National Survey of Waterfowl Hunters: Summary Report Central Flyway

2018

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Minnesota Cooperative Fish and Wildlife Research Unit
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And

The Ohio State University

for the

National Flyway Council

National Survey of Waterfowl Hunters: Summary Report Central Flyway 2018

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BACKGROUND

In cooperation with the four Flyway Councils (Atlantic, Mississippi, Central, and Pacific), the North American Waterfowl Management Plan (NAWMP) Committee, and non-governmental agencies, the National Flyway Council (NFC) initiated the formation of a Human Dimensions Working Group (HDWG) to obtain and incorporate human dimensions information and approaches into migratory bird conservation programs, policies and practices.

The 2012 NAWMP Revision *Vision Statement* provides a new conception of waterfowl management that emphasizes a growing and supportive core of waterfowl hunters and an engaged conservation community inspired by waterfowl and wetlands. The goal is to have a public supportive of waterfowl and wetlands conservation that have strong emotional and pragmatic ties to waterfowl and wetlands.

To achieve this goal, NAWMP partners must engage both the traditional waterfowl hunting community and other nontraditional stakeholder groups who are interested in waterfowl and the conservation of waterfowl and wetlands. To facilitate this engagement, the NFC's HDWG and other NAWMP partners conducted a research study using both stakeholder and general public surveys of North Americans that can inform: 1) NAWMP objectives; 2) harvest objectives and strategies; 3) habitat management; and 4) public engagement strategies.

STUDY OBJECTIVES

This study had the following key objectives:

1) Assess what hunters and other waterfowl conservationists (i.e., birders) most desire from their natural resource-based management and social settings to inform NAWMP objectives and select habitat and population management alternatives.

2) Establish baseline measures that can be repeated to inform the development of a Public Engagement Strategy and monitor trends in achieving the NAWMP goal of "growing numbers of waterfowl hunters, other conservationists, and citizens who enjoy and actively support waterfowl and wetlands conservation."

3) Assess waterfowl hunters' and conservationists' knowledge, preferences, levels of use and support for waterfowl and wetlands conservation.

4) Assess the general publics' participation in waterfowl-associated recreation and how much they support waterfowl and wetlands conservation.

5) Assess the general publics' awareness and their perceptions regarding the importance of the benefits and values (i.e., Ecological Goods and Services - EGS) provided by waterfowl and wetlands conservation.

6) Assess waterfowl professionals' perspectives on the levels of waterfowl populations and habitats needed to support hunter and viewer use opportunities.

The expected outcomes of this study include:

1) Quantified measures of stakeholder preferences;

2) NAWMP objectives and management actions that can be directly informed by waterfowl and wetland stakeholders;

3) A focus on harvest management actions that will provide the greatest benefits in terms of stakeholder preferences within the context of what is biologically feasible.

This study was completed by a collaborative research team at the U.S. Geological Survey's Fort Collins Science Center, the Minnesota Cooperative Research Unit located at the University of Minnesota, and the University of Alberta.

STUDY DESIGN AND METHODS

Survey Questionnaires

The project included three surveys – a general public survey, a waterfowl hunter survey, and a birdwatcher survey. The general public survey was mailed to 5,000 individuals throughout the continental United States with a completed sample size target of 1,200. A separate summary report is available for that effort (U.S. Geological Survey 2017). Throughout the rest of this report the waterfowl hunter survey is referred to as the National Survey of Waterfowl Hunters (NSWH) and the birdwatcher survey is referred to as the North American Birdwatching Survey (NABS).

The stakeholder studies involved multiple phases and research activities. A core portion of the NSWH and NABS involved discrete choice experiments (DCEs). The DCEs allow identification of key attributes and levels on those attributes that most influence hunter and viewer preferences for waterfowl hunting and viewing. The attributes used in the DCEs were identified through a series of workshops with stakeholders conducted by researchers from the U.S. Geological Survey Fort Collins Science Center.

Design and implementation of the U.S. stakeholder workshops began in November 2014 and was completed in June 2015. A total of 12 workshops with hunters and 12 with birdwatchers were completed in key geographic locations across the Flyways in the U.S. to provide a diverse representation of important ecological characteristics associated with these places and the social traditions associated with waterfowl hunting and viewing opportunities. A similar approach was taken in Canada. The primary outcome of the workshops was the identification of key attributes of waterfowl hunting and birdwatching experiences. This information was used in the design of the DCE in both the NSWH and NABS studies.

The NSWH and NABS were designed between June 2015 and September 2016. In addition to the stakeholder workshops, the survey design involved multiple workshops, meetings, and webinars, as well as reviews and comments from representatives of key partners. The core design team for the NSWH included Human Dimensions Working Group members from the Atlantic, Mississippi, Central and Pacific Flyways. This team held multiple meetings and webinars to identify appropriate sampling and questionnaire design. In addition to achieving the previously identified objectives and implementing DCE on hunting and viewing preferences, the hunter and birdwatching surveys also include questions targeting three areas identified by the HDWG as important:

1. Decisions: Individual decisions to participate in viewing, hunting, and conservation are reflected in participation patterns. This series of questions would determine baseline participation levels in viewing, hunting, and conservation and offer the potential to identify stakeholder segments based on participation levels as well as types of participation.

2. Identity: Measures of identity formation will focus on determining the degree to which hunters, viewers, and conservationists have developed personal identities associated with an activity or social role. (i.e., the individual's progression in formation of their identity as a hunter, viewer, etc.).

3. Capacity: The NAWMP suggests the long-term sustainability of waterfowl and wetlands will depend on building support among and relevancy to a broader conservation constituency. In essence, it is a matter of maintaining or increasing (where possible) waterfowl populations, protect and restore habitat, and increase and improve upon the activities people enjoy that involve waterfowl and wetlands. Social science research suggests that institutional capacity can be thought of in terms of the social, political, economic, and human capital ("capital" can be defined as the available resources that can be used to effect action and outcomes).

Additionally, the NSWH in particular was designed to replicate key questions of interest to waterfowl managers from the 2005 National Duck Hunter Survey (NDHS) (NFC 2006), and address several key management questions specific to each of the four Flyways. Appendix A contains a copy of the NSWH, and a question-by-objective matrix that summarizes which objective was addressed by each survey item and that item's source.

Sampling Design

The target population for the NSWH included all U.S. residents 18 years of age or older who had participated in waterfowl hunting during 2015. A subset of the 2015 Migratory Bird Harvest Information Program (HIP) database was used as the sample frame. The sampling design from the 2005 National Duck Hunter Survey (NDHS; National Flyway Council 2006) was used as a guide for sampling in the NSWH. However, the NDHS sampled only individuals who hunted ducks and harvested at least one duck during the year prior to the survey (2004). In the NSWH, all HIP registrants 18 years of age or older who hunted ducks, geese, sea ducks, or brant during 2015 *whether or not they actually bagged any birds* were included when possible. However, sampling procedures varied in 5 states due to errors in coding HIP information when collected at the state level (discussed below).

The Migratory Bird HIP (https://www.fws.gov/birds/surveys-and-data/harvest-surveys/harvest-information-program.php) is a method state wildlife agencies use to generate reliable estimates of hunting activity and the number of all migratory game birds harvested throughout the country. These estimates give biologists the information they need to make sound decisions concerning hunting seasons, bag limits, and population management. Individuals who hunt ducks, geese, brant, or other migratory birds are required to participate in HIP in every state in which they hunt migratory birds. When signing up, individuals must provide their name, address, and date of birth. In addition, HIP registrants are asked to voluntarily answer several

questions about their experience during the previous year's hunting season, including whether they hunted waterfowl (ducks, sea ducks, geese, or brant) and how many waterfowl they bagged. Each state collects information on the more than 1 million waterfowl hunters nationwide and provide those data to the U.S. Fish and Wildlife Service (FWS). The FWS uses the HIP database to conduct surveys to develop information about overall hunter activity and harvest estimates. The robust nature of the HIP database makes it an excellent sampling frame for other studies of waterfowl hunters.

Because the HIP information is collected and managed by the states, use of the data for contacting hunters requires permission from each state. In the NSWH, all 49 states involved in the study (excludes Hawaii) provided permission to sample up to 3,000 resident waterfowl hunters, 18 years of age or older, from their state's HIP data. In consultation with FWS Migratory Bird staff, a standard sampling protocol was developed, consisting of the following steps:

1) Limited the sample frame as:

a) Hunters >= 18 years old

b) In-state hunters

c) Active waterfowl hunters:

d) Ducks bagged 0 or more;

e) Geese bagged 0 or more;

f) Sea ducks bagged 0 or more;

g) Brant bagged 0 or more.

2) Limited states with problems

a) Georgia – No registrations before August had valid stratification information for harvest. These were identified in the data set by having all strata coded as 6. Used only hunters with valid stratification.

b) South Dakota – invalid stratification for the entire year. Drew simple random sample of entire data set of in-state hunters older than 18 years old.

c) Idaho, Texas, and West Virginia – lumped Did Not Hunt and bagged 0 in their bag coding. Included *only* successful hunters for these 3 states.

3) Removed records with known undeliverable addresses.

4) Randomized the order of the remaining records.

5) Conducted a simple random sample of the remaining hunter records with sample size of 3,000. For states with fewer than 3,000 registrations, all hunters were selected.

6) Corrected addresses based on information from previous mailing attempts.

A total of 138,948 hunter records were initially selected from the HIP records, with 3,000 in each of the 49 states except the following, which had less than that number of registrants: AK (723), CT (2,992), NH (2,479), NM (2,902), NV (2,441), RI (650), VT (2,769), and WV (992).

Following the 2005 NDHS (NFC 2006), the sample was stratified into 12 sub-regional strata across the four Flyways (table 1.1 and Figure 1.1). The target completed sample size was n = 400 in each substratum which would provide estimates within ±5% at the 95% confidence level, given an anticipated a response rate of 20% across the study after removing undeliverable addresses. Thus, each sub-regional stratum had an initial sample of n = 2,100 to achieve 400 completed surveys.

