
 Dues or contributions to national, state, or local conservation or wildlife-related organizations
 Any other purchases (*such as blinds or GPS devices*). Do **not** include boats, cabins, or vehicles.

C

REFERENCE _____

Wildlife-Watching Big Ticket Equipment Purchased in 2016

Off-the-road vehicle (snowmobile, 4-wheeler, ATV, 4 x 4 vehicle, trail bike, dune buggy)

Pickup, camper, van, travel or tent trailer, motor home, house trailer, recreational vehicle (RV)

Boat, either motorized or not

Boat accessories such as motor, trailer/hitch

Cabin

Any other purchases



U.S. Department of Commerce
Economics and Statistics Administration
U.S. CENSUS BUREAU

acting as collecting agent for the

U.S. Department of Interior
FISH AND WILDLIFE SERVICE

Issued December 2016

APPENDIX B. 2016 QUESTIONNAIRES AND SURVEY QUESTIONS

PRE-SCREENER QUESTIONNAIRE

FORM **FH-PS(1)** (12-07-2016) OMB Control No. 1018-0088; Approval Expires 12/31/2018



**NATIONAL SURVEY OF FISHING, HUNTING,
AND WILDLIFE-ASSOCIATED RECREATION**

U.S. DEPARTMENT OF COMMERCE
Economics and Statistics Administration
U.S. CENSUS BUREAU

CONTROL NUMBER

INSTRUCTIONS

Thank you for taking the time to complete this survey. This survey is designed to help the U.S. Fish and Wildlife Service and state conservation agencies better manage our Nation's natural resources. You must be 18 years or older to complete this survey. Please fill out the form completely and mail it back using the enclosed postage-paid envelope **within two weeks**. This information will be kept strictly confidential.

STEP 1 Please print your first and last name.

1. First name

2. Last name

STEP 2 We have your address listed as:

If your address above is correct – Please *SKIP* to Step 4 below
 If your address is incorrect – Please complete Step 3 below

STEP 3 If any part of the address in Step 2 is incorrect – Please enter your complete correct address below.

Address line 1

Address line 2 – if necessary

City State ZIP/Postal Code

STEP 4 Telephone number – Please provide a current telephone number below.

1. Primary telephone number

Area code Number – Mark (X) appropriate box

Home
 Cell
 Other

2. Secondary telephone number

Area code Number – Mark (X) appropriate box

Home
 Cell
 Other

PLEASE CONTINUE WITH QUESTIONS ON REVERSE.

STEP 5 *The next two questions ask general information regarding the makeup of your household.*

1. How many people are in your household, including you?

2. Please enter the number of people in your household into the correct boxes of the table below. In the first column, please enter the number of males for each age group listed. In the second column, please enter the number of females for each age group listed. Please include yourself in the table.

Age	Male	Female
0 – 5 years old	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
6 – 15 years old	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>
16 years old and older	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/>

STEP 6 *The next questions ask about different kinds of wildlife-related activities. We are only interested in recreational activities, that is, activities done for pleasure or sport and not for earning money or other compensation.*

1. Did you or anyone in your household closely observe, feed, or photograph wildlife recreationally or maintain natural areas for the benefit of wildlife in 2015 or so far in 2016? Please include activities around your home and on trips away from home.
Please do not include trips to zoos, circuses, aquariums, museums, or trips for hunting, fishing, or scouting for game.
1 Yes 2 No

2. Do you or anyone in your household anticipate closely observing, feeding, or photographing wildlife recreationally or maintaining natural areas for the benefit of wildlife in 2016? Please include activities around your home and on trips away from home.
Please do not include trips to zoos, circuses, aquariums, museums, or trips for hunting, fishing, or scouting for game.
1 Yes 2 No

3. Did you or anyone in your household hunt game or other wildlife recreationally in 2015 or so far in 2016?
1 Yes 2 No

4. Do you or anyone in your household anticipate hunting game or other wildlife recreationally in 2016?
1 Yes 2 No

PLEASE CONTINUE WITH QUESTIONS ON NEXT PAGE.

<p>5. Did you or anyone in your household fish recreationally, including shellfishing, in 2015 or so far in 2016?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>6. Do you or anyone in your household anticipate fishing recreationally, including shellfishing, in 2016?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>STEP 7 <i>The final two questions collect information regarding target shooting and archery activities.</i></p>
<p>1. Did you or anyone in your household do any target shooting or sport shooting with a firearm (rifle, shotgun, muzzleloader, handgun, air gun, etc.) in 2015, not including hunting? Please include any informal target shooting or sport shooting.</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p>2. Did you or anyone in your household participate in archery activities using a bow and arrow, compound bow, or crossbow in 2015, not including hunting? Please include any informal archery activities.</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p>
<p><i>Thank you for your participation! Please return your completed questionnaire in the postage-paid envelope you received with your mailing <u>within two weeks</u>.</i></p>
<p>For Official Use Only</p> <p>Outcome Code: <input type="text"/></p>

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this voluntary information collection is 1018-0088. The time required to complete this information collection is estimated to average 5 minutes per response, including the time to review instructions, search existing data resources, gather the data needed, and complete and review the information collection.

If you have any comments concerning the accuracy of the time estimate, suggestions for improving this collection, or comments or concerns about the contents or the status of your individual submission of this questionnaire, write directly to:

U.S. Fish and Wildlife Service
5275 Leesburg Pike
MS: WSFR
Falls Church, VA 22041-3803

An agency cannot conduct, sponsor, or require a response to a collection of information unless the collection displays a currently valid Office of Management and Budget (OMB) control number.

The OMB control number for this survey is 1018-0088 and the expiration date is 12/31/2018.

ABDRIGED LIST OF WAVES 1 AND 2 SCREENER INTERVIEW QUESTIONS

- SCINTRO** First, I will ask you about the people in your household who may or may not participate in wildlife-associated activities.
- List all persons staying there and all persons who usually live there who are absent.
- Start with the name of the person (or one of the persons) who owns or rents the residence.
- SCAGE** What is ARE_IS age?
- SCSEX** What is YOUR_NAMES sex?
- SCRELATE** What is YOUR_NAMES relationship to YOU_REFNAME?
- SCMSTAT** ARE_IS_CAP now - married, widowed, divorced, separated OR never married?
- SCSCHOOL** What is the highest grade (or year) of regular school you have/Name has ever completed?
- SCJOB** DO_DOES have a job or business?
- SCRETIRE** ARE_IS_CAP retired, going to school, keeping house or doing something else?
- SCHISP** ARE_IS_ANY of Spanish, Hispanic, OR Latino origin?
- SCRACE** What is YOUR_NAMES race?
- SCEVHUNT** Now I would like to ask you about YOUR_HUNTING ACTIVITIES_MEMBERS.
HAVEYOU_HASANYONE EVER hunted game or other wildlife?
- SCHUNT96** HAVE_HAS YOU_96 done any hunting so far in 2016?
- SCHUNT95** Did YOU_95 hunt game or other wildlife IN2015?
- SCHU95FY** Was 2015 the first year that YOU_95FY hunted?
- SCH95DAY** During 2015, did YOU_95DAY hunt 10 or more days?

- SCHUSPND During 2015, did YOU_SCHUSPND spend \$100 or more for hunting, that is, YOUR_HIS_HER share of expenses (for equipment, travel, lodging, license fees, etc.)?
- SCHNTREC What was the most recent yearBEFORE_HUNT_NOT_2016 in which YOU_NAME hunted?
- SCH96LIK On a scale of 1 to 5, where 1 is "Very Unlikely" and 5 is "Very Likely," how likely is it that YOU_NAME will do any hunting during 2016?
- TARGET Did YOU_TARGET participate in target shooting or sport shooting with a firearm (i.e., - rifle, shotgun, muzzleloader, handgun, air gun) in 2015, not including hunting?
- Please include any informal target shooting or sport shooting.
- ARCHERY Did YOU_ARCHERY participate in archery activities using a bow and arrow, compound bow, or crossbow in 2015, not including hunting?
- Please include any informal archery activity.
- SCEVFISH Now I would like to ask you about YOUR_FISHING ACTIVITIES_MEMBERS.
HAVEYOU_HASANYONE EVER done any recreational fishing, including shellfishing?
- SCFISH96 HAVE_HAS YOU_96 done any fishing so far in 2016?
- SCFI95FY Was 2015 the first year that YOU_95FY fished?
- SCF95DAY During 2015, did YOU_95DAY fish 10 or more days?
- SCFISPND During 2015, did YOU_SCFISPND spend \$100 or more for fishing, that is, YOUR_HIS_HER share of expenses (for equipment, travel, lodging, license fees, etc.)?
- SCFSHREC What was the most recent yearBEFORE_FISH_NOT_2016 in which YOU_NAME fished?
- SCF96LIK On a scale of 1 to 5, where 1 is "Very Unlikely" and 5 is "Very Likely," how likely is it that YOU_NAME will do any fishing during 2016?

- SCWILD96 Next, I would like to ask about SPECIAL INTEREST in wildlife in ways OTHER THAN hunting and fishing. We are interested in whether you closely observe, photograph, feed, or maintain natural areas or plantings for wildlife. Please do not include noticing wildlife while doing other activities. Do not include trips to zoos, circuses, aquariums, museums, or scouting for game.
- By wildlife I mean birds, mammals, fish, insects, reptiles such as snakes and lizards, and amphibians such as frogs. DO NOT include farm animals and pets.
- HAVE_HAS YOU_96 taken any SPECIAL INTEREST in wildlife so far in 2016?
- SCWILD95 Did YOU_95 take special interest in wildlife IN2015? Do not include trips to zoos, circuses, aquariums, museums, or scouting for game.
- SCW95DAY During 2015, did YOU_95DAY observe, photograph, or feed wildlife at least one mile from home for 21 or more days?
- SCWWSPND During 2015, did YOU_SCWWSPND spend \$300 or more to observe, photograph, or feed wildlife at least one mile from home, that is, YOUR_HIS_HER share of expenses (for equipment, travel, lodging, license fees, etc.)
- SCW96LIK On a scale of 1 to 5, where 1 is "Very Unlikely" and 5 is "Very Likely," how likely is it that YOU_NAME will take SPECIAL INTEREST in wildlife this year?
- SCINC SCINC_FILL
What was the total income of this household during 2015 before taxes and other deductions?

ABDRIGED LIST OF WAVE 3 DETAIL INTERVIEW QUESTIONS

- SINTRO** I would like to ask you some questions about hunting and fishing. These questions will deal with the kinds of hunting or fishing you did, where you went, and what you bought. All questions refer to the time period between Date of last Sportsperson interview and December 31, 2016.
- RECFISH** Did you do any recreational fishing, including shellfishing, in the United States from Date of last Sportsperson interview to December 31, 2016? Please do not include as fishing occasions when you only observed others fish.
- USHUNT** Did you hunt in the United States from Date of last Sportsperson interview to December 31, 2016?
- Please do not include as hunting occasions when you only observed others hunt or when you only scouted.
- HUNT_ST** In which state or states did you hunt?
- USDAYS_H** From Date of last Sportsperson interview to December 31, 2016, how many days did you hunt in the United States?
- STDAYS_H** How many days did you hunt in Hunt state?
- HUNT** Please tell me which kinds of game you hunted over this period in Hunt state.
- BG_TRIP** You reported hunting
Game fill for big game
in Hunt state which we consider to be big game. How many trips lasting a single day or multiple days did you take from Date of last Sportsperson interview to December 31, 2016 ^HUNT_IN_FLAG Hunt state to hunt big game?
- BG_DAYS** How many days in Hunt state did you hunt big game?
- BGDIFDAY** How many days did you hunt Big Game species day fill in Hunt state?
- BG_PRVT** Did you do any big game hunting in Hunt state on privately owned land?
- BGDYPRV** How many days?
- BGPUBLIC** Did you do any big game hunting in Hunt state on land owned by the local,

State, or Federal Government?