Within the sub-regions, random sample was drawn generally proportional to the number of waterfowl hunters in each state based on the average number of waterfowl hunters in each state as reported by the FWS in 2014 and 2015 (Raftovich, Chandler, and Wilkins. 2015). However, to achieve a minimum number of 40 respondents from each state, the minimum sample size drawn in any state was n = 200, even if the proportion of waterfowl hunters in a state was less than .095 for that region (2100* .095 = 200). In order to select a minimum of n = 200 from all states and not exceed a sample size of n =2100 in each sub-region, a disproportionately small sample was selected from states with relatively large populations of waterfowl hunters. In addition, 7 states (AR, FL, IN, MO, NC, SD, WI) requested oversampling in their state to ensure a minimum of 400 respondents in their state. For these states, the sample size was increased up to 2000, which provided an initial overall nationwide sample size of n = 35,101 (Table 1.2). In Arkansas, Florida and North Carolina, the target sample size of n = 400 was not achieved after 4 contacts, so the remaining 1000 waterfowl hunters in each of those states were contacted. In addition, response rates in Alabama, Arizona, Georgia,

Louisiana, Maine, Mississippi and Tennessee were low after 4 contacts, so an additional random sample was drawn in those states from the remaining names that had not been drawn for the initial sample in those states (Table 1.2).

Data Collection

Procedures outlined in Dillman, Smyth, and Christian (2014) for mixed-mode survey implementation using a four-contact postal mail implementation were adapted for this study. Waterfowl hunters were initially contacted via the US Postal Service with a letter that provided a brief explanation of the study and invited them to participate in the study by completing a survey on line (see Appendix for copies of the contact letters). The letters were printed on University of Minnesota letterhead from the Department of Fisheries, Wildlife and Conservation Biology, and mailed in #10 University of Minnesota envelopes. These letters and envelopes also included the logo of the state wildlife management agency for each relevant state.

The individuals were provided a web address with instructions on how to enter it into their browser along with a unique 6-digit access code which was required to begin the survey. Individuals were also provided an e-mail that they could contact to receive an automated reply e-mail with the same web address included as a link that they could click on to connect to the survey. A web-based survey was used to reduce costs and to facilitate the implementation of the DCE portion of the survey. Discrete choice experiments can be cumbersome to implement in tradition paper-and-pencil surveys due to their complexity of design and the amount of space required to present questions. Data were collected using Sawtooth Software's Lighthouse Studio (https://www.sawtoothsoftware.com). Sawtooth Software was chosen for data collection because it allows for the design, hosting, implementation, data collection and analysis of DCE data using Choice Based Conjoint (CBC) software.

Initial contact letters were mailed November 15th, 2016. Approximately 2 weeks later, a second contact letter containing the same information was mailed to everyone in the initial sample as a reminder to complete the survey. After updating the mailing list for undeliverable addresses, a third contact letter was sent the second week of January 2017 to everyone who had not yet completed the online survey. The caption "HUNTER STUDY" was printed in 16pt. Arial black font on the lower left side of the University of Minnesota envelopes used to mail the contact letter to encourage recipients to open the envelopes. We did not include state logos, but referenced their state's participation in the study in the contact letter. Also, a $1 incentive was

included in contact letters during the third mailing in states for which the response rate was below 12 percent after two rounds of contact.

After updating the mailing list for additional undeliverable addresses, a fourth contact letter was sent the second week of February to all individuals who had not completed the survey on line. This letter was more urgent and again referenced their state wildlife agency's support and interest in the study and was mailed in University of Minnesota envelope labeled "HUNTER STUDY".

By March 1, 2017, response rates in most states were at or above 20 percent. Data from all states were collected through March 20, 2017. By that date, 1,742 individuals were identified as having undeliverable addresses or deceased. Of the 33,359 living recipients with valid contact information a total of 7,689 individuals had at least partially completed the survey nationwide (23% response rate). There was a total of 25,670 non-respondents with apparent valid addresses remaining from the original 35, 101.

Response rates varied across the states. For this reason, 4,500 more individuals were sampled from the 10 states described previously (AL, AR, AZ, FL, GA, LA, ME, MS, NC, TN, Table 1.2). Individuals were contacted using the exact protocols as with the initial sample except we included a $1 incentive in the first round of mailing. All individuals in these 10 states were contacted twice—the 3rd week of February and the 1st week of March. For Florida and North Carolina, we obtained letterhead and envelopes from the wildlife agencies in those states and contacted individuals 2 additional times. Both Florida and North Carolina requested sample sizes of n = 400 and these additional contacts were made to attempt to obtain the desired sample size.

To conduct a non-response assessment, a proportional random sample of 16,000 was drawn from the 25,670 non-respondents remaining in the initial sample of 35,101. This sample was drawn proportional to the number of waterfowl hunters in each state. These 16,000 individuals were sent a shortened survey questionnaire the second week of April 2017, and asked to respond by mail. Completed non-response surveys were collected through May 31, 2017, and a total of 1879 surveys were returned (11.7% response rate). Key questions concerning waterfowl hunting experiences, identity, and demographics were collected from non-respondents to assess if there are any substantive differences between people who completed the complete survey and those who did not respond to it. A summary of the non-response results are provide in Section 10 of the report.

Where appropriate we report results of statistical tests in summary tables. We use the following convention when reporting statistical significance for these tests: * $p \leq 0.05$, ** $p \leq 0.01$, and *** $p \leq 0.001$.

Table 1.1 Study stratification for sampling

Flyway	Sub-regions	States
Atlantic	Lower Atlantic	FL, GA, NC, SC
	Middle Atlantic	DE, MD, NJ, PA, VA, WV
	Upper Atlantic	CT, ME, MA, NH, NY, RI, VT
Mississippi	Lower Mississippi	AL, AR, LA, MS, TN
	Middle Mississippi	IL, IN, IA, KY, MO OH
	Upper Mississippi	MI, MN, WI
Central	Lower Central	NM, OK, TX
	Middle Central	CO, KS, NE, WY
	Upper Central	MT (ZIP 59000-59699), ND, SD
Pacific	Lower Pacific	AZ, NV, UT
	Middle Pacific	CA
	Upper Pacific	AK, ID, MT (ZIP 59700-599990, OR, WA

Figure 1.1 Flyway map

Table 1.2 Initial sample sizes for states within NSWH study

State	Initial Sample Size	Additional Sample	State	Initial Sample Size	Additional Sample	Final Sample Size
Alabama	200	100	Nevada	272		
Alaska	200		New Hampshire	200		
Arizona	249	100	New Jersey	200		
Arkansas	2000	1000	New Mexico	200		
California	2000		New York	900		
Colorado	655		North Carolina	2000	1000	
Connecticut	200		North Dakota	1240		
Delaware	200		Ohio	321		
Florida	2000	1000	Oklahoma	342		
Georgia	433	400	Oregon	483		
Idaho	490		Pennsylvania	584		
Illinois	547		Rhode Island	200		
Indiana	2000		South Carolina	462		
Iowa	265		South Dakota	2000		
Kansas	719		Tennessee	200	100	
Kentucky	200		Texas	1558		
Louisiana	793	600	Utah	1578		
Maine	200	100	Vermont	200		
Maryland	523		Virginia	392		
Massachusetts	200		Washington	633		
Michigan	503		West Virginia	200		
Minnesota	807		Wisconsin	2000		
Mississippi	200	100	Wyoming	200		
Missouri	2000			35101		
Montana	626					
Nebraska	526					
Total Sample				**35101**	**4500**	**39601**

Table 1.3 Unadjusted response rate by state

State	Initial + additional Sample Size	Response	Response Rate	State	Initial Sample Size	Response	Response Rate
Alabama	300	55	18.3%	Nevada	272	72	26.5%
Alaska	200	75	37.5%	New Hampshire	200	38	19.0%
Arizona	349	58	16.6%	New Jersey	200	49	24.5%
Arkansas	3000	438	14.6%	New Mexico	200	50	25.0%
California	2000	473	23.7%	New York	900	216	24.0%
Colorado	655	154	23.5%	North Carolina	3000	397	13.2%
Connecticut	200	55	27.5%	North Dakota	1240	259	20.9%
Delaware	200	42	21.0%	Ohio	321	97	30.2%
Florida	3000	386	12.9%	Oklahoma	342	71	20.8%
Georgia	833	91	10.9%	Oregon	483	111	23.0%
Idaho	490	117	23.9%	Pennsylvania	584	134	22.9%
Illinois	547	128	23.4%	Rhode Island	200	59	29.5%
Indiana	2000	539	27.0%	South Carolina	462	114	24.7%
Iowa	265	72	27.2%	South Dakota	2000	465	23.3%
Kansas	719	155	21.6%	Tennessee	300	50	16.7%
Kentucky	200	47	23.5%	Texas	1558	319	20.5%
Louisiana	1393	142	10.2%	Utah	1578	404	25.6%
Maine	300	26	8.7%	Vermont	200	46	23.0%
Maryland	523	110	21.0%	Virginia	392	107	27.3%
Massachusetts	200	54	27.0%	Washington	633	158	25.0%
Michigan	503	113	22.5%	West Virginia	200	44	22.0%
Minnesota	807	213	26.4%	Wisconsin	2000	503	25.2%
Mississippi	300	50	16.7%	Wyoming	200	46	23.0%
Missouri	2000	421	21.1%				
Montana	626	148	23.6%				
Nebraska	526	152	28.9%				
Total Sample					**39601**	**8123**	**20.5%**

Table 1.4 Non-response sample and return rate by state

State	Sample Size	Returns	Return Rate	State	Sample Size	Returns	Return Rate
Alabama	102	6	5.9%	Nevada	173	29	16.8%
Alaska	73	9	12.3%	New Hampshire	100	11	11.0%
Arizona	158	20	12.7%	New Jersey	102	13	12.7%
Arkansas	469	43	9.2%	New Mexico	62	8	12.9%
California	1334	150	11.2%	New York	647	86	13.3%
Colorado	420	57	13.6%	North Carolina	550	63	11.5%
Connecticut	100	16	16.0%	North Dakota	787	115	14.6%
Delaware	69	8	11.6%	Ohio	219	27	12.3%
Florida	215	10	4.7%	Oklahoma	230	24	10.4%
Georgia	275	20	7.3%	Oregon	319	29	9.1%
Idaho	325	35	10.8%	Pennsylvania	432	62	14.4%
Illinois	359	45	12.5%	Rhode Island	100	13	13.0%
Indiana	114	19	16.7%	South Carolina	293	20	6.8%
Iowa	178	23	12.9%	South Dakota	350	49	14.0%
Kansas	461	53	11.5%	Tennessee	92	10	10.9%
Kentucky	97	9	9.3%	Texas	1045	71	6.8%
Louisiana	542	32	5.9%	Utah	1002	117	11.7%
Maine	144	9	6.3%	Vermont	100	14	14.0%
Maryland	392	38	9.7%	Virginia	270	24	8.9%
Massachusetts	133	17	12.8%	Washington	415	51	12.3%
Michigan	319	58	18.2%	West Virginia	69	8	11.6%
Minnesota	512	100	19.5%	Wisconsin	501	80	16.0%
Mississippi	130	10	7.7%	Wyoming	114	17	14.9%
Missouri	371	33	8.9%				
Montana (P)	168	29	17.3%				
Montana (C)	229	40	17.5%				
Nebraska	339	49	14.5%				
Total Sample					**16000**	**1879**	**11.7%**

SECTION 2. PARTICIPATION

HUNTING

Respondents reported on average that they began hunting waterfowl around age 20 (Table 2.1). There were significant but small differences between the substrata, with hunters starting at age 18 on average in the Upper Central and at 21 in the Lower Central. Respondents also indicated their typical pursuits when waterfowl hunting, with most (61-86%) reporting that they hunt both geese and ducks; analysis of this variable revealed no significant differences between the substrata. Most respondents indicated hunting for waterfowl in 5 of the past 5 years (61-71%; Table 2.2) with significant but small differences between the substrata.

RECENT TRIP CHARACTERISTICS

Respondents were highly variable in the average number of days they reported having hunted per year in the past 5 years, with 5 days or less being the most frequent response in the Lower and Upper Central (35% and 36%, respectively), and 11 to 20 days the most frequent response in the Middle Central (28%; Table 2.3). Overall, respondents in the Middle Central indicated spending significantly more days afield over the past 5 years. Respondents also indicated the number of days they hunted for waterfowl in 2015, on average spending 9-12 days afield, with significant but small differences between the flyway substrata (Table 2.4).

Most respondents reported a combination of self-planned trips and invited trips (66-68%; Table 2.5), while only 11-15% indicated that they only went if someone else invited them. This finding is likely driven by the high number of avid hunters in the respondent pool, indicating level of comfort and familiarity with trip planning. There were no significant differences between the substrata on trip planning. Most respondents also indicated taking primarily day trips (72-85%; Table 2.6) with significant but small differences between the substrata; overnight or multi-day trips were more common in the Lower Central (18%) than in either the Upper (7%) or Middle Central (10%).

Across the substrata, less than half of respondents indicated they had taken a person who had never been waterfowl hunting before, with respondents in the Lower Central (48%) significantly more likely than those in the Middle (44%) or Upper Central (29%) to take someone new

waterfowl hunting (Table 2.7). There was one significant difference between the substrata regarding who else in the hunting party with the respondent (Table 2.8a); respondents in the Lower Central were more likely to report that they took an adult friend for the first time (63%) when compared to the Middle (52%) or Upper Central (44%; Table 2.8).

HARVEST

Respondents were highly variable in their estimates of duck harvest over the past 5 years, and differences between the substrata were significant but small (Table 2.9). Goose harvest over the past 5 years was less variable than duck harvest for the Lower Central, with most respondents reporting that they harvested 5 or less per year on average (62%), however, overall reports of goose harvest was significantly higher in the Middle and Upper Central than in the Lower Central (Table 2.10).

Table 2.1 Age at first waterfowl hunt and general pursuits

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
How old were you when you started waterfowl hunting	Mean	21.3	20.0	18.1	20.0
	SD	13.42	12.95	12.66	13.13
	Valid N	437	499	794	1733
Pursuits in waterfowl hunting	I hunt only ducks	34.3%	6.0%	3.8%	17.6%
	I hunt ducks and geese	61.2%	85.6%	85.6%	75.0%
	I hunt only geese	.3%	4.1%	5.7%	2.9%
	I hunt neither ducks nor geese	4.2%	4.4%	5.0%	4.5%
	Valid N	439	508	806	1752
Pursuits significance:		χ^2 (6) = 289.45*		Cramer's V = .29*	
Age at start significance:		F (2, 1729) = 8.98		η^2= .01	

Table 2.2 Years hunted waterfowl of previous 5

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
How many years of the last 5 years have you hunted waterfowl?	None	1.0%	.7%	2.6%	1.6%
	1 Year	4.3%	2.3%	3.5%	3.5%
	2 Years	7.2%	5.8%	7.1%	6.8%
	3 Years	16.3%	11.4%	12.8%	13.9%
	4 Years	10.1%	9.3%	11.7%	10.3%
	5 Years	61.1%	70.5%	62.3%	64.0%
	Valid N	421	486	764	1673
Significance:		χ^2 (10) = 22.47*		Cramer's V= .08*	

Table 2.3 Average number of days per year hunting waterfowl

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Over the last five years, about how many days did you usually hunt waterfowl in a year?	5 days or less	34.8%	24.3%	35.6%	32.2%
	6 to 10 days	27.9%	26.7%	32.0%	28.8%
	11 to 20 days	22.1%	28.4%	19.7%	23.1%
	21 to 30 days	8.7%	14.2%	7.4%	9.8%
	More than 30 days	6.5%	6.4%	5.3%	6.1%
	Valid N	409	473	739	1625
Significance:		χ^2 (8) = 40.50*		Cramer's V= .11*	

Table 2.4 Days hunted for waterfowl in 2015

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
During last year's (2015) waterfowl hunting season, how many days did you hunt for waterfowl?	Mean	9.7	11.8	8.6	9.9
	SD	10.89	12.40	9.80	11.08
	Valid N	368	422	660	1455
Significance:		F (2, 1448) = 10.78* η^2= .01			

Table 2.5 Circumstances for hunting trip

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Under what circumstances do you typically go hunting?	When I plan the hunt myself	19.0%	21.3%	23.4%	20.9%
	When someone else invites me	14.6%	10.7%	10.6%	12.4%
	Both when I plan the hunt or someone else invites me	66.4%	68.0%	66.0%	66.7%
	Valid N	412	480	741	1638
Significance:	χ^2 (4) = 6.65		Cramer's V= .05		

Table 2.6 Hunting trips primarily day trips or overnight trips

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Do you primarily take day trips or overnight/multi-day trips when you waterfowl hunt?	Primarily day trips	71.8%	85.1%	82.3%	78.5%
	Primarily overnight or multi-day trips	18.1%	7.3%	9.8%	12.8%
	Both about equally	10.1%	7.6%	7.9%	8.8%
	Valid N	411	480	741	1636
Significance:	χ^2 (4)= 33.31*		Cramer's V= .10*		

Table 2.7 Recruit New Hunter Yes/No

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
During the past season did you take anyone waterfowl hunting who had never waterfowl hunted before?	Yes	47.6%	43.5%	28.8%	37.9%
	No	52.4%	56.5%	71.2%	62.1%
	Valid N	382	456	692	1531
Significance:		χ^2 (2)= 45.92*		Cramer's V= .17*	

Table 2.8 Recruit new hunter

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Who was the new hunter you took last season?	My own children	30.5%	24.6%	32.0%	29.1%
	Related children	15.0%	15.6%	19.2%	16.1%
	Other children	20.2%	27.1%	25.0%	23.3%
	Adult close family	13.8%	10.9%	7.0%	11.6%
	Adult extended family	11.7%	7.8%	14.1%	11.0%
	Adult friend	63.3%	52.1%	43.7%	56.0%
	Co-worker	22.3%	20.6%	14.6%	20.2%
	Other	9.8%	7.1%	7.6%	8.6%
	Valid N	261	518	251	627

Table 2.8a Recruit new hunter significance tests

		Chi-Square	df	Cramer's V
Who was the new hunter you took last season?	My own children	2.59	2	.07
	Related children	1.44	2	.05
	Other children	2.99	2	.07
	Adult close family	4.59	2	.09
	Adult extended family	4.17	2	.09
	Adult friend	12.98*	2	.15*
	Co-worker	3.91	2	.08
	Other	1.06	2	.04

*p < 0.05

Table 2.9 Average yearly duck harvest

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Over the last five years, how many ducks did you harvest in a year on average?	5 or less	17.4%	30.5%	27.9%	23.9%
	Between 6 and 10	22.0%	18.8%	22.7%	21.3%
	Between 11 and 20	26.9%	20.5%	21.4%	23.6%
	Between 21 and 50	23.5%	23.2%	19.7%	22.3%
	More than 50	10.2%	7.1%	8.2%	8.8%
	Valid N	414	458	699	1593
Significance:		χ^2 (8)= 27.69*		Cramer's V= .09*	

Table 2.10 Average yearly goose harvest

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Over the last five years, how many geese did you harvest in a year on average?	5 or less	61.6%	38.5%	39.2%	46.7%
	Between 6 and 10	15.5%	21.4%	21.5%	19.4%
	Between 11 and 20	11.2%	21.3%	17.9%	16.6%
	Between 21 and 50	6.5%	10.5%	11.7%	9.5%
	More than 50	5.3%	8.3%	9.7%	7.8%
	Valid N	267	446	713	1337
Significance:		χ^2 (8)= 48.89*		Cramer's V= .13*	

Section 3. Satisfaction and Crowding

SATISFACTION WITH DUCK HUNTING

On average, respondents were at or above the midpoint (3) for every item, with the highest levels of satisfaction with the overall duck hunting experience ($\bar{x}$ = 3.6-4.0). The lowest levels of satisfaction was reported on the number of ducks typically present during the hunting season ($\bar{x}$ = 2.9-3.3; Table 3.1, 3.1a). While analyses revealed significant differences, effect sizes suggest that these are small (Table 3.1b).