- BGDYSPUB How many days?
- SM_TRIP You reported hunting
Game fills for small game
in Hunt state which we consider to be small game. How many trips lasting a
single day or multiple days did you take from Date of last Sportsperson
interview to December 31, 2016 in/to Hunt state to hunt small game?
- SM_DAYS How many days in Hunt state did you hunt small game?
- SMDIFDAY How many days did you hunt Show small game species in Hunt state? Fill
small game text
- SM_PRVT Did you do any small game hunting in Hunt state on privately owned land?
- SMDYPRV How many days?
- SMPUBLIC Did you do any small game hunting in Hunt state on land owned by the
local, State, or Federal Government?
- SMDYSPUB How many days?
- MB_TRIP You reported hunting
Fill of migratory bird species
in Hunt state which we consider to be migratory birds. How many trips
lasting a single day or multiple days did you take from Date of last
Sportsperson interview to December 31, 2016 in/to Hunt state to hunt
migratory birds?
- MB_DAYS How many days in Hunt state did you hunt migratory birds?
- MB_COMBO How many days did you hunt waterfowl (geese and/or ducks) in Hunt state?
- MBDIFDAY How many days did you hunt List of migratory game species in Hunt state?
- MB_PRVT Did you do any migratory bird hunting in Hunt state on privately owned
land?
- MBDYPRV How many days?
- MBPUBLIC Did you do any migratory bird hunting in Hunt state on land owned by the

local, State, or Federal Government?

MBDYSPUB How many days?

OA_TRIP You reported hunting
Game fill for other animals
in Hunt state which we consider to be other animals. How many trips
lasting a single day or multiple days did you take from Date of last
Sportsperson interview to December 31, 2016 in/to Hunt state to hunt
these other animals?

OA_DAYS How many days in Hunt state did you hunt these other animals?

OA_PRVT Did you hunt these other animals in Hunt state on privately owned land?

OADYPRV How many days?

OAPUBLIC Did you hunt these other animals in Hunt state on land owned by the local,
State, or Federal Government?

OADYSPUB How many days?

INTRO1 Now I would like to ask you some questions about your hunting-related
expenditures from Date of last Sportsperson interview to December 31,
2016. If you paid for others or if someone else paid for you, please include
ONLY YOUR SHARE of the cost. Do not include amounts paid for license
fees, stamps, tags, or equipment purchases. I will ask about those costs
later.

The following fields (BGSHAR_A through BGSHAR5_1 were asked for each type of hunting (Big Game, Small Game, Migratory Birds, and Other Animals).

BGSHAR_A When you were hunting in Hunt state CHIEFLY for BIG GAME from Date of
last Sportsperson interview to December 31, 2016, how much was spent for
YOUR SHARE of -

Food, drink, and refreshments?

BGSHAR_B Lodging at motels, cabins, lodges, or campgrounds, etc.?

BGSHAR_C Public transportation by airplane?

BGSHAR_D Other public transportation, including trains, buses, and car rentals, etc.?

- BGSHAR_E The round-trip cost for transportation by private vehicle?
Do not include boating expenses.
- BGSHAR2_F When you were hunting in Hunt state CHIEFLY for BIG GAME from Date of
last Sportsperson interview to December 31, 2016, how much was spent for
YOUR SHARE of -

Guide fees, pack trip or package fees?
- BGSHAR2_G Public land use or access fees? Do NOT include leases.
- BGSHAR2_H Private land use or access fees? Do NOT include leases.
- BGSHAR2_I Heating and cooking fuel?
- BGSHAR2_J Equipment rental such as boats, hunting or camping equipment, etc.?
- BGSHAR3 Did you have ANY boating expenses boat rental fill while big game hunting
in Hunt state?
- BGSHAR4_K How much for...
Boat Fuel?
- BGSHAR4_L Boat launching fees? Do not include land access fees already reported.
- BGSHAR4_M Boat mooring, storage, maintenance, pumpout fees, and insurance?
- BGSHAR5_1 The total amount you spent on your big game hunting trip(s) to Hunt state
was Total big game expenses, not including airfare. How much of this was
spent in your resident state of Resident state?

The following questions were asked once the trip expenditures were asked for each type of hunting.

- MUZZHNT The next series of questions will refer to ALL of your hunting for any species
from Date of last Sportsperson interview to December 31, 2016.

Did you do any hunting with a muzzleloader?
- FIREHUNT Any hunting with a firearm other than a muzzleloader, such as a shotgun or
rifle?

- HUNTBOW Any hunting with a bow and arrow?
- DAYMUZZ How many days did you hunt with a muzzleloader from
Date of last Sportsperson interview to December 31, 2016?
- DAYFIRE How many days did you hunt with a firearm other than a muzzleloader
from Date of last Sportsperson interview to December 31, 2016?
- DAYBOW How many days did you hunt with a bow and arrow from Date of last
Sportsperson interview to December 31, 2016?
- FISH_ST Now I would like you to think about all the fishing you did
from Date of last Sportsperson interview to December 31, 2016. This
includes
Great Lakes, other freshwater, and saltwater fishing.
- In which state or states did you fish?
- USDAYS_F From Date of last Sportsperson interview to December 31, 2016, how many
days did you fish in the United States?
- STDAYS_F From Date of last Sportsperson interview to December 31, 2016 how many
days did you fish in Fishing state?
- SSTATE Did you do any recreational saltwater fishing in Fishing state?
- GSTATE Did you do any Great Lakes fishing in Fishing state?
- FSTATE Did you do any freshwater fishing in Fishing state?
- DAYFRESH From Date of last Sportsperson interview to December 31, 2016, how many
days did you fish in any freshwater, including the Great Lakes, in New York?
- WHCHGL In which of the Great Lakes, including their tributaries and connecting
waters, did you fish?
- DAYS_GL How many days did you fish in Great Lakes names?
- GL_TRIP How many trips lasting a single day or multiple days did you take in/to
Fishing state to go Great Lakes fishing?
- GLSTDAYS From Date of last Sportsperson interview to December 31, 2016, how many
days in Fishing state did you go Great Lakes fishing?

- GLTYP On your Great Lakes trip(s) over this period in/to Fishing state, what types of fish were you primarily fishing for? Please do not report what you caught unintentionally.
- GLDAYS How many days did you fish for Great Lakes species name fill in Fill text in GLDAYS?
- BOATGL Did you fish from a boat while Great Lakes fishing in Fishing state?
- BOATGLDY How many days did you Great Lakes fish from a boat in Fishing state?
- FR_TRIP How many trips lasting a single day or multiple days did you take in/to Fishing state to go freshwater fishing?
- FR_DAYS How many days in Fishing state did you go freshwater fishing?
- FRTYP On your trip(s) over this period in/to Fishing state, what types of fish were you primarily fishing for? Please do not report what you caught unintentionally.
- DAYS_FR How many days did you fish for Freshwater species name for DAYS_FR
- FR_POND Did you fish in Fishing state in ponds or lakes or reservoirs?
- DAYPOND How many days?
- FR_RIVER Did you fish in Fishing state in rivers or streams?
- RIVERDAY How many days?
- BOATFR Did you fish from a boat while FRESHFILL fishing in Fishing state?
- BOATFRDY How many days did you FRESHFILL fish from a boat in Fishing state?
- SALTTRIP How many trips lasting a single day or multiple days did you take in/to Fishing state to go saltwater fishing?
- SALTDAYS How many days in Fishing state did you go saltwater fishing?
- CRABS1 On the day you went saltwater fishing in Fishing state, were you seeking ONLY crabs, clams, or other shellfish, but NOT finfish?

- FINFISH1 On the day you went saltwater fishing in Fishing state, were you finfishing ONLY?
- CRABS2 How many of your Fill SALTDAYS if non DK/RF saltwater fishing days in Fishing state were you seeking ONLY crabs, clams, or other shellfish, but NOT finfish?
- FINFISH2 Of your Fill SALTDAYS if non DK/RF saltwater fishing days in Fishing state, how many were for finfishing ONLY?
- SLTYP On your trip(s) from Date of last Sportsperson interview to December 31, 2016 in/to Fishing state, what types of fish were you primarily fishing for? Please do not report what you caught unintentionally.
- SALTDAY How many days did you fish for Saltwater species name fill in Fishing state?
- BOATSL Did you fish from a boat while saltwater fishing in Fishing state?
- BOATSLDY How many days did you saltwater fish from a boat in Fishing state?
- INTRO2 Now I would like to ask you some questions about your fishing-related expenditures from Date of last Sportsperson interview to December 31, 2016. If you paid for others, or if someone else paid for you, please include ONLY YOUR SHARE of the cost. Do not include amounts paid for license fees, stamps, tags, or equipment purchases. I will ask about those costs later.

The following fields (GLSHAR_A through GLSHAR5_1 were asked for each type of fishing (Great Lakes, Other Freshwater, and Saltwater).

- GLSHAR_A When you were fishing in Fishing state CHIEFLY in the Great Lakes from Date of last Sportsperson interview to December 31, 2016, how much was spent for YOUR SHARE of -

Food, drink, and refreshments?
- GLSHAR_B Lodging at motels, cabins, lodges, or campgrounds, etc.?
- GLSHAR_C Public transportation by airplane?
- GLSHAR_D Other public transportation, including trains, buses, and car rentals, etc.?
- GLSHAR_E The round-trip cost for transportation by private vehicle?

Do not include boating expenses.

- GLSHAR_F Guide fees, pack trip or package fees (incl. fees for party and charter boats, etc.)?
- GLSHAR2_G When you were fishing in Fishing state CHIEFLY in the Great Lakes from Date of last Sportsperson interview to December 31, 2016, how much was spent for YOUR SHARE of -

Public land use or access fees? Do NOT include leases.
- GLSHAR2_H Private land use or access fees? Do NOT include leases.
- GLSHAR2_I Bait (live, cut, prepared)? Do NOT include lures.
- GLSHAR2_J Ice?
- GLSHAR2_K Heating and cooking fuel?
- GLSHAR2_L Equipment rental such as boats, fishing or camping equipment, etc.?
- GLSHAR3 Did you have ANY boating expenses boat rental fill during these trips in/to Fishing state?
- GLSHAR4_M How much for...

Boat Fuel?
- GLSHAR4_N Boat launching fees? Do not include land access fees already reported.
- GLSHAR4_O Boat mooring, storage, maintenance, pumpout fees, and insurance?
- GLSHAR5_1 The total amount you spent on your Great Lakes fishing trip(s) to Fishing state was Cost of Great Lake expenditures, not including airfare. How much of this was spent in your resident state of Resident state?

The following questions were asked once the expenditures above were asked for each type of fishing.

- FLYFISH Now I would like to ask you a few questions about the fishing methods you may have used in the United States.

From Date of last Sportsperson interview to December 31, 2016, did you

flyfish?

DAYSFLY How many days?

ICEFISH From Date of last Sportsperson interview to December 31, 2016, did you
icefish?

DAYS_IF How many days?

H_EQP_A As I read the following list, tell me those items that you bought for yourself
or that were bought for you PRIMARILY FOR HUNTING.

From Date of last Sportsperson interview to December 31, 2016, did you
purchase or acquire -

Rifles?

H_EQP_B Shotguns?

H_EQP_C Muzzleloaders or other so-called primitive firearms?

H_EQP_D Pistols, handguns?

H_EQP_E Bows, arrows, or other archery equipment?

H_EQP_F Telescopic sights?

H_EQP2_G From Date of last Sportsperson interview to December 31, 2016, did you
purchase or acquire -

Decoys, game calls?

H_EQP2_H Ammunition?

H_EQP2_I Hand loading equipment and components (i.e., powder, shot, etc.)?

H_EQP2_J Hunting dogs and associated costs?

H_EQP2_K Any other purchases (such as cases and carriers for equipment or game,
hunting knives, etc.)?

H_EQP2_K1 What was that purchase?

- RIFLECST What was the total cost of the RIFLE(S) purchased?
- RIFLEUSE Is it/Are they PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- RIFLE_ST In which state(s) did you purchase this equipment?
- GUNSCOST What was the total cost of the SHOTGUN(S) purchased?
- GUNS_USE Is it/Are they PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- GUNS_ST In which state(s) did you purchase this equipment?
- MUZZCST What was the total cost of the MUZZLELOADER(S) OR OTHER SO-CALLED PRIMITIVE FIREARM(S) purchased?
- MUZZUSE Is it/Are they PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- MUZZ_ST In which state(s) did you purchase this equipment?
- PISTLCST What was the total cost of the PISTOLS, HANDGUNS purchased?
- PISTLUSE Is it/Are they PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- PISTL_ST In which state(s) did you purchase this equipment?
- BOWSCOST What was the total cost of the BOWS, ARROWS, OR OTHER ARCHERY EQUIPMENT purchased?
- BOWS_USE Is it/Are they PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- BOWS_ST In which state(s) did you purchase this equipment?
- SCOPECST What was the total cost of the TELESCOPIC SIGHT(S) purchased?
- SCOPEUSE Is it/Are they PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- SCOPE_ST In which state(s) did you purchase this equipment?