Respondents in the Middle Central were significantly more likely to report never shooting the limit in 2015 (43%), compared to the Lower (35%) and Upper Central (40%; Table 3.2), and were also more likely to report having occasionally shot their daily limit (Lower: 20%; Middle: 26%; Upper: 21%). Fewer than 2% of respondents indicated that they always needed to shoot their daily limit to feel satisfied, 9.7% indicated they needed to harvest a limit on most of their hunts, 28.2% indicated they occasionally needed to harvest a limit, and 12.5% reported they were satisfied to harvest a limit on at least one. The remaining 47.9% indicated they never needed to shoot their daily limit (Table 3.3). Respondents in the Lower Central reported needing to shoot their limit significantly more frequently than the Middle or Upper Central (Table 3.3).

REQUIREMENTS FOR A SATISFYING TRIP

The most frequent response for the minimum number of ducks hunters felt they needed to harvest to feel satisfied for the Middle (27%) and Upper Central (26%) was 0 ducks, while the most frequent response in the Lower Central was 3 ducks (25%); analyses suggest that these responses were significantly different (Table 3.4). A similar pattern emerged for the smallest acceptable daily bag limit of ducks before no longer hunting; the most frequent response was any size bag limit for the Middle (36%) and Upper Central (36%), and responses in the Lower Central were split between any bag limit (24%) and 4 ducks minimum bag limit (25%). Analyses suggested these differences were significant (Table 3.5). Finally, the most frequent response to the minimum number of duck hunting days that were acceptable was that they would hunt any number of days available (Lower: 38%; Middle: 40%; Upper: 43%) and there were no significant differences between the substrata (Table 3.6).

PERCEPTIONS RELATED TO CROWDING AND HUNTING PRESSURE

On average, respondents perceived crowding at hunting areas, hunting pressure, interference from other hunters, and lack of public places for waterfowl hunting to be slight to moderate problems (Table 3.7). Conflict with other hunters was rated as less of a problem in all regions of the Flyway. Overall, there were significant, but not substantive differences in ratings across the Flyway regions (Table 3.7a). About 1 in 4 of the hunters across the Flyway, reported that lack of public places for waterfowl hunting was a severe to very severe problem in the places they hunt ducks the most (Table 3.7b).

Table 3.1 Satisfaction with hunting in most hunted state

	Flyway substrata									Flyway ID		
	Lower Central			Middle Central			Upper Central			Central		
	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N
The number of ducks you see during the season	3.3	1.14	408	3.2	1.21	456	3.4	1.17	692	3.3	1.17	1576
The number of ducks you harvest during the season	3.4	1.11	407	3.1	1.13	455	3.4	1.11	692	3.3	1.12	1574
The number of days in the duck season	3.4	1.16	405	3.2	1.23	457	3.7	1.10	691	3.4	1.18	1573
The number of ducks in the daily limit	3.7	1.04	407	3.9	.98	453	3.9	1.04	689	3.8	1.03	1571
The number of ducks typically present during the hunting season	3.0	1.16	407	2.9	1.21	456	3.3	1.18	690	3.1	1.19	1574
Quality of the habitat where you hunt	3.6	1.05	404	3.4	1.15	456	3.6	1.14	692	3.6	1.11	1570
Your overall duck hunting experience	4.0	.89	407	3.6	1.05	457	3.9	.98	690	3.9	.97	1574

Scale from 1=Very dissatisfied to 5=Very satisfied

3.1a Satisfaction with hunting response distribution

Item	Response					
	Very dissatisfied	Somewhat dissatisfied	Neutral	Somewhat satisfied	Very satisfied	Valid N
The number of ducks you see during the season	7.4%	19.3%	26.2%	30.7%	16.4%	1576
The number of ducks you harvest during the season	6.1%	19.6%	28.9%	30.9%	14.6%	1574
The number of days in the duck season	5.8%	17.0%	28.2%	26.6%	22.4%	1573
The number of ducks in the daily limit	1.9%	7.6%	29.8%	28.4%	32.2%	1571
The number of ducks typically present during the hunting season	9.1%	28.0%	22.5%	28.3%	12.1%	1574
Quality of the habitat where you hunt	4.7%	13.9%	24.0%	36.2%	21.2%	1570
Your overall duck hunting experience	2.1%	8.8%	16.6%	46.7%	25.8%	1574

Table 3.1b Satisfaction with hunting in most hunted state ANOVA tests

		Sum of Squares	df	Mean Square	F	Sig.	η^2
The number of ducks you see during the season	Between Groups	18.54	2.00	9.27	6.73	0.00	
	Within Groups	2138.27	1552.40	1.38			
	Total	2156.81	1554.40				0.01
The number of ducks you harvest during the season	Between Groups	24.44	2.00	12.22	9.84	0.00	
	Within Groups	1927.06	1551.08	1.24			
	Total	1951.50	1553.08				0.01
The number of days in the duck season	Between Groups	67.53	2.00	33.77	25.33	0.00	
	Within Groups	2067.49	1550.63	1.33			
	Total	2135.02	1552.63				0.03
The number of ducks in the daily limit	Between Groups	16.97	2.00	8.48	8.10	0.00	
	Within Groups	1619.60	1546.26	1.05			
	Total	1636.57	1548.26				0.01
The number of ducks typically present during the hunting season	Between Groups	50.14	2.00	25.07	17.94	0.00	
	Within Groups	2166.56	1549.99	1.40			
	Total	2216.70	1551.99				0.02
Quality of the habitat where you hunt	Between Groups	15.10	2.00	7.55	5.99	0.00	
	Within Groups	1952.64	1548.87	1.26			
	Total	1967.74	1550.87				0.01
Your overall duck hunting experience	Between Groups	36.57	2.00	18.29	19.08	0.00	
	Within Groups	1486.07	1550.78	0.96			
	Total	1522.64	1552.78				0.02

Table 3.2 Number of times hunter shot daily bag limit

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
How many times did you shoot a limit of ducks/geese during last year's season (2015)?	Never	35.2%	43.2%	39.6%	38.6%
	On at least one of my hunts	27.0%	22.5%	23.4%	24.7%
	Occasionally on my hunts	19.8%	25.7%	21.3%	21.9%
	Most of my hunts	14.2%	6.5%	11.6%	11.3%
	Every time I hunted	1.4%	0.0%	.7%	.8%
	I did not hunt in 2015	2.4%	2.0%	3.4%	2.6%
	Valid N	415	480	739	1640
Significance:		χ^2 (10)= 31.40*		Cramer's V= .10*	

Table 3.3 Satisfaction and shooting daily bag limit

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
How many times do you feel you need to shoot a daily bag limit of ducks/geese to have a satisfying season?	Never	40.6%	48.7%	58.0%	47.9%
	On at least one of my hunts	12.9%	15.2%	9.4%	12.5%
	Occasionally on my hunts	31.6%	29.3%	22.2%	28.2%
	Most of my hunts	12.4%	5.7%	9.4%	9.7%
	Every time I hunted	2.4%	1.1%	.9%	1.6%
	Valid N	412	479	741	1636
Significance:		χ^2 (8)= 51.77*		Cramer's V= .13*	

Table 3.4 Minimum number of ducks harvested per day to feel satisfied

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Minimum number of ducks you have to harvest in a day to feel satisfied?	0	18.7%	27.2%	26.1%	23.1%
	1	11.9%	21.8%	15.4%	15.6%
	2	16.1%	20.5%	21.0%	18.7%
	3	24.6%	16.2%	16.9%	20.1%
	4	16.2%	8.5%	9.5%	12.2%
	5	7.2%	3.7%	6.6%	6.1%
	6	4.2%	.9%	3.3%	3.0%
	7	.3%	1.0%	.3%	.5%
	>7	.8%	.2%	.9%	.7%
	Valid N	396	447	679	1539
Significance:		χ^2 (16)= 67.06*		Cramer's V= .15*	

Table 3.5 Smallest acceptable daily bag limit of ducks

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
What is the smallest daily bag limit you would accept before you would no longer hunt?	1 duck	2.1%	5.6%	2.4%	3.1%
	2 ducks	9.1%	9.6%	7.8%	8.9%
	3 ducks	18.1%	17.7%	24.0%	19.6%
	4 ducks	25.2%	17.6%	14.3%	20.1%
	5 ducks	13.4%	7.3%	11.0%	11.1%
	6 ducks	8.2%	6.8%	4.2%	6.7%
	I'll hunt with any size daily bag limit	23.9%	35.5%	36.3%	30.5%
	Valid N	407	454	692	1572
Significance:		χ^2 (12)= 64.83*		Cramer's V= .15*	

Table 3.6 Minimum acceptable number of days for duck hunting

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
What is the minimum number of days in a waterfowl hunting season you would accept before you would no longer hunt?	10 days	1.5%	2.3%	2.0%	1.8%
	15 days	1.7%	1.3%	1.4%	1.5%
	20 days	4.8%	2.2%	3.3%	3.7%
	25 days	2.1%	1.0%	0.9%	1.5%
	30 days	12.1%	10.6%	13.0%	12.0%
	35 days	2.2%	2.2%	2.1%	2.2%
	40 days	5.5%	2.7%	5.3%	4.7%
	45 days	10.1%	9.6%	8.9%	9.7%
	50 days	5.6%	7.4%	4.2%	5.7%
	55 days	0.7%	1.8%	0.8%	1.0%
	60 days	15.5%	19.0%	14.7%	16.2%
	I'll hunt with any season length	38.1%	39.8%	43.3%	40.1%
	Valid N	612	1210	701	1569
Significance:		χ^2 (22)= 29.14		Cramer's V= .10	

Table 3.7 Perceptions of problems with crowding, hunting pressure, interference, and conflict

	Flyway substrata									Flyway ID		
	Lower Central			Middle Central			Upper Central			Central		
	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N
Crowding at hunting areas	2.2	1.24	403	2.5	1.24	471	2.1	1.04	738	2.3	1.20	1611
Hunting pressure	2.3	1.16	405	2.7	1.21	421	2.3	1.09	736	2.4	1.16	1615
Interference from other hunters	2.0	1.14	398	2.3	1.17	472	2.1	1.08	738	2.1	1.13	1600
Conflict with other hunters in places I hunt	1.6	1.00	402	1.9	1.11	468	1.8	0.96	738	1.7	1.02	1609
Lack of public places for waterfowl hunting	2.5	1.37	400	2.9	1.41	470	2.4	1.26	739	2.6	1.36	1608

Scale from 1=Not at all a problem, 2 = Slight problem, 3 = Moderate Problem, 4 = Severe Problem, 5=Very severe problem

Table 3.7a Perceptions of problems with crowding, hunting pressure, interference, and conflict ANOVA tests

		Sum of Squares	df	Mean Square	F	Sig.	η^2
Crowding at hunting areas	Between Groups	57.48	2	28.74	21.66	0.001	0.03
	Within Groups	2133.86	1608	1.33			
	Total	2191.34	1610				
Hunting pressure	Between Groups	42.79	2	21.39	16.43	0.001	0.02
	Within Groups	2096.09	1610	1.30			
	Total	2138.87	1612				
Interference from other hunters	Between Groups	22.15	2	11.08	8.86	0.001	0.01
	Within Groups	2002.71	1601	1.25			
	Total	2024.86	1603				
Conflict with other hunters in places I hunt	Between Groups	10.96	2	5.48	5.33	0.005	0.01
	Within Groups	1653.84	1607	1.03			
	Total	1664.80	1609				
Lack of public places for waterfowl hunting	Between Groups	70.20	2	35.10	19.80	0.001	0.02
	Within Groups	2849.50	1608	1.77			
	Total	2919.70	1610				

Table 3.7b Perceptions of problems with crowding, hunting pressure, interference and conflict (Flyway Level)

	Response					
Item	Not at all	Slight Problem	Moderate Problem	Severe Problem	Very Severe Problem	Valid N
Crowding at hunting areas	36.1%	23.9%	24.4%	10.4%	5.2%	1611
Hunting pressure	28.9%	25.4%	28.5%	12.3%	4.8%	1615
Interference from other hunters	37.1%	28.9%	21.9%	7.4%	4.6%	1600
Conflict with other hunters in places I hunt	56.1%	23.5%	13.2%	4.6%	2.6%	1609
Lack of public places for waterfowl hunting	31.2%	19.3%	23.3%	14.7%	11.5%	1608

Section 4. Place

PREFERENCES

Nearly all respondents reported the Central Flyway as their most hunted flyway (94-98%; Table 4.1), and most respondents reported hunting states within their own substrata (Table 4.2). There were large significant differences between the substrata in the states most frequently hunted, suggesting a strong tendency among hunters to stay within their flyway substrata. Around one-third of respondents in each substrata reported using public lands and waters for waterfowl hunting, while in the Lower Central, significantly fewer respondents used private property owned by a friend or another landowner who gave them permission to hunt for free (24%), than in the Middle (33%) and Upper (47%; Table 4.3).

Respondents were asked to indicate how important it was to them to hunt certain species in the Central Flyway: diving ducks, mallards, other dabbling ducks, and geese. Overall, mallards received the highest average importance rating ($\bar{x}$ = 3.5-4.9), though in the Lower Central, other dabbling ducks were nearly as important ($\bar{x}$ = 3.6) and diving ducks received the lowest importance rating overall ($\bar{x}$ = 2.1-2.4; Table 4.4, 4.4a). While there were significant differences between the substrata for some species, effect size suggest these were small (Table 4.4b).

ECOSYSTEM SERVICES

Overall, the highest average level of concerns were for hunting opportunities ($\bar{x}$ = 3.6-3.7) and providing a home for wildlife ($\bar{x}$ = 3.6; Table 4.5, 4.5a). Respondents reported the lowest level of concern with losing storage of greenhouse gases, such as carbon ($\bar{x}$ = 2.3-2.5), scenic places for inspiration or spiritual renewal ($\bar{x}$ = 2.5-2.6), and wildlife viewing and birdwatching opportunities ($\bar{x}$ = 2.6-2.7). There were some significant difference between the substrata, but effect sizes suggest these were small (Table 4.5b).

Though there were significant differences between the substrata for less-mentioned services, there was an overall consensus that storage of greenhouse gases (31-36%) or scenic places for inspiration and spiritual renewal (25-28%) were of least concern (Table 4.6). Similarly, there were significant differences between the substrata for ecological services respondents were

most concerned about losing, but most were concerned with losing hunting opportunities (37%-47%), or providing a home for wildlife (22-29%; Table 4.7).

Table 4.1 Flyway hunted most in 2015

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
In which Flyway did you hunt most often last year (2015) or the year you last hunted?	Pacific Flyway	.6%	5.3%	5.7%	3.3%
	Central Flyway	97.9%	93.9%	94.0%	95.7%
	Mississippi Flyway	1.3%	.8%	.4%	.9%
	Atlantic Flyway	.3%	0.0%	0.0%	.1%
	Valid N	412	480	741	1638
Significance:		χ^2 (6)= 24.36*		Cramer's V= .09*	

Table 4.2 State hunted waterfowl most over past 5 years

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
In which state or Canadian Province have you hunted waterfowl most often over the past 5 years?*	CO	0.0%	30.5%	0.0%	8.3%
	KS	.3%	32.7%	0.0%	9.0%
	MT	0.0%	.6%	14.4%	4.4%
	ND	0.0%	0.0%	61.0%	17.8%
	NE	0.0%	25.7%	0.0%	7.0%
	NM	3.6%	0.0%	0.0%	1.6%
	OK	18.2%	0.0%	0.0%	7.9%
	SD	0.0%	.4%	23.4%	7.0%
	TX	76.3%	.4%	0.0%	33.3%
	WY	0.0%	7.6%	0.0%	2.1%
	Valid N	412	480	741	1638
Significance:		χ^2 (42)= 2730.39*		Cramer's V= .98*	

*States within flyway reported

Table 4.3 Public vs private lands waterfowl hunting

	Flyway substrata			Flyway ID
Please indicate where you do most of your waterfowl hunting:	Lower Central	Middle Central	Upper Central	Central
Public lands or waters	30.6%	36.8%	37.3%	34.2%
Private property owned by you, your family or in partnership with someone else	19.6%	14.1%	14.2%	16.5%
Private property owned by a friend or another landowner who give you permission to hunt for free	23.8%	32.6%	47.1%	33.0%
Private property you lease or pay to hunt on	21.3%	13.6%	1.2%	13.3%
Guest on private property someone else leases or pay to hunt on	4.7%	2.9%	.2%	2.9%
Valid N	411	480	741	1636
Significance:	χ^2 (8)= 194.73*		Cramer's V= .24*	

Table 4.4 Importance of hunting species in Central

	Flyway substrata									Flyway ID		
	Lower Central			Middle Central			Upper Central			Central		
	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N
Diving ducks	2.4	1.25	399	2.2	1.26	440	2.1	1.15	682	2.3	1.24	1540
Mallards	3.5	1.32	401	3.9	1.18	439	3.7	1.15	693	3.7	1.25	1549
Other dabbling ducks	3.6	1.20	399	3.3	1.31	444	3.0	1.20	676	3.4	1.26	1540
Geese	2.6	1.34	397	3.8	1.19	448	3.7	1.18	693	3.3	1.38	1551

Scale from 1=Not at all important to 5=Extremely important

Table 4.4a Importance of hunting species in Pacific response distribution

	Response					
Item	Not at all important	Slightly important	Moderately Important	Very important	Extremely important	Valid N
Diving ducks	35.4%	25.2%	22.9%	9.3%	7.2%	1540
Mallards	8.8%	9.2%	20.6%	30.6%	30.9%	1549
Other dabbling ducks	12.0%	10.6%	26.6%	29.4%	21.4%	1540
Geese	16.2%	14.0%	21.2%	25.4%	23.2%	1551

Table 4.4b Importance of hunting species in Central ANOVA tests

		Sum of Squares	df	Mean Square	F	Sig.	Eta
Diving ducks	Between Groups	110.997	2	55.498	35.541	.000	
	Within Groups	2111.690	1352	1.562			
	Total	2222.686	1354				.05
Mallards	Between Groups	8.646	2	4.323	3.698	.025	
	Within Groups	1598.819	1368	1.169			
	Total	1607.465	1370				.01
Other dabbling ducks	Between Groups	50.700	2	25.350	17.609	.000	
	Within Groups	1966.864	1366	1.440			
	Total	2017.564	1368				.03
Geese	Between Groups	39.683	2	19.841	11.400	.000	
	Within Groups	2382.002	1369	1.740			
	Total	2421.684	1371				.02

Table 4.5 Level of concern for ecological benefits

	Flyway substrata									Flyway ID		
	Lower Central			Middle Central			Upper Central			Central		
	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N
Flooding Protection	3.1	.88	378	2.9	1.00	448	3.0	.95	678	3.0	.94	1508
Erosion Protection	3.2	.85	378	3.1	.90	447	3.1	.88	673	3.1	.88	1504
Wildlife viewing and birdwatching	2.6	1.02	374	2.6	1.03	445	2.7	1.05	673	2.7	1.03	1496
Hunting opportunities	3.6	.65	377	3.6	.65	447	3.7	.68	678	3.6	.66	1505
Storage of greenhouse gases, such as carbon	2.3	1.06	375	2.5	1.07	446	2.4	1.05	677	2.4	1.06	1499
Clean water	3.5	.70	378	3.4	.81	448	3.4	.87	677	3.4	.79	1507
Clean air	3.4	.78	378	3.4	.86	444	3.3	.93	678	3.4	.85	1504
Providing home for wildlife	3.6	.62	377	3.6	.65	444	3.6	.68	678	3.6	.65	1502
Providing a home for animals such as butterflies and bees that pollinate plants and crops	3.3	.82	377	3.3	.85	446	3.2	.85	678	3.3	.84	1504
Scenic places for inspiration or spiritual renewal	2.5	1.08	377	2.6	1.08	447	2.5	1.08	677	2.5	1.08	1505