- DECOYCST What was the total cost of the DECOYS, GAME CALLS purchased?
- DECOYUSE Is it/Are they PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- DECOY_ST In which state(s) did you purchase this equipment?
- AMMCOST What was the total cost of the AMMUNITION purchased?
- AMM_USE Is it PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- AMMO_ST In which state(s) did you purchase the AMMUNITION?
- HANDCST What was the total cost of the HAND LOADING EQUIPMENT AND COMPONENTS purchased?
- HANDUSE Is it/Are they PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- HAND_ST In which state(s) did you purchase this equipment?
- DOGSCOST What was the total cost of the HUNTING DOGS AND ASSOCIATED COSTS?
- DOGSUSE Is it/Are they PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- DOGS_ST In which state(s) did you make this purchase?
- OTH_COST What was the total cost of the Entry in H_EQP2_K1 purchased?
- OTH_USE Is it/Are they PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- HOTHST In which state(s) did you purchase this equipment?
- F_EQP_A As I read the following list, tell me those items that you bought for yourself or that were bought for you PRIMARILY FOR FISHING.

From Date of last Sportsman interview to December 31, 2016, did you purchase or acquire -

- Rods, reels, poles, and rod making components?
- F_EQP_B Lines and leaders?
- F_EQP_C Artificial lures, flies, baits, and dressing for flies or lines?
- F_EQP_D Hooks, sinkers, swivels, and other items attached to a line, except lures and baits?
- F_EQP2_E From Date of last Sportsperson interview to December 31, 2016, did you purchase or acquire -
- Tackle boxes?
- F_EQP2_F Creels, stringers, fish bags, landing nets and gaff hooks?
- F_EQP2_G Minnow traps, seines, and bait containers?
- F_EQP2_H Depth finders, fish finders, and other electronic fishing devices?
- F_EQP2_I Ice fishing equipment (such as tip-ups and tilts, ice fishing houses, etc.)?
- F_EQP2_J Any other purchases (such as scales, knives, fishing hook disgorgers, fish fighting chairs, outriggers, downriggers, rod holders and rod belts, fishing vests, and spear fishing and scuba equipment)?
- F_EQP2_J1 What was that purchase?
- RODSCOST What was the total cost of the RODS, REELS, POLES, AND ROD MAKING COMPONENTS purchased?
- RODSUSE Is it/Are they PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?
- RODSST In which state(s) did you purchase this equipment?
- LINECOST What was the total cost of the LINES AND LEADERS purchased?
- LINE_USE Is it/Are they PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?
- LINEST In which state(s) did you purchase this equipment?

- LURECOST What was the total cost of the ARTIFICIAL LURES, FLIES, BAIT, OR DRESSING FOR FLIES AND LINES purchased?
- LURE_USE Is it/Are they PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?
- LUREST In which state(s) did you purchase this equipment?
- HOO KCOST What was the total cost of the HOOKS, SINKERS, SWIVELS, AND OTHER ITEMS ATTACHED TO A LINE, EXCEPT LURES AND BAIT purchased?
- HOO K_USE Is it/Are they PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?
- HOO KST In which state(s) did you purchase this equipment?
- TACKCOST What was the total cost of the TACKLE BOX(ES) purchased?
- TACK_USE Is it/Are they PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?
- TACKST In which state(s) did you purchase this equipment?
- CREELCST What was the total cost of the CREELS, STRINGERS, FISH BAGS, LANDING NETS, AND GAFF HOOKS purchased?
- CREELUSE Is it/Are they PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?
- CRL_ST In which state(s) did you purchase this equipment?
- BAITCOST What was the total cost of the MINNOW TRAPS, SEINES, AND BAIT CONTAINERS purchased?
- BAIT_USE Is it/Are they PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?
- BAITST In which state(s) did you purchase this equipment?
- FINDCOST What was the total cost of the DEPTH FINDERS, FISH FINDERS, AND OTHER ELECTRONIC FISHING DEVICES purchased?
- FIND_USE Is it/Are they PRIMARILY for use in fishing in the Great Lakes, other

freshwater, OR saltwater?

- FINDST In which state(s) did you purchase this equipment?
- ICE_COST What was the total cost of the ICE FISHING EQUIPMENT (SUCH AS TIP-UPS AND TILTS, ICE FISHING HOUSES, ETC.) purchased?
- ICE_USE Is it/Are they PRIMARILY for use in fishing in the Great Lakes or other freshwater?
- ICE_ST In which state(s) did you purchase this equipment?
- OTHERCST What was the total cost of the Entry in F_EQP2_J1 purchased?
- OTHERUSE Is it/Are they PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?
- FOTHST In which state(s) did you purchase this equipment?
- FH_EQP_A As I read the following list, tell me those items that you bought for yourself or that were bought for you PRIMARILY FOR USE IN EITHER FISHING OR HUNTING.
- From Date of last Sportsperson interview to December 31, 2016, did you purchase or acquire -
- Camping equipment (such as sleeping bags, packs, duffel bags, tents, etc.)?
- FH_EQP_B Binoculars, field glasses, telescopes, etc.?
- FH_EQP_C Special fishing or hunting clothing, foul weather gear, boots, waders, etc.?
- FH_EQP_D Processing and taxidermy costs?
- FH_EQP2_E From Date of last Sportsperson interview to December 31, 2016, did you purchase or acquire -
- Books, magazines, or DVDs devoted to fishing or hunting?
- FH_EQP2_F Dues or contributions to national, state, or local organizations?
- FH_EQP2_G Any other purchases (such as GPS devices, snowshoes, skis, maintenance and repair of equipment, etc.)? DO NOT INCLUDE BOATS OR VEHICLES.

- FH_EQP2_G1 What was that purchase?
- CAMPCOST What was the total cost of the CAMPING EQUIPMENT purchased?
- CAMP_USE Is it PRIMARILY for use in fishing OR for use in hunting?
- CAMPFISH Is it PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?
- CAMPHNT Is it PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- CAMPST In which state(s) did you purchase this equipment?
- BINOCOST What was the total cost of the BINOCULARS, FIELD GLASSES, TELESCOPES, ETC. purchased?
- BINO_USE Is it/Are they PRIMARILY for use in fishing OR for use in hunting?
- BINOFISH Is it/Are they PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?
- BINOHNT Is it/Are they PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- BINOST In which state(s) did you purchase this equipment?
- GEARCOST What was the total cost of the SPECIAL FISHING OR HUNTING CLOTHING, FOUL WEATHER GEAR, BOOTS, WADERS, ETC. purchased?
- GEAR_USE Is it/Are they PRIMARILY for use in fishing OR for use in hunting?
- GEARFISH Is it/Are they PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?
- GEARHNT Is it/Are they PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- GEARST In which state(s) did you purchase this equipment?
- TAXICOST What were the total PROCESSING AND TAXIDERMY COSTS?

- TAXI_USE Were the costs PRIMARILY for fishing OR hunting?
- TAXIFISH Were the costs PRIMARILY for fishing in the Great Lakes, other freshwater, OR saltwater?
- TAXIHNT Were the costs PRIMARILY for hunting big game, small game, migratory birds, OR other animals?
- TAXIST In which state(s) did you pay these costs?
- BOOKCOST What was the total cost of the BOOKS, MAGAZINES, AND DVD'S DEVOTED TO FISHING OR HUNTING purchased?
- BOOK_USE Is it/Are they PRIMARILY for use in fishing OR for use in hunting?
- BOOKFISH Is it/Are they PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?
- BOOKHNT Is it/Are they PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- BOOKST In which state(s) did you make this purchase?
- DUECOST What was the total cost of the DUES OR CONTRIBUTIONS TO NATIONAL, STATE, OR LOCAL ORGANIZATIONS?
- DUES_USE Are they PRIMARILY for use in fishing OR for use in hunting?
- DUESFISH Are they PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?
- DUESHNT Are they PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- DUESST In which state(s) did you pay these costs?
- FHCOST What was the total cost of the Entry in FH_EQP2_G1 purchased?
- FH_USE Is it/Are they PRIMARILY for use in fishing OR for use in hunting?
- FH_FISH Is it/Are they PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?

- FH_HNT Is it/Are they PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- FH_ST In which state(s) did you purchase this equipment?
- EqpAnn_A As I read the following list, tell me those items that you bought for yourself or that were bought for you PRIMARILY FOR USE IN EITHER FISHING OR HUNTING.
- During 2016, did you purchase or acquire -
- A bass boat?
- EqpAnn_B Another type of motor boat?
- EqpAnn_C A canoe or other non-motor boat?
- EqpAn2_D A boat motor, boat trailer or hitch, or other boat accessories?
- EqpAn2_E A pickup, camper, van, travel or tent trailer, motor home, house trailer, recreational vehicle (RV)?
- EqpAn2_F A cabin?
- EqpAn2_G A trail bike, dune buggy, 4 x 4 vehicle, ATV, 4-wheeler, snowmobile?
- EqpAn2_H Anything else, including airplanes, freezers, etc.?
- AnnOth_H What was that purchase?
- BASSCOST What was the amount paid for the BASS BOAT in 2016?
Please only report the cost in 2016, not the total value of the item.
- BASSUSE Is it/Are they PRIMARILY for use in fishing OR for use in hunting?
- BASSFISH Is it PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?
- BASSHNT Is it PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- BASST In which state(s) did you purchase this equipment?

- BOATCOST** What was the amount paid for the OTHER TYPE OF MOTOR BOAT in 2016? Please only report the cost in 2016, not the total value of the item.
- BOATUSE** Is it PRIMARILY for use in fishing OR for use in hunting?
- BOATFISH** Is it PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?
- BOATHNT** Is it PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- BOATST** In which state(s) did you purchase this equipment?
- CANOECST** What was the amount paid for the CANOE OR OTHER NON-MOTOR BOAT in 2016? Please only report the cost in 2016, not the total value of the item.
- CANOEUSE** Is it/Are they PRIMARILY for use in fishing OR for use in hunting?
- CANOEFSH** Is it/Are they PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?
- CANOEHNT** Is it/Are they PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- CANOEST** In which state(s) did you purchase this equipment?
- MOTORCST** What was the amount paid for the BOAT MOTOR, BOAT TRAILER/HITCH OR OTHER BOAT ACCESSORIES in 2016? Please only report the cost in 2016, not the total value of the item.
- MOTORUSE** Is it/Are they PRIMARILY for use in fishing OR for use in hunting?
- MOTORFSH** Is it/Are they PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?
- MOTORHNT** Is it/Are they PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- MOTORST** In which state(s) did you purchase this equipment?
- VANOCST** What was the amount paid for the PICKUP, CAMPER, VAN, TRAVEL OR TENT TRAILER, MOTOR HOME, HOUSE TRAILER, RECREATIONAL VEHICLE in 2016? Please only report the cost in 2016, not the total value of the item.

- VANUSE Is it/Are they PRIMARILY for use in fishing OR for use in hunting?
- VANFISH Is it/Are they PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?
- VANHNT Is it/Are they PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- VANST In which state(s) did you purchase this equipment?
- CABINCST What was the amount paid for the CABIN in 2016?
Please only report the cost in 2016, not the total value of the item.
- CABINUSE Is it/Are they PRIMARILY for use in fishing OR for use in hunting?
- CABINFISH Is it/Are they PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?
- CABINHNT Is it/Are they PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- CABINST In which state(s) did you purchase this equipment?
- OFF_COST What was the amount paid for the TRAIL BIKE, DUNE BUGGY, 4 X 4 VEHICLE, ATV, 4-WHEELER, OR SNOWMOBILE in 2016?
Please only report the cost in 2016, not the total value of the item.
- OFFUSE Is it/Are they PRIMARILY for use in fishing OR for use in hunting?
- OFF_FISH Is it/Are they PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?
- OFF_HNT Is it/Are they PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- OFF_ST In which state(s) did you purchase this equipment?
- EQPCST What was the amount paid for the Entry in ANNOTH_H in 2016?
Please only report the cost in 2016, not the total value of the item.
- OTHG_USE Is it/Are they PRIMARILY for use in fishing OR for use in hunting?

- OTHG_FSH Is it/Are they PRIMARILY for use in fishing in the Great Lakes, other freshwater, OR saltwater?
- OTHG_HNT Is it/Are they PRIMARILY for use in hunting big game, small game, migratory birds, OR other animals?
- OTHG_ST In which state(s) did you purchase this equipment?
- HOWN In 2016, did you own land in the United States, in part or whole, PRIMARILY for the purpose of hunting?
- HOWN_ACRE How many acres did you own?
- HOWN_CLUB Were you part of a club or group, including a family group, owning this land in 2016?
- HOWN_CNUM How many others were members of this group or club, not counting yourself?
- HOWN_SHR What did you spend in 2016 for YOUR SHARE of the land which was owned PRIMARILY for hunting? Include mortgage, taxes, maintenance, and down payment cost if purchased in 2016. Do not include the cost of a cabin if reported earlier.
- HOWN_ST In which state(s) was this land located?
- HLEASE In 2016, did you lease land in the United States, alone or with others, PRIMARILY for the purpose of hunting?
- HLSE_ACRE How many acres did you lease?
- HLSE_CLUB Were you part of a club or group, including a family group, leasing this land in 2016?
- HLSE_CNUM How many others were members of this group or club, not counting yourself?
- HLSE_SHR What did you spend in 2016 for YOUR SHARE of the land which was leased PRIMARILY for hunting?
- HLSE_ST In which state(s) was this land located?
- FOWN In 2016, did you own land in the United States, in part or whole, PRIMARILY

for the purpose of fishing?

- FOWN_ACRE How many acres did you own?
- FOWN_CLUB Were you part of a club or group, including a family group, owning this land in 2016?
- FOWN_CNUM How many others were members of this group or club, not counting yourself?
- FOWN_SHR What did you spend in 2016 for YOUR SHARE of the land which was owned PRIMARILY for fishing? Include mortgage, taxes, maintenance, and down payment cost if purchased in 2016. Do not include the cost of a cabin if reported earlier.
- FOWN_ST In which state(s) was this land located?
- FLEASE In 2016, did you, alone or with others, lease land in the United States PRIMARILY for the purpose of fishing?
- FLSE_ACRE How many acres did you lease?
- FLSE_CLUB Were you part of a club or group, including a family group, leasing this land in 2016?
- FLSE_CNUM How many others were members of this group or club, not counting yourself?
- FLSE_SHR What did you spend in 2016 for YOUR SHARE of the land which was leased PRIMARILY for fishing?
- FLSE_ST In which state(s) was this land located?
- EXEMPT_H Some hunters were exempt from BUYING a license in 2016 because of their age, because they had a lifetime or free license, because they had a landowner exemption, or for some other reason. Were you exempt from buying a hunting license in any state in which you hunted in 2016?
- EXEMPT_H_ST For which states?
- BUY_H Did you buy a license to hunt in 2016? This could be a license that you bought or was bought for you.

- BUY_H_ST For which states?
- NUM_H How many hunting licenses did you have for State Name in 2016?
- COST_H Concerning your License_number license for State Name, how much did it cost?
- OBT_H Did you actually obtain this license in 2016?
- HUNT_H Was this license only for hunting, or to both hunt and fish?
- DUCK_H Did you have a federal duck stamp in 2016?
- FEES_H Some states charge special fees or require special permits, stamps, or tags for certain types of hunting; a state waterfowl stamp or an elk permit, for example. Did you pay any such fees in 2016?
- FEES_ST_H For which states?
- FEES2H Concerning the special permits, stamps, and tags you bought in Hunting State, in 2016, how much did they cost in total?
- EXEMPT_F Some anglers were exempt from BUYING a license in 2016 because of their age, because they had a lifetime or free license, because they had a landowner exemption, or for some other reason. Were you exempt from buying a fishing license in any state in which you fished in 2016?
- EXEMPT_F_ST For which states?
- BUY_F Did you buy a license to fish in 2016? This could be a license that you bought or was bought for you.
- BUY_F_ST For which states?
- NUM_F How many fishing licenses did you have for State Name in 2016?
- FISH_F Concerning your License_number license for State Name, was this license only for fishing, or to both fish and hunt?
- COST_F Concerning your License_number license for State Name, how much did it cost?
- OBT_F Did you actually obtain this license in 2016?

- FEES_F Some states charge special fees or require special permits, stamps, or tags for certain types of fishing; a trout stamp, for example. Did you pay any such fees in 2016?
- FEES_ST_F For which states?
- FEES2F Concerning the special permits, stamps, and tags you bought in Fishing State in 2016, how much did they cost in total?
- H_PLNT During 2016, did you maintain any plantings, such as food or cover plants, for the PRIMARY PURPOSE of hunting? Include areas in agricultural crops.
- H_PLNST Approximately what were your costs for these plantings or crops during 2016?
- FHINTRST Now I would like to ask you about observing and enjoying wildlife in ways other than hunting and fishing. By wildlife, I mean birds, mammals, fish, insects, reptiles such as snakes and lizards, and amphibians such as frogs. Do not include farm animals or pets.
- From Date of last Sportsman interview to December 31, 2016, did you take any special interest in wildlife around your home, other than simply noticing wildlife while doing other activities? By this I mean, did you closely observe, feed, or photograph wildlife within a one-mile radius of your home, OR did you maintain any natural areas or plantings around your home FOR WHICH BENEFIT TO WILDLIFE WAS AN IMPORTANT CONCERN? (Natural areas and plantings would include wooded lots, food and cover plants, etc.)
- NCUINTRO Now I'm going to ask you some questions for a new time period, from Date of last interview to December 31, 2016. "Wildlife" includes birds, mammals, fish, insects, reptiles such as snakes and lizards, and amphibians such as frogs.
- FH_OBSRV From Date of Last Interview to December 31, 2016, did you take any trips or outings in the United States of at least one mile from home for the PRIMARY PURPOSE of observing, photographing, or feeding wildlife? Do not include trips to zoos, circuses, aquariums, museums, or trips for hunting, fishing, or scouting for game.
- NCU_ST In which state(s) did you take trips or outings to observe, photograph, or feed wildlife?

- USNCU From Date of last Wildlife Watcher interview to December 31, 2016, how many days did you observe, photograph, or feed wildlife at least one mile from your home in the United States?
- NCU_TOT How many trips lasting a single day or multiple days did you take in/to Wildlife state from Date of last Wildlife Watcher interview to December 31, 2016 PRIMARILY to observe, photograph, or feed wildlife?
- NCU_DAYS What is the total number of days you spent doing these activities in Wildlife state?
- TRIP On these trips/this trip in/to Wildlife state, did you...
Observe wildlife?
Photograph wildlife?
Feed wildlife?
- TRPDAY1 On these trips/this trip in/to Wildlife state, how many days did you observe wildlife?
- TRPDAY2 On these trips/this trip in/to Wildlife state, how many days did you photograph wildlife?
- TRPDAY3 On these trips/this trip in/to Wildlife state, how many days did you feed wildlife?
- NCU_PRIV On your trips/trip in/to Wildlife state, did you visit any areas on privately-owned land?
- NCU_PUB On your trips/trip in/to Wildlife state, did you visit any areas on land owned by the local, State, or Federal Government?
- BIRDS1 On your trips/trip in/to Wildlife state, did you observe birds?
- BIRDS1A How many days did you observe birds?
- BIRDS2 On your trips/trip in/to Wildlife state, did you photograph birds?
- BIRDS3 On your trips/trip in/to Wildlife state, did you feed birds?
- TYPBRD Did the birds you were observe in Wildlife state include...
- ANIMLS On your trips/trip in/to Wildlife state, did you observe, photograph, or

feed...(read list of answer options).

- NSINTRO Now I would like to ask you some questions about your expenses for all trips or outings that you took in the United States from Date of last Wildlife Watcher interview to December 31, 2016 for the PRIMARY purpose of observing, photographing, or feeding wildlife. If you paid for others or if someone else paid for you, INCLUDE ONLY YOUR SHARE OF THE EXPENSE.
- NCUSHR_A On your trips/trip in/to Wildlife state, how much was spent for YOUR SHARE of ...
- Food, drink, and refreshments?
- NCUSHR_B Lodging at motels, cabins, lodges, campgrounds, etc.?
- NCUSHR_C Public transportation by airplane?
- NCUSHR_D Other public transportation, including trains, buses, and car rentals, etc.?
- NCUSHR2_E The round-trip cost for transportation by private vehicle? Do not include boating expenses.
- NCUSHR2_F Guide fees, pack trip or package fees?
- NCUSHR2_G Public land use or access fees? Do NOT include leases.
- NCUSHR2_H Private land use or access fees? Do NOT include leases.
- NCUSHR3_I Equipment rental such as boats, camping equipment, etc.?
- NCUSHR3_J Boat fuel?
- NCUSHR3_K Other boat costs (such as launching, mooring, storage, maintenance, pumpout fees, insurance)? Do not include land access fees already reported.
- NCUSHR3_L Heating and cooking fuel?
- NCUSHAR5_1 The total amount you spent on your trips/trip in/to Wildlife state was Total wildlife trip expenses, not including airfare. How much of this was spent in your resident state of Resident state?
- WILDLIFE Now I'm going to ask some questions about your experiences with wildlife

around your home. By "around your home," I mean the area within a one-mile radius of your home.

From Date of last Wildlife Watcher interview to December 31, 2016, did you take SPECIAL INTEREST in wildlife around your home, other than simply noticing wildlife while doing other activities? By this I mean, did you closely observe wildlife or try to identify types of wildlife you did not know?

- WILDDAYS How many days did you do this kind of observing of wildlife?
- TYPWLD Which of the following kinds of wildlife did you observe?
- TYPWLD1A How many days did you observe birds?
- PHOTO Did you photograph any type of wildlife around your home?
- PHOTDAY How many days?
- FEEDBRD From Date of last Wildlife Watcher interview to December 31, 2016, did you feed wild birds around your home?
- FEEDFSH Did you feed any kind of fish or wildlife, other than birds, around your home? Please do not include animals you fed unintentionally.
- PARKS From Date of last Wildlife Watcher interview to December 31, 2016, did you visit any parks or natural areas within a one-mile radius of your home, for the purpose of observing, photographing, or feeding wildlife?
- DYSPARK How many days did you visit these areas?
- NCUEQP_A Now I would like to ask you about equipment and other items purchased PRIMARILY for use in observing, photographing, or feeding fish or wildlife. Include only items that were purchased in the United States. Include both new items and items previously owned by others.

As I read the following list, please tell me which items you purchased for yourself or were purchased for you.

From Date of last Wildlife Watcher interview to December 31, 2016, did you PURCHASE or ACQUIRE -

Binoculars, spotting scopes, etc.?

- NCUEQP_B Cameras, special lenses, videocameras, or other photography equipment, including memory cards?
- NCUEQP_C Film and photo processing?
- NCUEQP2_D Commercially prepared and packaged wild bird food?
- NCUEQP2_E Other bulk food used to feed wild birds?
- NCUEQP2_F Food used to feed other wildlife?
- NCUEQP2_G Nest boxes, bird houses, feeders, or baths?
- NCUEQP2_H Any other purchases such as field guides, maps, etc.?
- OTH_SPEC What was that purchase?
- BNOCOST What was the total cost of the BINOCULARS, SPOTTING SCOPES, ETC. purchased?
- BNO_ST In which state(s) did you purchase this equipment?
- PHOTCOST What was the total cost of the CAMERAS, SPECIAL LENSES, VIDEO CAMERAS, OR OTHER PHOTOGRAPHY EQUIPMENT, INCLUDING MEMORY CARDS purchased?
- PHOTST In which state(s) did you purchase these items?
- FILMCOST What was the total cost of the FILM AND PHOTO PROCESSING purchased?
- FILMST In which state(s) did you purchase these items?
- FOODCOST What was the total cost of the COMMERCIALLY PREPARED AND PACKAGED WILD BIRD FOOD purchased?
- FOODST In which state(s) did you purchase this bird food?
- BULKCOST What was the total cost of the OTHER BULK FOOD USED TO FEED WILD BIRDS purchased?
- BULKST In which state(s) did you purchase this other bird food?
- OTHCOST What was the total cost of the FOOD USED TO FEED OTHER WILDLIFE

purchased?