Scale from 1=Not at all concerned to 4=Very concerned

Table 4.5a Level of concern for ecological benefits response distribution

	Response				
Item	Not at all concerned	Slightly concerned	Somewhat concerned	Very concerned	Valid N
Flooding Protection	8.0%	19.0%	36.6%	36.5%	1508
Erosion Protection	5.6%	15.7%	38.1%	40.7%	1504
Wildlife viewing and birdwatching	16.3%	27.4%	31.0%	25.3%	1496
Hunting opportunities	2.2%	3.9%	21.8%	72.2%	1505
Storage of greenhouse gases, such as carbon	25.4%	28.8%	27.1%	18.8%	1499
Clean water	2.9%	9.7%	27.4%	59.9%	1507
Clean air	4.3%	11.4%	28.4%	55.9%	1504
Providing home for wildlife	1.5%	4.6%	24.1%	69.8%	1502
Providing a home for animals such as butterflies and bees that pollinate plants and crops	4.1%	12.7%	33.0%	50.2%	1504
Scenic places for inspiration or spiritual renewal	21.5%	27.2%	26.6%	24.7%	1505

Table 4.5b Level of concern for ecological benefits ANOVA tests

		Sum of Squares	df	Mean Square	F	Sig.	Eta
Flooding Protection	Between Groups	6.29	2.00	3.15	3.50	0.03	
	Within Groups	1348.04	1500.72	0.90			
	Total	1354.34	1502.72				0.00
Erosion Protection	Between Groups	3.46	2.00	1.73	2.23	0.11	
	Within Groups	1161.95	1494.83	0.78			
	Total	1165.41	1496.83				0.00
Wildlife viewing and birdwatching	Between Groups	0.25	2.00	0.13	0.12	0.89	
	Within Groups	1590.90	1489.43	1.07			
	Total	1591.15	1491.43				0.00
Hunting opportunities	Between Groups	0.22	2.00	0.11	0.25	0.78	
	Within Groups	666.62	1498.88	0.44			
	Total	666.84	1500.88				0.00
Storage of greenhouse gases, such as carbon	Between Groups	4.27	2.00	2.13	1.90	0.15	
	Within Groups	1673.01	1494.15	1.12			
	Total	1677.28	1496.15				0.00
Clean water	Between Groups	6.22	2.00	3.11	4.70	0.01	
	Within Groups	992.00	1499.62	0.66			
	Total	998.21	1501.62				0.01
Clean air	Between Groups	7.08	2.00	3.54	4.66	0.01	
	Within Groups	1136.42	1496.76	0.76			
	Total	1143.50	1498.76				0.01
Providing home for wildlife	Between Groups	0.10	2.00	0.05	0.12	0.89	
	Within Groups	646.02	1495.96	0.43			
	Total	646.12	1497.96				0.00
Providing a home for animals such as butterflies and bees that pollinate plants and crops	Between Groups	2.36	2.00	1.18	1.65	0.19	
	Within Groups	1070.62	1497.49	0.71			
	Total	1072.98	1499.49				0.00
Scenic places for inspiration or spiritual renewal	Between Groups	6.17	2.00	3.08	2.63	0.07	
	Within Groups	1756.16	1497.88	1.17			
	Total	1762.32	1499.88				0.00

Table 4.6 Ecological services least concerned about losing

	Flyway substrata			Flyway ID
	Lower Central	Middle Central	Upper Central	Central
Flooding Protection	4.5%	10.2%	7.6%	7.0%
Erosion Protection	3.9%	6.8%	4.9%	5.0%
Wildlife viewing and birdwatching	16.0%	12.4%	10.8%	13.5%
Hunting opportunities	4.9%	3.5%	2.3%	3.8%
Storage of greenhouse gases	31.9%	30.9%	36.4%	33.0%
Clean water	.3%	.6%	.6%	.5%
Clean air	1.8%	1.9%	3.1%	2.2%
Providing a home for wildlife	.9%	1.0%	1.2%	1.0%
Providing a home for butterflies and bees (pollinators)	7.5%	7.6%	6.2%	7.1%
Scenic places for inspiration and spiritual renewal	28.3%	25.1%	26.9%	27.0%
Valid N	371	442	668	1485
Significance:	χ^2 (18)= 29.16*		Cramer's V= .10*	

Table 4.7 Ecological services most concerned about losing

	Flyway substrata			Flyway ID
	Lower Central	Middle Central	Upper Central	Central
Flooding Protection	13.7%	6.9%	9.6%	10.6%
Erosion Protection	4.5%	4.0%	3.1%	3.9%
Wildlife viewing and birdwatching	1.0%	.7%	.7%	.8%
Hunting opportunities	37.0%	46.5%	41.8%	41.0%
Storage of greenhouse gases	.3%	.4%	.9%	.5%
Clean water	17.8%	15.6%	13.4%	15.9%
Clean air	1.7%	1.5%	.6%	1.4%
Providing a home for wildlife	21.7%	23.0%	28.6%	24.1%
Providing a home for butterflies and bees (pollinators)	1.2%	.9%	1.0%	1.0%
Scenic places for inspiration and spiritual renewal	1.2%	.4%	.4%	.7%
Valid N	371	443	668	1486
Significance:	χ^2 (18)= 31.42*		Cramer's V= .10*	

Section 5. Discrete Choice Modeling of Waterfowl Hunting Trips

This study included a discrete choice experiment (DCE) examining the preferences of waterfowl hunters concerning different potential combinations of hunting experiences. Choice models present hypothetical scenarios to respondents to derive individuals' preferences for alternatives composed of multiple resource and management attributes (Adamowicz, Louviere & Williams 1994; Louviere, Hensher & Swait 2000; Oh et al. 2005). The approach depends on the imperfect relationship between behavioral intention and behavior (Ajzen & Fishbein 1980), yet allows estimation of the effects of all parameters of interest independently. Individuals are assumed to be utility maximizers, and respondents' choices reflect the perceived utility of the alternatives presented (McFadden 1981). Individual respondent choices reflect the personal utility of attributes and attribute levels, and are aggregated to estimate the utility of attributes and attribute levels in a population (McFadden 1981). In an economic sense, utility is simply a measure of the perceived usefulness of something to an individual. The degree to which someone chooses one circumstance over another provides the ability to measure its perceived usefulness, or utility, to that person. In general, the utility of an attribute level may be considered a reflection of relative desirability (Orme 2014).

Alternatives presented in this DCE consisted of five hunting related attributes:

1) Harvest: The number of waterfowl you are likely to harvest in a day;

2) Access Effort: How easy or difficult it is to get into, out of and around an area in order to hunt;

3) Length of Travel: The time you have to travel one-way in order to hunt;

4) Quantity of Waterfowl: The number of ducks/geese that you see in a day when hunting even if not in shooting range; and

5) Potential for Interference/Competition: Competition from other hunters who might interfere with your hunt in some way such as making you feel crowded or competing for hunting spots or birds.

Response levels varied from 3 to 5 for each attribute (Table 5.1). In order to have adequate power to conduct this experiment, we developed 10 survey versions. In each, respondents were presented with 10 different hypothetical comparisons of birdwatching experiences and asked to choose one option. Each scenario included two hunting option choices plus a "none" (i.e., I would not go waterfowl hunting if these were my only choices). The background explanation of the DCE and an example of the choice scenarios are presented in Figures 5.1 and 5.2.

Results for the hierarchical Bayes model, including average utilities, or usefulness, for each attribute level, summarize the preferences of waterfowl hunters in Florida for different hunting experiences. The attribute importances (Table 5.2) provide a summary of how important each of the 5 attributes were in respondents' choices.

The utilities of each level for each attribute are summarized in Table 5.3. The larger the range in the part-worth utilities (i.e. the average utilities across levels within that attribute) for an attribute, the more influential that attribute is on respondents' choices and the greater the importance of that attribute. For example, harvest was the most influential attribute in the DCE, as indicated by the largest range in part-worth utilities (range in utilities = 136; Table 5.3). The set of part-worth utilities for each attribute is scaled to sum to zero, so some part-worth utilities are necessarily negative numbers for some levels. A negative part-worth utility does not mean that the level has a negative utility; but the larger the number, the higher the utility. This means that a large positive value has higher utility than a larger negative value.

In summary, the order of importance of the attributes is: 1) potential for interference/comptetion; 2) harvest; 3) length of travel; 4) quantity of waterfowl; and 5) access effort. The individual levels on the attributes that had the highest utility were: 1) harvesting 6 birds, 2) travel time of 30 minutes or 1 hour; and 3) no competition or low completion from other hunters. The lowest utilities were: 1) high competition from other hunters; 2) harvesting only 1 bird; and 3) a travel time of 4 hours.

Table 5.1 Possible trip choice characteristics in discrete choice experiment

Attribute	Possible levels
Harvest: The number of waterfowl you are likely to harvest in a day	- One bird - 3 birds - 6 birds
Access Effort: How easy or difficult it is to get into, out of and around an area in order to hunt	- Easy access that takes little effort - Moderate access that takes some effort - Difficult access that takes a lot of effort
Length of Travel: The time you have to travel one-way in order to hunt	- 30 minutes - 1 hour - 2 hours - 3 hours - 4 hours
Quantity of Waterfowl: The number of ducks/geese that you see in a day when hunting even if not in shooting range	- 25 birds or less - 50 birds - 250 birds - 500 birds - 1,000 birds or more
Potential for Interference/Competition: Competition from other hunters who might interfere with your hunt in some way such as making you feel crowded or competing for hunting spots or birds	- No competition - Low competition from other hunters - Moderate competition from other hunters - High competition from other hunters

Figure 5.1 Background for Discrete Choice Experiment (DCE) for waterfowl hunting

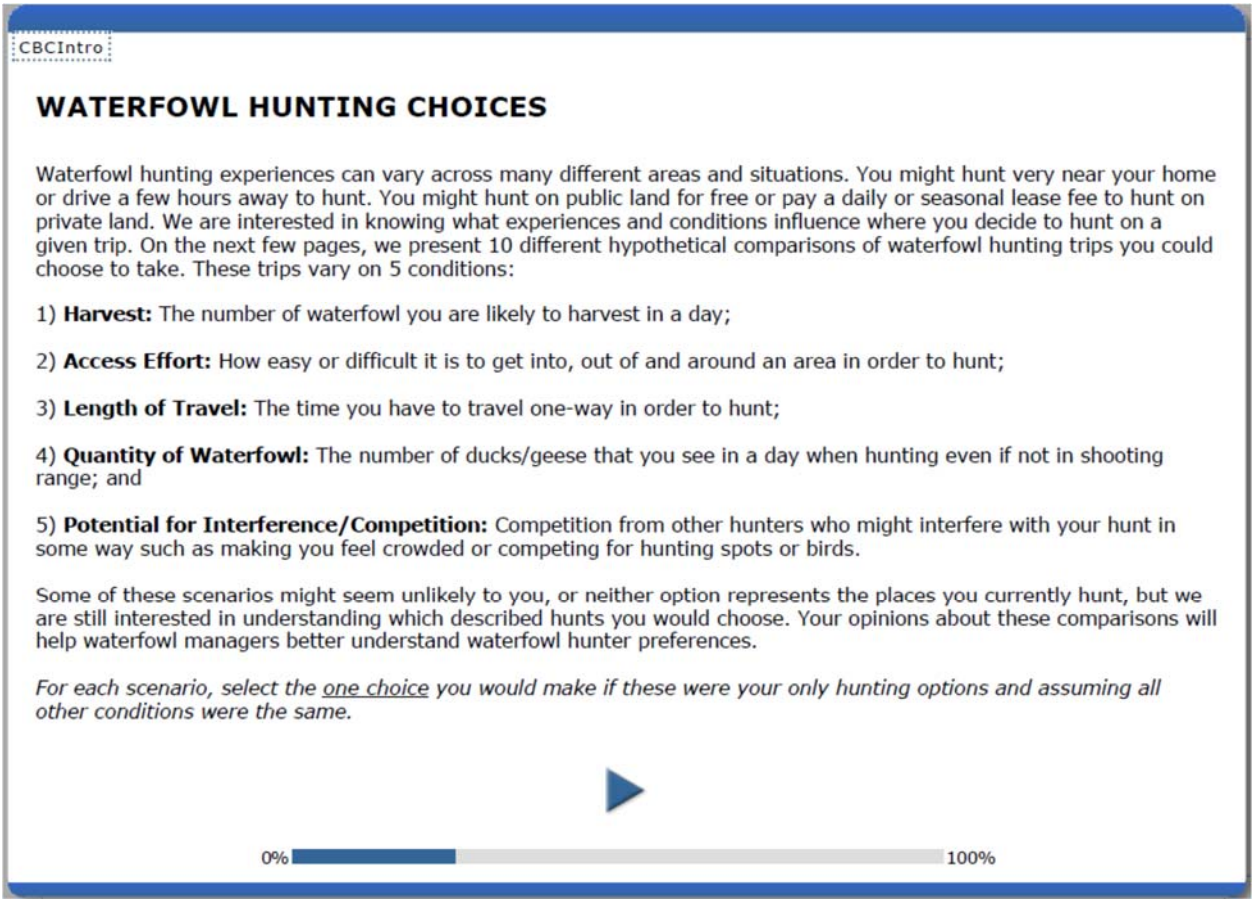

Figure 5.2 Example of choice scenario for waterfowl hunting DCE

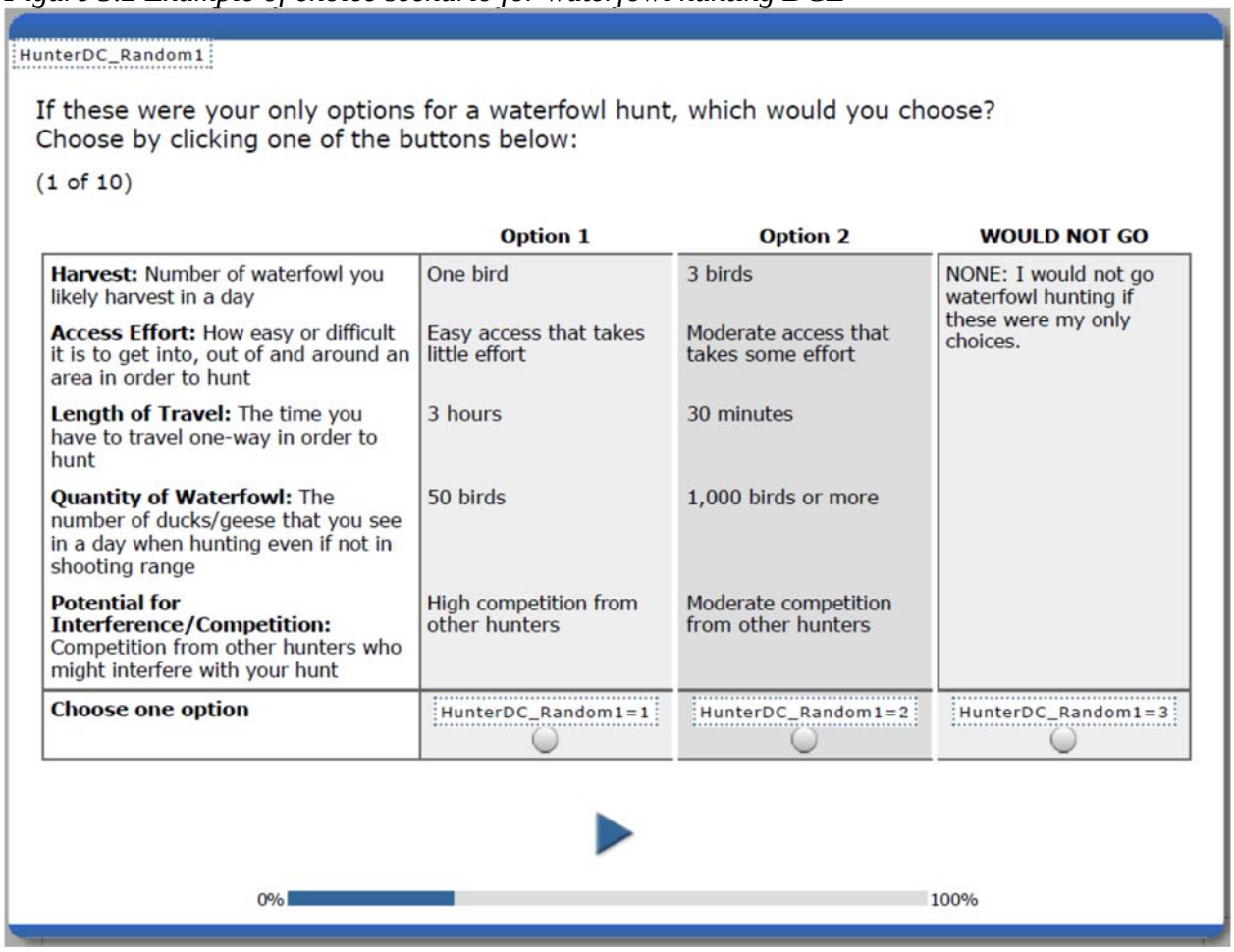

Table 5.2 Relative attribute importance derived from hierarchical Bayes estimation of utilities for waterfowl hunting DCE

Season choice attribute	Importances	SD
Harvest	23.94	11.01
Access Effort	10.23	6.29
Length of Travel	24.05	10.99
Quantity of Waterfowl	13.70	6.12
Potential for Interference/Competition	28.08	13.43

Notes: n = 857

Table 5.3 Results of the hierarchical Bayes model for waterfowl hunting DCE using zero-centered differences.

Choice attribute - level	**Average utilities**	**SD**
Harvest		
One bird	-65.76	34.29
3 birds	19.03	10.04
6 birds	46.74	33.28
Access Effort		
Easy access that takes little effort	17.94	15.91
Moderate access that takes some effort	9.78	11.47
Difficult access that takes a lot of effort	-27.73	21.20
Length of Travel		
30 minutes	45.84	38.31
1 hour	42.48	25.54
2 hours	-0.43	12.78
3 hours	-27.97	29.55
4 hours	-59.92	35.61
Quantity of Waterfowl		
25 birds or less	-30.61	22.81
50 birds	-14.87	14.36
250 birds	4.74	12.93
500 birds	12.39	12.99
1,000 birds or more	28.34	20.42
Potential for Interference/Competiton		
No competition	42.27	29.90
Low competition from other hunters	42.04	21.56
Moderate competition from other hunters	3.97	13.31
High competition from other hunters	-88.28	47.74
None	-42.83	107.28

Notes: n = 857

Section 6. Policy and Regulatory Preferences

PRIORITIES

The policy objective receiving the highest average priority rating was having the largest duck populations possible ($\bar{x}$ = 3.9-4.2), and the lowest average ranking was for having the largest drake mallard bag limits possible ($\bar{x}$ = 2.9-3.1; Table 6.1, 6.1a). Analyses revealed significant differences between the substrata but effect sizes suggest that these were small (Table 6.1b). Respondents were also asked to rank their top 3 highest priority objectives of those listed, with having the largest duck populations possible ranked first more frequently than any other objective across substrata (Table 6.2).

PERCEPTION OF EXISTING POLICY

Overall, respondents felt that current bag limits were neither difficult to understand (80-83%) nor difficult to comply with in the field (68-78%; Table 6.3). Lower Central Respondents were significantly more likely to indicate that they felt bag limits were difficult to comply with in the field (32%), though this difference was small. Respondents were also asked about their preferred scenario for bag limits of duck species with typically small bag limits, and respondents were split in their response with no significant differences between the substrata (Table 6.3).

FLYWAY-SPECIFIC REGULATORY PREFERENCES

Responses to most of the policy questions were highly variable (Table 6.4, 6.6, 6.9), with consensus emerging on a few questions (Table 6.7, 6.8) and significant differences on others (Table 6.5). Nearly half of respondents in the Upper and Lower Central preferred the 32 days, 4 ducks option, while only 25% of respondents in the Middle Central preferred this option (Table 6.5). Perceptions of the drake mallard bag limit over the last 5 years in the Middle (71%) and Upper Central (64%) was that it was about right, while in the Lower Central, most said it was either about right (38%) or they had no opinion (50%; Table 6.7). On the question of the

preferred liberal season, around half preferred to maintain length of 74 days, and another 17-20% had no opinion, with no differences between the substrata (Table 6.8).