OTHRST In which state(s) did you purchase this food?

NESTCOST What was the total cost of the NEST BOXES, BIRD HOUSES, FEEDERS, OR BATHS purchased?

NESTST In which state(s) did you purchase this equipment?

SPECCOST What was the total cost of the Entry in OTH_SPEC purchased?

SPECST In which state(s) did you purchase this equipment?

MOREQP_A Show wildlife equipment reference card number

As I read the following list, please tell me if you purchased or acquired any other equipment primarily for use in observing, photographing, or feeding fish or wildlife from Date of last Wildlife Watcher interview to December 31, 2016.

Did you PURCHASE or ACQUIRE -

Tents, tarps?

MOREQP_B Frame packs, backpacking equipment?

MOREQP_C Other camping equipment?

MOREQP2_D Day packs, carrying cases, or special clothing (such as foul weather gear, camouflage clothing, boots, etc.)?

MOREQP2_E Books, magazines, and DVD's specifically devoted to fish or wildlife?

MOREQP2_F Dues or contributions to national, state, or local conservation or wildlife-related organizations?

MOREQP2_G Any other purchases (such as blinds or GPS devices. Do not include boats, cabins, or vehicles)?

OTHER_G What was that purchase?

TENTCOST How much did the TENTS AND/OR TARPS cost?

- TENTST In which state(s) did you purchase this equipment?
- PACKCOST How much did the FRAME PACKS AND/OR BACKPACKING EQUIPMENT cost?
- PACKST In which state(s) did you purchase this equipment?
- CAMP2CST How much did the OTHER CAMPING EQUIPMENT cost?
- CMP2ST In which state(s) did you purchase this equipment?
- DYPK_CST How much did the DAY PACKS, CARRYING CASES, OR SPECIAL CLOTHING cost?
- DYPKST In which state(s) did you purchase this equipment?
- MAG_COST How much did the BOOKS, MAGAZINES, OR DVD'S SPECIFICALLY DEVOTED TO FISH OR WILDLIFE cost?
- MAG_ST In which state(s) did you make this purchase?
- DUE2COST What was the total cost of the DUES OR CONTRIBUTIONS TO CONSERVATION OR WILDLIFE-RELATED ORGANIZATIONS?
- DUE2ST In which state(s) did you make this purchase?
- OTH_GCST How much did the Entry in OTHER_G cost?
- OTHGST In which state(s) did you purchase this equipment?
- ANNINTRO In the remaining equipment questions, I will be referring to the ENTIRE calendar year of 2016 - that is, from January 1 to December 31, 2016.
- AnnEqp_A From this next list of equipment, please tell me which items you purchased for yourself or were purchased for you PRIMARILY for use in observing, photographing, or feeding fish or wildlife.
- During 2016, did you PURCHASE or ACQUIRE -
- An off-the-road vehicle (snowmobile, 4-wheeler, ATV, 4 by 4 vehicle, trail bike, dune buggy)?
- AnnEqp_B A pickup, camper, van, travel or tent trailer, motor home, house trailer, or recreational vehicle (RV)?

- AnnEqp_C A boat, either motorized or not?
- AnnEqp_D Boat accessories such as motor, trailer, or hitch?
- AnnEqp_E A cabin?
- AnnEqp_F Any other purchases?
- AnnOth_F What was that purchase?
- OTR_COST What was the amount paid for the OFF-THE-ROAD VEHICLE in 2016?
Please only report the cost in 2016, not the total value of the item.
- OTR_ST In which state(s) did you purchase this equipment?
- TRAILCST What was the amount paid for the TRAVEL OR TENT TRAILER, MOTOR
HOME, PICKUP, CAMPER, HOUSE TRAILER, RECREATIONAL VEHICLE (RV) OR
VAN in 2016? Please only report the cost in 2016, not the total value of the
item.
- TRAILST In which state(s) did you purchase this equipment?
- BOAT_COST What was the amount paid for the BOAT (EITHER MOTORIZED OR NOT) in
2016? Please only report the cost in 2016, not the total value of the item.
- BOATSTN In which state(s) did you purchase this equipment?
- ACCESCST What was the amount paid for the BOAT ACCESSORIES SUCH AS MOTOR,
BOAT TRAILER/HITCH in 2016? Please only report the cost in 2016, not the
total value of the item.
- ACCEST In which state(s) did you purchase this equipment?
- CABNCOST What was the amount paid for the CABIN in 2016? Please only report the
cost in 2016, not the total value of the item.
- CABNST In which state(s) did you purchase the CABIN?
- EQUIPCST What was the amount paid for the ^ANNOOTH_F in 2016?
Please only report the cost in 2016, not the total value of the item.
- EQP_ST In which state(s) did you purchase this equipment?

- AOWN Now I would like to ask you about any land that you owned or leased because of your interest in observing, photographing, or feeding wildlife. In 2016, did you own land in the United States, in part or whole, PRIMARILY for the purpose of observing, photographing, or feeding wildlife?
- AOWN_ACRE How many acres did you own?
- AOWN_CLUB Were you part of a club or group, including a family group, owning this land in 2016?
- AOWN_CNUM How many others were members of this group or club, not counting yourself?
- AOWN_SHR What did you spend in 2016 for YOUR SHARE of the land which was owned PRIMARILY for observing, photographing, or feeding wildlife? Include mortgage, taxes, maintenance, and down payment cost if purchased in 2016. Do not include the cost of a cabin if reported earlier.
- AOWN_ST In which state(s) was this land located?
- ALEASE In 2016, did you lease land in the United States, alone or with others, PRIMARILY for the purpose of observing, photographing, or feeding wildlife?
- ALSE_ACRE How many acres did you lease?
- ALSE_CLUB Were you part of a club or group, including a family group, leasing this land in 2016?
- ALSE_CNUM How many others were members of this group or club, not counting yourself?
- ALSE_SHR What did you spend in 2016 for YOUR SHARE of the land which was leased PRIMARILY for observing, photographing, or feeding wildlife?
- ALSE_ST In which state(s) was this land located?
- NATRAREA Some people maintain natural areas around their homes; that is, wooded lots, hedgerows, open fields, or other areas that provide a place for wildlife. During 2016, did you maintain any natural areas around your home for the PRIMARY PURPOSE of benefitting fish or wildlife? Include only areas 1/4 acre or more in size and do not include areas that are farmed.

- ANNNUM1 How many acres of natural area did you keep or maintain for the benefit of wildlife?
- MAINPLNT During 2016, did you maintain in the area around your home any plantings, such as food or cover plants, for the PRIMARY PURPOSE of benefitting fish or wildlife? Include areas in agricultural crops.
- ANPLCST Approximately what were your costs for these plantings or crops during 2016?
- NCU_HNT Did you hunt game or other wildlife from Date of last Wildlife Watcher interview to December 31, 2016?
- NCU_HNTST In which state(s)?
- NCU_FISH Did you do any recreational fishing, including shellfishing, from Date of last Wildlife Watcher interview to December 31, 2016?
- NCU_FISHST In which state(s)?

APPENDIX C. VARIANCE ITEMS

SUMMARY OF SCREENER VARIABLES INCLUDED ON ALL PUBLIC USE FILES AND VARIANCE ITEMS BY SAMPLE

Table C.1 details the screener variables included in the three public use files. Tables C.2-C.4 list, by sample, the direct variance items that were calculated.

Table C.1 Screener Variables Included in All Three Public Use Files

Variable	Description
CENDIV	Census Division
I_RESIDENT	State (respondent) lived in at the start of Wave 1 interviewing
RESSTATE	State (respondent) lived in at the start of Wave 3 interviewing
LETTER_A	Did you receive our letter with the enclosed reference aid? <i>A,B,C in variable name refers to interview wave</i>
LETTER_B	
LETTER_C	
MODE_A	Mode of interview <i>A,B,C in variable name refers to interview wave</i>
MODE_B	
MODE_C	
GEMSAST	Metropolitan Statistical Area (MSA) designator
GEMSASZ	Population size of Metropolitan Statistical Area
GEUR	Population density
MARITAL	Is (respondent) now – married, widowed, divorced, separated or never married?
SCHOOL	What is the highest grade (or year) of regular school (respondent) ever attended?
HISPANIC	Is (respondent) of Spanish, Hispanic, or Latino origin?
RACE	Did (respondent) specify a race (one of <i>RACE1-RACE5</i> is filled)?
SCRACE	The variable is filled from answers in <i>RACFE1-RACE5</i>
RACE1	Did (respondent) specify their race as White?
RACE2	Did (respondent) specify their race as Black or African American?
RACE3	Did (respondent) specify their race as American Indian or Alaska Native?
RACE4	Did (respondent) specify their race as Asian?
RACE5	Did (respondent) specify their race as Native Hawaiian or Other Pacific Islander?
HINCOME	What was your total HOUSEHOLD income during 2015 before taxes and other deductions?

Table C.2 Screener Variance Items

Variable	Description
\$1 ³⁷	Wildlife participant in 2016 (HUNT06, FISH06, INTEREST06)
\$2	Wildlife participant in 2015 (HUNT05, FISH05, INTEREST05)
HUNT06	Did name hunt so far in 2016
FISH06	Did name fish so far in 2016
INTEREST06	Did name take any special interest in wildlife so far in 2016
HUNT05	Did name hunt in 2015
FISH05	Did name fish in 2015
INTEREST05	Did name take any special interest in wildlife in 2015

Table C.3 Sportsperson Variance Items

Variable	Description
USHUNT	Did you hunt in 2016
\$3	How many hunting trips did you take (BGTRIPS, SMTRIPS, MBTRIPS, OATRIPS)
USDAYS_H	How many days did you hunt in the US
BGHUNT	Did you hunt big game
BG_TRIP	How many trips did you take in reported state to hunt big game
BG_DAYS	How many days did you hunt big game in reported state
SMHUNT	Did you hunt small game
SM_TRIP	How many trips did you take in reported state to hunt small game
SM_DAYS	How many days did you hunt small game in reported state
MBHUNT	Did you hunt migratory birds
MB_TRIP	How many trips did you take in reported state to hunt migratory birds
MB_DAYS	How many days did you hunt migratory birds in reported state
OAHUNT	Did you hunt other animals
OA_TRIP	How many trips did you take in reported state to other animals
OA_DAYS	How many days did you hunt other animals in reported state
RECFISH	Did you recreationally fish in 2016
\$4	How many fishing trips did you take (FWTRIPS, SWTRIPS)
USDAYS_F	How many days did you fish in the U.S.
FSTATE	Did you do any freshwater fishing in reported state
FR_TRIP	How many trips lasting a single day or more did you take to go freshwater fishing
FR_DAYS	How many days did you fish in freshwater
GSTATE	Did you do any Great Lakes fishing in reported state
GL_TRIP	How many trips lasting a single day or more did you take to go Great Lakes fishing
GLSTDAYS	How many days did you fish in Great Lakes

³⁷If the Variable column contains a "\$" then this indicates the question uses multiple variables to reach the final answer/total; the variables used can be found at the end of the description. The same goes for Tables C4 and C4.

Variable	Description
SSTATE	Did you do any saltwater fishing in reported state
SALTRIP	How many trips lasting a single day or more did you take to go saltwater fishing
SALTDAYS	How many days did you fish in saltwater
\$5	Sportsman (USHUNT, USFISH)
\$6	How many days did you fish in other states (FISHST, I_RESIDENT, STDAYSF, USDAYS_F)
\$7	How many days did you fish in state of residence (FISHST, I_RESIDENT, STDAYSF, USDAYS_F)
\$8	Did you freshwater fish in other states, excluding Great Lakes (FRSTE, I_RESIDENT)
\$9	Did you saltwater fish in state of residences (SLTSTE, I_RESIDENT)
\$10	Did you saltwater fish in other states (SLSTE, I_RESIDENT)
FRTYP	Freshwater fished except Great Lakes – black bass
DAYS_FR	Days fishing - black bass
FRTYP	Freshwater fished except Great Lakes – panfish
DAYS_FR	Days fishing - panfish
DAYS_FR	Days freshwater fished - catfish and bullheads
FRTYP	Freshwater fished except Great Lakes – trout
DAYS_FR	Days fishing - trout
GLTYP	Great Lakes fished – walleye, sauger
GLDAYS	Days fishing - walleye, sauger
GLTYP	Great Lakes fished – perch
GLDAYS	Days fishing - perch
GLDAYS	Days Great Lakes fished - salmon
SLTYP	Saltwater fished – striped bass
SALTDAY	Days fishing saltwater - striped bass
\$11	Did you hunt in other states (HUNTST, I_RESIDENT)
\$12	Did you hunt big game in state of residence (HUNTST, I_RESIDENT, BGHNT)
HUNT	Big game hunted – deer
BGDIFDAY	Days hunting – deer
HUNT	Big game hunted - wild turkey
BGDIFDAY	Days hunting - wild turkey
HUNT	Small game hunted – rabbit
SMDIFDAY	Days hunting – rabbit
HUNT	Small game hunted – quail
SMDIFDAY	Days hunting – quail
HUNT	Small game hunted – squirrel
SMDIFDAY	Days hunting – squirrel
HUNT	Small game hunted – pheasant
SMDIFDAY	Days hunting – pheasant

Variable	Description
HUNT	Migratory bird hunted – geese
MBDIFDAY	Days hunting - geese
HUNT	Migratory bird hunted – duck
MBDIFDAY	Days hunting - duck
\$13	Amount spent on fishing or hunting equipment (RIFLE COST, GUNSCOST, MUZZCST, PISTLCST, BOWSCOST, SCOPECST, DECOYCST, AMMCOST, HANDCST, DOGSCOST, OTHCOST, RODSCOST, LINECOST, LURECOST, HOOKCOST, TACKCOST, CREELCST, BAITCOST, FINDCOST, ICECOST, OTHERCST)
\$14	Amount spent on auxiliary equipment - fishing or hunting (CAMPCOST, BINOCOST, GEARCOST, TAXICOST, FHCOST)
BOOKCOST	Amount spent on books, magazines, and DVD's for fishing or hunting
DUECOST	Total cost of dues or contributions
\$15	Amount spent on heating and cooking fuel – fishing (OFSHAR11, SLSHAR11, GLSHAR11)
\$16	Amount spent on fishing equipment (RODSCOST, LINECOST, LURECOST, HOOKCOST, TACKCOST, CREELCST, BAITCOST, FINDCOST, ICECOST, OTHERCST)
RODSCOST	Total cost of rods, reels, poles, and rod making components purchased
HOOKCOST	Total cost of hooks, sinkers, swivels, etc. purchased
LURECOST	What was the total cost of the artificial lures, flies, baits
TACKCOST	Total cost of tackle boxes
CREELCST	Total cost of creels, stingers, fish bags, landing nets, and gaff hooks
BAITCOST	Total cost of minnow traps, seines, and bait containers
\$17	Amount spent on fishing license (COSTF, OBTF, FISHF, USHUNT, COSTH, OBTH, HUNTH)
\$18	Amount spent on camping equipment – fishing (CAMPCOST, CAMPUSE)
OFSHAR_A	OF - Amount spent on food, drink, and refreshments
OFSHAR_B	OF - Amount spent on lodging
\$19	Amount spent on transportation – Freshwater (OFSHAR3, OFSHAR4, OFSHAR5)
OFSHAR2_G	OF - Amount spent on public land use or access fees
OFSHAR4_N	OF - Amount spent on boat launching fees
GLSHAR_A	Amount spent on food, drink, and refreshment - Great Lakes
\$20	Amount spent on fishing – Saltwater (SLSHAR1-SLSHAR15, RODSCOST, LINECOST, LURECOST, HOOKCOST, TACKCOST, CREELCST, BAITCOST, FINDCOST, LICECOST, OTHERCST, RODSUSE, LINEUSE, LUREUSE, HOOKUSE, TACKUSE, CREELUSE, BAITUSE, FINDUSE, ICEUSE, OTHERUSE, CAMPCOST, BINOCOST, GEARCOST, TAXICOST, FHCOST, CAMPUSE, BINOUSE, GEARUSE, TAXIUSE, FHUSE, CAMPFISH, BINFISH, GEARFISH, TAXIFISH, FHFISH, BASSCOST, BOATCOST,

Variable	Description
	CANOECST, MOTORCST, VANCOST, CABINCST, OFF_COST, EQPCST, BASSUSE, BOATUSE, CANOEUSE, MOTORUSE, VANUSE, CABINUSE, OFFUSE, OTHG_USE, BASSFISH, BOATFISH, CANOEFISH, MOTORFSH, VANFISH, CABINFSH, OFF_FISH, OTHG_FISH)
\$21	Amount spent on fishing trip related costs – Saltwater (SLSHAR1-SLSHAR15)
SLSHAR_E	Amount spent for transportation by private vehicle Saltwater
SLSHAR_F	Amount spent on guide fees, pack trip or package fees
SLSHAR2_K	SW - Amount spent on heating and cooking fuel
SLSHAR2_L	SW - Amount spent on equipment rental - boats, fishing or camping equipment, etc.
SLTOTAMOUNT	Total Amount spent on saltwater fishing trips
\$22	Amount spent on hunting trip related costs (BGSHAR1-BGSHAR13, SMSHAR1-SMSHAR13, MBSHAR1-MBSHAR13, OASHAR1-OASHAR13)
\$23	Amount spent on lodging – hunting (BGSHAR2, SMSHAR2, MBSHAR2, OASHAR2)
\$24	Amount spent on other trip costs – hunting (BGSHAR6-BGSHAR13, SMSHAR6-SMSHAR13, MBSHAR6-MBSHAR13, OASHAR6-OASHAR13)
\$25	Amount spent on hunting equipment (RIFLECST, GUNSCOST, MUZZCST, PISTLCST, BOWSCOST, SCOPECST, DECOYCST, AMMCOST, HANDCST, DOGSCOST, OTHCOST)
RIFLECST	Amount spent on rifles
GUNSCOST	Amount spent on shotguns
BOWSCOST	Amount spent on bows, arrows or other archery equipment
SCOPECST	Amount Spent on telescopic sights
\$26	Amount spent on special equipment for hunting (BASSCOST, BOATCOST, CANOECST, MOTORCST, VANCOST, CABINCST, OFF_COST, EQPCST, BASSUSE, BOATUSE, CANOEUSE, MOTORUSE, VANUSE, CABINUSE, OFFUSE, OTHG_USE)
\$27	Amount spent on hunting magazines (BOOKCOST, BOOKUSE)
\$28	Amount spent on hunting dues and contributions (DUECOST, DUESUSE)
\$29	Amount spent on leasing and ownership of land for hunting (HOWN_SHR, HLSE_SHR)
\$30	Amount spent on hunting licenses (COSTH, OBTH)
FEES2H	Amount spent on special permits, stamps, and tags
\$31	Amount spent on hunting transportation (BGSHAR3-BGSHAR5, SMSHAR3-SMSHAR5, MBSHAR3-MBSHAR5, OASHAR3-OASHAR5)
AMMCOST	What was the total cost of ammunition
\$32	Amount spent on big game hunting (BGSHAR1-BGSHAR13, RIFLECST, GUNSCOST, MUZZCST, PISTLCST, BOWSCOST, SCOPECST, RIFLEUSE, GUNSUSE, MUZZUSE, PISTLUSE, BOWSUSE, SCOPEUSE, DECOYUSE,

Variable	Description
	AMMUSE, HANDUSE, DOGSUSE, OTHUSE, CAMPCOST, BINOCOST, GEARCOST, TAXICOST, FHCOST, CAMPUSE, BINOUSE, GEARUSE, TAXIUUSE, FHUSE, CAMPHNT, BINOHNT, GEARHNT, TAXIHNT, FHHNT, BASSCOST, BOATCOAST, CANOECST, MOTORCST, VANCOST, CABINCST, OFF_COST, EQPCST, BASSUSE, BOATUSE, CANOEUSE, MOTORUSE, VANUSE, CABINUSE, OFFUSE, OTHG_USE, BASSHNT, BOATHNT, CANOEHNT, MOTORHNT, VANHNT, CABINHNT, OFF_HNT, OTHG_HNT)
\$33	BG - Amount. spent on food and lodging (BGSHAR1, BGSHAR2)
BGSHAR_E	BG - Amount spent on round trip cost for transportation by private vehicle
\$34	BG - Amount. spent on special hunting clothes (GEARCOST, GEARUSE, GEARHNT)
\$35	BG - Amount. spent on taxidermy costs (TAXICOST, TAXIUUSE, TAXIHNT)
\$36	Amount spent on small game hunting (SMSHAR1-SMSHAR13, RIFLECST, GUNSCOST, MUZZCST, PISTLCST, BOWSCOST, SCOPECST, DECOYCST, AMMCOST, HANDCST, DOGSCOST, OTHCOST, RIFLEUSE, GUNSUSE, MUZZUSE, PISTLUSE, BOWSUSE, SCOPEUSE, DECOYUSE, AMMUSE, HANDUSE, DOGSUSE, OTHUSE, CAMPCOST, BINOCOST, GEARCOST, TAXICOST, FHCOST, CAMPUSE, BINOUSE, GEARUSE, TAXIUUSE, FHUSE, CAMPHNT, BINOHNT, GEARHNT, TAXIHNT, FHHNT, BASSCOST, BOATCOST, CANOECST, MOTORCST, VANCOST, CABINCST, OFF_COST, EQPCST, BASSUSE, BOATUSE, CANOEUSE, MOTORUSE, VANUSE, CABINUSE, OFFUSE, OTHG_USE, BASSHNT, BOATHNT, CANOEHNT, MOTORHNT, VANHNT, CABINHNT, OFF_HNT, OTHG_HNT)
SMSHAR_A	SG - Amount spent of food, drink, and refreshments
\$37	SG - Amount. spent on transportation (SMSHAR3, SMSHAR4, SMSHAR5)
\$38	Amount spent on migratory bird hunting (MBSHAR1-MBSHAR13, RIFLECST, GUNSCOST, MUZZCST, PISTLCST, BOWSCOST, SCOPECST, DECOYCST, AMMCOST, HANDCST, DOGSCOST, OTHCOST, RIFLEUSE, GUNSUSE, MUZZUSE, PISTLUSE, BOWSUSE, SCOPEUSE, DECOYUSE, AMMUSE, HANDUSE, DOGSUSE, OTHUSE, CAMPCOST, BINOCOST, GEARCOST, TAXICOST, FHCOST, CAMPUSE, BINOUSE, GEARUSE, TAXIUUSE, FHUSE, CAMPHNT, BINOHNT, GEARHNT, TAXIHNT, FHHNT, BASSCOST, BOATCOST, CANOECST, MOTORCST, VANCOST, CABINCST, OFF_COST, EQPCST, BASSUSE, BOATUSE, CANOEUSE, MOTORUSE, VANUSE, CABINUSE, OFFUSE, OTHG_USE, BASSHNT, BOATHNT, CANOEHNT, MOTORHNT, VANHNT, CABINHNT, OFF_HNT, OTHG_HNT)
MBSHAR_A	MB – Amount spent for food and drink
GEARCOST	Total cost of special fishing or hunting clothing

Variable	Description
\$39	Amount spent on special fishing or hunting equipment (BASSCOST, BOATCOST, CANOECST, MOTORCST, VANCOST, CABINCST, OFF_COST, EQPCST)
\$40	Did you use a boat to fish (BOATGL, BOATFR, BOATSL)
BOATCOST	Amount spent on other types of motor boats
BUY_F	Did you buy a license to fish in 2016
EXEMPT_F	Were you exempt from buying a fishing license
BUY_H	Did you buy a license to hunt
EXEMPT_H	Were you exempt from buying a hunting license
DAYPOND	How many days did you fish in ponds or lakes or reservoirs
FR_RIVER	Did you fish in reported state(s) in rivers or streams
RIVERDAY	How many days did you fish in rivers or streams
WHCHGL	Fished - Lake Erie
DAYS_GL	Days fished - Lake Erie
WHCHGL	Fished - Lake Michigan
DAYS_GL	Days fished - Lake Michigan
\$41	Hunted on public land (BGPUBLIC, SMPUBLIC, MBPUBLIC, OAPUBLIC)
\$42	Days of hunting on public land (BGDYS PUB, SMDYS PUB, MBDYS PUB, OADYS PUB, STDAYSH)
BG_PRVT	Did you do any big game hunting in reported state on privately-owned land
BGDYPRV	How many days did you hunt big game in reported state on privately-owned land
BGPUBLIC	Did you do any big game hunting in reported state on public land
BGDYS PUB	How many days did you hunt big game in reported state on public land
SM_PRVT	Did you do any small game hunting in reported state on privately-owned land
SMDYPRV	How many days did you hunt small game in reported state on privately-owned land
SMPUBLIC	Did you do any small game hunting in reported state on public land
SMDYS PUB	How many days did you hunt small game in reported on public land
MBPUBLIC	Did you do any migratory bird hunting in reported state on public land
MBDYPUB	How many days did you hunt migratory birds in reported state on public land
MB_PRVT	Did you do any migratory bird hunting in reported state on privately-owned land
MBDYPRV	How many days did you hunt migratory birds in reported state on privately-owned land
ICEFISH	Did you ice fish
DAYS_IF	How many days did you ice fish
FLYFISH	Did you fly fish

Variable	Description
DAYSFLY	How many days did you fly fish
FLEASE	Did you lease land in the U.S. primarily for fishing
FH_EQP_A	Did you purchase or acquire - camping equipment
FH_EQP_B	Did you purchase or acquire - binoculars, field glasses, telescopes

Table C.4 Wildlife-Watching Variance Items

Variable	Description
FH_OBSRV	Nonresidential participant
\$43	Did you participate in a state other than state of residence (NCU_ST, I_RESIDENT, I_WAVE3)
AOWN	Did you own land primarily for observing, photo, or feeding wildlife
NCU_TOT	How many trips did you take in reported state(s)
USNCU	How many days did you observe, photo or feed at least 1 mile from home
AOWN_SHR	What did you spend on this owned land
TRPDAY1	Days observing wildlife
TRPDAY2	Days photographing wildlife
TRPDAY3	Days feeding wildlife
\$44	Did you observe, photo, or feed birds (BIRDS1, BIRDS2, BIRDS3)
ANIMLS	Did you observe, photo, or feed fish
ANIMLS	Did you observe, photo, or feed land mammals
ANIMLS	Did you observe, photo, or feed marine mammals
NCUSHR_A	Amount spent on - food, drinks, and refreshments
NCUSHR_B	Amount spent on - lodging
\$45	Amount spent on public transportation (NCUSHR3, NCUSHR4)
NCUSHR2_E	Amount spent on - round trip transportation by private vehicle
NCUSHR2_F	Amount spent on - guide fees, pack trip, or package fees
NCUSHR2_G	Amount spent on - public land use or access fees
NCUSHR2_H	Amount spent on - private land use or access fees
NCUSHR3_I	Amount spent on - equipment rental: boats, camping, etc.
\$46	Residential user (USRESIDE)
\$47	Wildlife participant (FH_OBSRV, I_WAVE3, USRESIDE)
WILDLIFE	Did you take special interest in wildlife around your home
WILDDAYS	How many days did you do this kind of observing
TYPWLD	Did you observe birds
TYPWLD	Did you observe mammals
PHOTO	Did you photograph any type of wildlife around your home
PHOTDAY	How many days did you photograph
\$48	Feed wildlife around home (FEEDBRD, FEEDFSH)
PARKS	Did you visit any parks within one mile of your home to observe, photo or feed
DYSPARK	How many days did you visit these parks

Variable	Description
BNOCOST	Total cost of binoculars purchased
FILMCOST	Total cost of film purchased
PHOTOCST	Total cost of cameras, etc. purchased
DYPK_CST	Total cost of carrying cases, special clothing purchased
FOODCOST	Total cost of wild bird food purchased
BULKCOST	Total cost of bulk food purchased
NESTCOST	Total cost of nest boxes, etc. purchased
\$49	Amount spent on wildlife-watching equipment (BINOCOST, PHOTOCST, FILMCOST, FOODCOST, BULKCOST, OTHRCOST, NESTCOST, DYPK_CST, SPECCOST)
MAG_COST	Total cost of books, magazines purchased
DUE2COST	Total cost of dues purchased
OTH_GCST	Total cost of other items purchased
TENTCOST	Total cost of tents, tarps purchased
PACKCOST	Total cost of frame packs purchased
CAMP2CST	Total cost of other camping equip purchased
\$50	Amount spent on auxiliary equipment (TENTCOST, PACKCOST, CAMP2CST, OTH_GCST)
OTR_COST	Amount paid for - off-the-road vehicle
TRAILCST	Amount paid for - trailer, etc.
EQUIPCST	Amount paid for - other equipment
\$51	Did you maintain any natural areas or plantings around your home for the primary purpose of benefitting wildlife (NATRAREA, MAINPLNT)
\$52	Total trip expenditures (NCUSHR1-NCUSHR12)
OBSERVE	Did you observe wildlife - outside of resident state
PHOTOGRAPH	Did you photograph wildlife - outside of resident state
FEED	Did you feed wildlife - outside of resident state

APPENDIX D. COMPARABILITY ACROSS FHWAR SURVEYS

Table D.1 Anglers and Hunters by Census Division: 1991, 1996, 2001, 2006, 2011, and 2016

(U.S. population 16 years and older. Numbers in thousands)

Area and sportsperson	1991		1996		2001		2006		2011		2016	
	Number	Percent										
United States												
Total population	189,964	100	201,472	100	212,298	100	229,245	100	239,313	100	254,686	100
Sportspersons	39,979	21	39,694	20	37,805	18	33,916	15	37,397	16	39,553	16
Anglers	35,578	19	35,246	17	34,067	16	29,952	13	33,112	14	35,754	14
Hunters	14,063	7	13,975	7	13,034	6	12,510	5	13,674	6	11,453	4
New England												
Total population	10,180	100	10,306	100	10,575	100	11,233	100	11,593	100	12,018	100
Sportspersons	1,658	16	1,673	16	1,504	14	1,353	12	1,441	12	1,485	12
Anglers	1,545	15	1,520	15	1,402	13	1,246	11	1,355	12	1,333	11
Hunters	444	4	465	5	386	4	374	3	420	4	297	2
Middle Atlantic												
Total population	29,216	100	29,371	100	29,806	100	31,518	100	32,392	100	33,368	100
Sportspersons	4,508	15	4,192	14	3,810	13	3,214	10	3,966	12	3,793	11
Anglers	3,871	13	3,627	12	3,250	11	2,550	8	3,496	11	3,471	10
Hunters	1,746	6	1,453	5	1,633	5	1,520	5	1,558	5	884	3
East North Central												
Total population	32,188	100	33,121	100	34,082	100	35,609	100	36,199	100	36,893	100
Sportspersons	7,202	22	6,912	21	6,400	19	5,975	17	6,766	19	7,097	19
Anglers	6,264	19	6,006	18	5,655	17	5,190	15	5,861	16	6,336	17
Hunters	2,789	9	2,712	8	2,421	7	2,376	7	2,688	7	2,737	7
West North Central												
Total population	13,504	100	13,875	100	14,430	100	15,458	100	15,860	100	16,502	100
Sportspersons	4,143	31	3,977	29	4,239	29	3,836	25	3,980	25	3,487	21
Anglers	3,647	27	3,416	25	3,836	27	3,284	21	3,591	23	3,042	18
Hunters	1,709	13	1,917	14	1,710	12	1,779	12	1,661	10	1,364	8
South Atlantic												
Total population	33,682	100	36,776	100	39,286	100	43,965	100	46,417	100	50,611	100
Sportspersons	6,996	21	7,282	20	6,957	18	6,633	15	6,749	15	8,181	16
Anglers	6,441	19	6,636	18	6,451	16	6,116	14	6,163	13	7,394	15
Hunters	2,083	6	2,050	6	1,875	5	1,884	4	1,870	4	1,716	3
East South Central												
Total population	11,667	100	12,459	100	12,976	100	13,722	100	14,206	100	14,968	100
Sportspersons	2,984	26	2,907	23	2,865	22	2,689	20	3,010	21	3,386	23
Anglers	2,635	23	2,514	20	2,543	20	2,436	18	2,444	17	3,061	20
Hunters	1,279	11	1,301	10	1,164	9	1,101	8	1,531	11	*1,256	*8
West South Central												
Total population	19,926	100	21,811	100	23,337	100	25,407	100	27,195	100	30,094	100
Sportspersons	5,125	26	5,093	23	4,924	21	4,499	18	4,855	18	5,694	19
Anglers	4,592	23	4,616	21	4,375	19	3,952	16	4,298	16	5,206	17
Hunters	1,843	9	1,812	8	1,988	9	1,810	7	1,909	7	1,556	5
Mountain												
Total population	10,092	100	11,966	100	13,308	100	15,651	100	17,013	100	18,364	100
Sportspersons	2,488	25	2,761	23	2,757	21	2,372	15	2,976	17	2,941	16
Anglers	2,079	21	2,411	20	2,443	18	2,084	13	2,586	15	2,687	15
Hunters	1,069	11	1,061	9	1,020	8	868	6	1,043	6	946	5
Pacific												
Total population	29,508	100	31,787	100	34,498	100	36,681	100	38,438	100	41,869	100
Sportspersons	4,875	17	4,897	15	4,349	13	3,345	9	3,654	10	3,489	8
Anglers	4,505	15	4,501	14	4,111	12	3,094	8	3,319	9	3,224	8
Hunters	1,101	4	1,203	4	837	2	798	2	996	3	697	2

Table D.2 Wildlife-Watching Participants by Census Division: 1991, 1996, 2001, 2006, 2011, and 2016

(U.S. population 16 years and older. Numbers in thousands)

Area and wildlife watcher	1991		1996		2001		2006		2011		2016	
	Number	Percent										
United States												
Total population	189,964	100	201,472	100	212,298	100	229,245	100	239,313	100	254,686	100
Wildlife watchers	76,111	40	62,868	31	66,105	31	71,132	31	71,776	30	86,042	34
Away from home	29,999	16	23,652	12	21,823	10	22,977	10	22,496	9	23,720	9
Around the home	73,904	39	60,751	30	62,928	30	67,756	30	68,598	29	81,128	32
New England												
Total population	10,180	100	10,306	100	10,575	100	11,233	100	11,593	100	12,018	100
Wildlife watchers	4,598	45	3,710	36	3,875	37	4,489	40	3,954	34	4,430	37
Away from home	1,856	18	1,443	14	1,155	11	1,340	12	1,187	10	1,499	12
Around the home	4,544	45	3,586	35	3,765	36	4,310	38	3,858	33	4,336	36
Middle Atlantic												
Total population	29,216	100	29,371	100	29,806	100	31,518	100	32,392	100	33,368	100
Wildlife watchers	10,556	36	8,185	28	8,740	29	8,723	28	9,118	28	12,170	36
Away from home	4,166	14	2,960	10	2,849	10	2,729	9	2,561	8	3,688	11
Around the home	10,282	35	8,023	27	8,452	28	8,451	27	8,744	27	11,838	35
East North Central												
Total population	32,188	100	33,121	100	34,082	100	35,609	100	36,199	100	36,893	100
Wildlife watchers	14,511	45	11,731	35	11,631	34	12,215	34	12,840	35	13,348	36
Away from home	5,572	17	4,501	14	3,571	10	3,792	11	3,168	9	2,847	8
Around the home	14,175	44	11,297	34	11,196	33	11,845	33	12,492	35	12,808	35
West North Central												
Total population	13,504	100	13,875	100	14,430	100	15,458	100	15,860	100	16,502	100
Wildlife watchers	6,924	51	5,089	37	6,206	43	6,741	44	5,479	35	5,322	32
Away from home	2,654	20	1,927	14	2,059	14	2,163	14	1,783	11	1,590	10
Around the home	6,722	50	4,900	35	5,938	41	6,447	42	5,201	33	5,249	32
South Atlantic												
Total population	33,682	100	36,776	100	39,286	100	43,965	100	46,417	100	50,611	100
Wildlife watchers	13,047	39	11,252	31	11,395	29	12,862	29	13,315	29	17,832	35
Away from home	4,450	13	3,992	11	3,469	9	3,208	7	4,393	9	5,530	11
Around the home	12,813	38	10,964	30	10,911	28	12,432	28	12,767	28	16,502	33
East South Central												
Total population	11,667	100	12,459	100	12,976	100	13,722	100	14,206	100	14,968	100
Wildlife watchers	4,864	42	3,904	31	4,514	35	4,931	36	4,663	33	5,062	34
Away from home	1,592	14	1,118	9	1,086	8	1,758	13	1,456	10	*498	*3
Around the home	4,765	41	3,795	30	4,390	34	4,683	34	4,394	31	4,907	33
West South Central												
Total population	19,926	100	21,811	100	23,337	100	25,407	100	27,195	100	30,094	100
Wildlife watchers	7,035	35	5,933	27	5,747	25	6,764	27	7,164	26	8,173	27
Away from home	2,459	12	2,096	10	1,822	8	2,127	8	1,728	6	1,541	5
Around the home	6,817	34	5,773	26	5,490	24	6,319	25	7,087	26	7,763	26
Mountain												
Total population	10,092	100	11,966	100	13,308	100	15,651	100	17,013	100	18,364	100
Wildlife watchers	4,437	44	4,099	34	4,619	35	4,968	32	5,189	30	6,257	34
Away from home	2,215	22	1,967	16	2,019	15	2,004	13	2,230	13	3,119	17
Around the home	4,145	41	3,855	32	4,282	32	4,605	29	4,716	28	4,883	27
Pacific												
Total population	29,508	100	31,787	100	34,498	100	36,681	100	38,438	100	41,869	100
Wildlife watchers	10,139	34	8,966	28	9,377	27	9,439	26	10,054	26	13,448	32
Away from home	5,035	17	3,648	11	3,793	11	3,856	11	3,990	10	3,408	8
Around the home	9,641	33	8,558	27	8,504	25	8,664	24	9,337	24	12,842	31

Table D.3 Comparison of Major Findings of the National Surveys: 1955 to 1985

(U.S. population 12 years and older. Numbers in thousands)

Sportspersons	1955	1960	1965	1970	1975	1980	1985
Total sportspersons	24,917	30,435	32,881	36,277	45,773	46,966	49,827
Anglers	20,813	25,323	28,348	33,158	41,299	41,873	45,345
Freshwater	18,420	21,677	23,962	29,363	36,599	35,782	39,122
Saltwater	4,557	6,292	8,305	9,460	13,738	11,972	12,893
Hunters	11,784	14,637	13,583	14,336	17,094	16,758	16,340
Small game	9,822	12,105	10,576	11,671	14,182	12,496	11,130
Big game	4,414	6,277	6,566	7,774	11,037	11,047	12,576
Waterfowl	1,986	1,955	1,650	2,894	4,284	3,177	3,201
Expenditures¹	\$11,401,464	\$13,948,974	\$14,991,502	\$19,618,548	\$33,398,677	\$34,517,421	\$42,058,860
Anglers	\$7,655,522	\$9,743,971	\$9,952,411	\$13,699,311	\$23,498,506	\$23,387,469	\$28,585,686
Freshwater	\$5,700,187	\$7,476,454	\$7,231,851	\$10,315,966	\$17,333,212	\$16,663,239	\$18,942,060
Saltwater	\$1,955,336	\$2,267,512	\$2,720,574	\$3,383,345	\$6,165,294	\$5,581,976	\$7,191,387
Hunters	\$3,745,942	\$4,204,997	\$3,814,303	\$5,919,236	\$9,900,171	\$10,812,058	\$10,256,668
Small game	\$1,975,707	\$2,629,360	\$2,093,137	\$2,612,390	\$4,525,942	\$3,335,852	\$2,342,860
Big game	\$1,295,357	\$1,251,800	\$1,424,711	\$2,631,532	\$4,238,341	\$5,638,395	\$5,345,606
Waterfowl	\$474,878	\$323,840	\$296,452	\$675,315	\$1,135,889	\$766,033	\$783,315
Days	566,870	658,308	708,578	909,876	1,459,551	1,300,983	1,415,379
Fishing	397,447	465,769	522,759	706,187	1,058,075	952,420	1,065,986
Freshwater	338,826	385,167	426,922	592,494	890,576	788,392	895,027
Saltwater	58,621	80,602	95,837	113,694	167,499	164,040	171,055
Hunting	169,423	192,539	185,819	203,689	401,476	348,543	350,393
Small game	118,630	138,192	128,448	124,041	269,653	225,793	214,544
Big game	30,834	39,190	43,845	54,536	100,600	117,406	135,447
Waterfowl	19,959	15,158	13,526	25,113	31,223	26,179	25,933

¹In 1985 U.S. dollars

Note: Methodological differences described in Chapter 2 make the estimates in this table not comparable with the estimates in Tables D.1 and D.2.

Table D.4 Anglers and Hunters by Census Division: 1955 to 1985

(U.S. population 12 years and older. Numbers in thousands)

Year	Population		Sportsperson, fished or hunted		Anglers		Hunters	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
United States	118,366	100	24,917	21.1	20,813	17.6	11,784	10.0
1955	131,226	100	30,435	23.2	25,323	19.3	14,637	11.2
1960	141,928	100	32,881	23.2	28,348	20.0	13,585	9.6
1965	155,230	100	36,277	23.4	33,158	21.4	14,336	9.2
1970	171,860	100	45,773	26.6	41,299	24.0	17,094	9.9
1975	184,691	100	46,966	25.4	41,873	22.7	16,758	9.1
1980	195,659	100	49,827	25.5	45,345	23.2	16,340	8.4
1985	118,366	100	24,917	21.1	20,813	17.6	11,784	10.0
New England								
1955	7,919	100	1,224	15.4	1,002	12.7	589	7.4
1960	8,349	100	1,368	16.4	1,205	14.4	517	6.2
1965	9,256	100	1,650	17.8	1,488	16.0	583	6.3
1970	8,652	100	1,579	18.3	1,430	16.5	582	6.7
1975	9,910	100	2,004	20.2	1,861	18.8	566	5.7
1980	10,205	100	1,974	19.3	1,788	17.5	572	5.6
1985	10,554	100	2,058	19.5	1,914	18.1	552	5.2
Middle Atlantic								
1955	24,869	100	3,539	14.2	2,811	11.3	1,608	6.5
1960	26,493	100	3,432	13.0	2,569	9.7	1,723	6.5
1965	27,346	100	3,602	13.2	2,760	10.1	1,631	6.0
1970	28,244	100	4,539	16.1	4,504	14.4	1,731	6.1
1975	30,449	100	5,919	19.4	5,097	16.7	2,096	6.9
1980	30,256	100	5,181	17.1	4,332	14.3	2,001	6.6
1985	31,099	100	5,565	17.9	4,820	15.5	1,972	6.3
East North Central								
1955	25,733	100	5,489	21.3	4,583	17.8	2,538	9.9
1960	26,833	100	6,316	32.5	5,317	19.8	2,985	11.1
1965	28,124	100	6,214	22.1	5,336	19.0	2,563	9.1
1970	31,550	100	7,284	23.1	6,699	21.2	2,812	8.9
1975	32,796	100	9,049	27.6	8,181	24.9	3,392	10.3
1980	33,526	100	8,725	26.0	7,891	23.5	2,955	8.8
1985	33,747	100	8,973	26.6	8,270	24.5	2,814	8.3
West North Central								
1955	9,201	100	2,913	31.7	2,346	25.5	1,534	16.7
1960	10,149	100	3,383	33.3	2,855	28.1	1,709	16.8
1965	11,681	100	3,678	31.5	3,226	27.6	1,620	13.9
1970	12,904	100	4,000	31.0	3,579	27.7	1,783	13.8
1975	13,564	100	4,524	33.3	4,089	30.1	1,863	13.7
1980	13,826	100	4,770	34.5	4,220	30.5	1,965	14.2
1985	14,137	100	5,140	36.4	4,681	33.1	1,971	13.9
South Atlantic								
1955	14,336	100	3,223	22.5	2,805	19.6	1,449	10.1
1960	17,798	100	4,423	24.9	3,695	20.8	2,045	11.5
1965	20,593	100	5,626	27.3	5,054	24.5	1,900	9.2
1970	23,539	100	5,461	23.2	5,129	21.8	1,904	8.1
1975	27,127	100	7,110	26.2	6,479	23.9	2,494	9.2
1980	30,512	100	7,769	25.5	7,086	23.2	2,444	8.0
1985	33,636	100	8,721	25.9	8,056	24.0	2,467	7.3
East South Central								
1955	7,959	100	1,963	24.7	1,665	20.9	989	12.4
1960	9,277	100	2,778	29.9	2,207	23.8	1,510	16.3
1965	9,652	100	2,587	26.8	2,201	22.8	1,294	13.4
1970	9,862	100	2,660	27.0	2,464	25.0	1,162	11.8
1975	10,798	100	3,007	27.8	2,689	24.9	1,355	12.5
1980	11,771	100	3,614	30.7	3,173	27.0	1,567	13.3
1985	12,364	100	3,671	29.7	3,308	26.8	1,441	11.7

Year	Population		Sportsperson, fished or hunted		Anglers		Hunters	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
West South Central								
1955	10,250	100	2,560	25.0	2,237	21.8	1,165	11.4
1960	11,837	100	3,666	31.0	3,133	26.5	1,750	14.8
1965	12,724	100	3,713	29.2	3,278	25.8	1,571	12.3
1970	14,624	100	4,380	30.0	4,006	27.4	1,918	13.1
1975	16,628	100	5,781	34.8	5,267	31.7	2,563	15.4
1980	19,136	100	5,862	30.6	5,136	26.8	2,456	12.8
1985	21,184	100	6,418	30.3	5,704	26.9	2,572	12.1
Mountain								
1955	4,529	100	1,369	30.2	1,112	24.6	796	17.6
1960	5,222	100	1,646	31.5	1,372	26.3	1,120	21.4
1965	5,029	100	1,565	31.1	1,261	25.1	988	19.6
1970	5,656	100	2,044	36.1	1,769	31.3	980	17.3
1975	7,576	100	2,570	33.9	2,252	29.7	1,159	15.3
1980	9,160	100	2,903	31.7	2,500	27.3	1,268	13.8
1985	10,215	100	3,128	30.6	2,765	27.1	1,241	12.1
Pacific								
1955	13,570	100	2,637	19.4	2,252	16.6	1,116	8.2
1960	15,268	100	3,422	22.4	2,971	19.5	1,279	8.4
1965	17,523	100	4,246	24.2	3,744	21.4	1,433	8.2
1970	20,199	100	4,332	21.4	4,030	20.0	1,466	7.3
1975	23,012	100	5,811	25.2	5,386	23.4	1,607	7.0
1980	26,299	100	6,168	23.5	5,747	21.9	1,531	5.0
1985	38,725	100	6,154	21.4	5,829	20.3	1,310	4.6

Note: Methodological differences described in Chapter 2 make the estimates in this table not comparable with the estimates in Tables D.1 and D.2.

APPENDIX E. OUTCOME CODES

Table E.1 defines the CATI outcome codes and Table E.2 defines the CAPI outcome codes. These codes were used for both the household-level data collections (Waves 1 and 2) and the person-level data collection (Wave 3).

Table E.1 CATI Outcome Codes

Outcome Code	Description
001	Fully Complete
002	Complete Screener, sufficient partial
006	Complete/Partial
007	Complete Screener, no one in sample
020	Sample Unit Ineligible - out of scope
024	Unconverted language problem
025	Unconverted hearing barrier
026	In scope but data unavailable
179	Hostile breakoff
181	Refusal
182	Hard refusal
183	Exceeded unproductive call max
188	Insufficient partial - callback
193	Privacy detector
194	Never contacted - confirmed number
195	Never contacted - unconfirmed number

Table E.2 CAPI Outcome Codes

Outcome Code	Description
201	Complete Screener/Detail
204	Complete Screener, no one in sample
206	Complete Screener, detail undone – transmitted
208	Complete Screener, detail sufficient partial
216	No one home
217	Temporarily absent
218	Refused
219	Type A - Other
225	Temp Occupied with Usual Residence Elsewhere (URE)
226	Vacant
228	Unfit/to be demolished
230	Converted to temp business
231	Unoccupied tent/trailer site
233	Type B - Other
234	Type B - Institutionalized
240	Demolished
241	House/trailer moved
243	Converted to business
244	Merged
245	Condemned
248	Type C – Other
250	Type C, deceased
251	Type C, respondent moved out of country
260	Address Unknown - no further research possible