A plurality of respondents that hunted the central high plains preferred simpler regulations for bag limits for ducks other than mallards during the 97 day season (Table 6.9); there were no significant differences between the substrata. Overall, a plurality of respondents that hunted the central plains preferred a 32 day season length/4 duck bag limit; this option was significantly more preferred in the Lower Central (54%) substrata than in either the Middle (32%) or Upper Central (32%; Table 6.10).

Table 6.1 Preferred agency priorities for duck hunting regulations

	Flyway substrata									Flyway ID		
	Lower Central			Middle Central			Upper Central			Central		
	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N
Having the largest bag limits possible	3.0	1.00	401	2.6	.93	464	2.7	.91	712	2.8	.97	1585
Having the longest seasons possible	3.6	.97	399	3.7	.96	464	3.3	.95	710	3.5	.97	1581
Having the largest duck populations possible	4.2	.78	399	4.1	.88	465	3.9	.93	707	4.1	.86	1579
Avoiding different season lengths for different duck species	3.6	1.16	400	3.5	1.20	462	3.5	1.21	710	3.5	1.19	1581
Providing the simplest regulations possible	4.0	1.02	400	3.9	.99	462	3.9	.97	708	3.9	1.00	1578
Reducing the number of species-specific bag limits	3.2	1.11	401	3.0	1.01	464	3.1	.98	707	3.1	1.05	1581
Having the largest drake mallard bag limits possible	2.9	1.08	401	3.1	1.04	462	3.1	.96	709	3.0	1.04	1581

Scale from 1=Very low to 5=Very high

Table 6.1a Level of concern for ecological benefits response distribution

	Response				
Item	Not at all concerned	Slightly concerned	Somewhat concerned	Very concerned	Valid N
Flooding Protection	8.0%	19.0%	36.6%	36.5%	1508
Erosion Protection	5.6%	15.7%	38.1%	40.7%	1504
Wildlife viewing and birdwatching	16.3%	27.4%	31.0%	25.3%	1496
Hunting opportunities	2.2%	3.9%	21.8%	72.2%	1505
Storage of greenhouse gases, such as carbon	25.4%	28.8%	27.1%	18.8%	1499
Clean water	2.9%	9.7%	27.4%	59.9%	1507
Clean air	4.3%	11.4%	28.4%	55.9%	1504
Providing home for wildlife	1.5%	4.6%	24.1%	69.8%	1502
Providing a home for animals such as butterflies and bees that pollinate plants and crops	4.1%	12.7%	33.0%	50.2%	1504
Scenic places for inspiration or spiritual renewal	21.5%	27.2%	26.6%	24.7%	1505

Table 6.1b Preferred agency priorities for duck hunting regulations ANOVA tests

		Sum of Squares	df	Mean Square	F	Sig.	Eta
Having the largest bag limits possible	Between Groups	30.11	2.00	15.05	17.05	0.00	
	Within Groups	1389.99	1574.12	0.88			
	Total	1420.10	1576.12				0.02
Having the longest seasons possible	Between Groups	45.42	2.00	22.71	24.67	0.00	
	Within Groups	1445.57	1570.30	0.92			
	Total	1490.99	1572.30				0.03
Having the largest duck populations possible	Between Groups	31.24	2.00	15.62	20.22	0.00	
	Within Groups	1211.17	1567.93	0.77			
	Total	1242.41	1569.93				0.03
Avoiding different season lengths for different duck species	Between Groups	3.86	2.00	1.93	1.35	0.26	
	Within Groups	2241.29	1569.37	1.43			
	Total	2245.15	1571.37				0.00
Providing the simplest regulations possible	Between Groups	2.17	2.00	1.09	1.11	0.33	
	Within Groups	1531.18	1567.01	0.98			
	Total	1533.35	1569.01				0.00
Reducing the number of species-specific bag limits	Between Groups	8.35	2.00	4.18	4.00	0.02	
	Within Groups	1639.88	1568.96	1.05			
	Total	1648.23	1570.96				0.01
Having the largest drake mallard bag limits possible	Between Groups	8.23	2.00	4.12	3.98	0.02	
	Within Groups	1624.29	1568.73	1.04			
	Total	1632.52	1570.73				0.01

Table 6.2 Ranked top 3 highest priority regulations

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Having the largest bag limits possible	First	31.6%	15.4%	17.1%	24.9%
	Second	27.0%	28.6%	38.2%	30.0%
	Third	41.4%	56.0%	44.6%	45.2%
	Total	148	101	168	458
Having the longest seasons possible	First	31.3%	44.3%	33.7%	35.9%
	Second	37.0%	37.8%	35.8%	37.0%
	Third	31.7%	17.9%	30.5%	27.1%
	Total	250	327	364	972
Having the largest duck populations possible	First	62.0%	58.5%	68.6%	62.9%
	Second	26.9%	28.8%	18.2%	25.0%
	Third	11.0%	12.7%	13.3%	12.1%
	Total	304	349	514	1182
Avoiding different season lengths for different duck species	First	15.8%	11.2%	16.0%	14.6%
	Second	39.3%	37.7%	44.9%	40.6%
	Third	44.9%	51.1%	39.1%	44.8%
	Total	129	163	265	547
Providing the simplest regulations possible	First	19.0%	19.7%	22.6%	20.4%
	Second	38.7%	38.0%	39.5%	38.8%
	Third	42.3%	42.3%	37.9%	40.8%
	Total	196	245	456	861
Reducing the number of species-specific bag limits	First	12.4%	9.1%	10.2%	11.0%
	Second	26.9%	26.1%	34.8%	29.1%
	Third	60.6%	64.8%	55.0%	59.9%
	Total	84	77	143	310
Having the largest drake mallard bag limits possible	First	9.7%	15.3%	19.8%	15.6%
	Second	48.1%	26.8%	31.8%	34.6%
	Third	42.2%	57.9%	48.4%	49.8%
	Total	41	91	165	262

Table 6.3 Bag limits difficult to comply with and preferred bag limits for species with small bags

			Flyway substrata			Flyway ID
			Lower Central	Middle Central	Upper Central	Central
Are rules for current species-specific bag limits difficult to understand?		Yes	19.9%	19.7%	16.6%	18.9%
		No	80.1%	80.3%	83.4%	81.1%
		Valid N	392	458	697	1555
Are the current species-specific bag limits difficult to comply with in the field		Yes	32.3%	21.6%	23.9%	26.9%
		No	67.7%	78.4%	76.1%	73.1%
		Valid N	391	458	698	1554
Preferred scenario for bag limits of duck species that typically have smaller bag limits	Maximize harvest opportunity by maintaining individual species bag limits		52.1%	48.6%	47.1%	49.7%
	Create simpler regulations by creating aggregate bag limits for a combination of certain species		47.9%	51.4%	52.9%	50.3%
		Valid N	390	458	696	1550

Rules difficult to understand significance:	χ^2 (2)= 2.69	Cramer's V= .04
Limits difficult to comply with significance:	χ^2 (2)= 14.44*	Cramer's V= .10*
Preferred scenario significance:	χ^2 (2)= 2.43	Cramer's V= .04

Table 6.4 Preferred approach for ducks other than mallards

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Approach favored for setting bag limits for duck species other than mallards	Simpler regulations: 6-bird, 3-bird, 1 bird	43.9%	34.2%	32.5%	39.8%
	Offer largest bag limit possible for every duck species	32.7%	37.6%	36.0%	34.3%
	No preference	23.4%	28.3%	31.5%	25.9%
	Valid N	97	61	78	274
Significance:		χ^2 (4)= 3.00		Cramer's V= .08	

Table 6.5 Preferred season length/bag limit

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Most preferred	32 days, 4 ducks	51.5%	25.3%	46.6%	45.5%
	39 days, 3 ducks	37.5%	36.1%	42.2%	38.1%
	46 days, 1 duck	11.0%	38.6%	11.2%	16.4%
	Valid N	82	47	65	227
Significance:		χ^2 (4)= 20.41*		Cramer's V= .23*	

Table 6.6 Acceptability lower daily bag limit of 4 ducks of any kind

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Would you accept a lower daily bag limit of 4 ducks per day if you could harvest 4 ducks of any kind	Yes	45.5%	34.5%	36.1%	41.5%
	No	20.3%	18.7%	32.0%	22.1%
	Does not matter to me	34.2%	46.8%	31.9%	36.4%
	Valid N	96	60	78	271
Significance:		χ^2 (4)= 7.42		Cramer's V= .13	

Table 6.7 Perception of drake mallard daily bag limit in past 5 years

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
How do you feel about the drake mallard bag limit over the last 5 years	Drake mallard daily bag limit too low	11.3%	1.7%	7.7%	8.7%
	Drake mallard daily bag limit about right	37.9%	71.2%	64.4%	49.6%
	Drake mallard daily bag limit too high	1.1%	0.0%	10.7%	2.7%
	No opinion	49.7%	27.1%	17.2%	39.0%
	Valid N	96	60	78	271
Significance:		χ^2 (6)= 42.43*		Cramer's V= .30*	

Table 6.8 Most preferred liberal season

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Liberal season length most preferred	Reduce from 74 to 60 days	19.2%	6.9%	11.8%	15.3%
	Maintain length of 74 days	48.9%	60.2%	51.5%	51.7%
	Increase from 74 to 81 days	15.1%	15.1%	17.1%	15.4%
	No preference	16.9%	17.8%	19.6%	17.6%
	Valid N	96	60	78	271
Significance:		χ^2 (6)= 5.49		Cramer's V= .11	

Table 6.9 Preferred bag limits for ducks other than mallards during 97 day season (High Plains)

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Approach favored for setting bag limits for duck species other than mallards	Simpler regulations: 6-bird, 3-bird, 1 bird	47.6%	43.7%	43.6%	45.2%
	Offer largest bag limit possible for every duck species	32.5%	29.5%	30.1%	30.9%
	No preference	19.9%	26.8%	26.3%	23.9%
	Valid N	284	366	572	1201
Significance:		χ^2 (4)= 4.91		Cramer's V= .05	

Table 6.10 Most preferred season length/bag limit (High Plains)

		Flyway Substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Most preferred	32 days, 4 ducks	53.7%	32.1%	41.5%	43.8%
	39 days, 3 ducks	29.4%	35.1%	36.2%	33.2%
	46 days, 1 duck	16.9%	32.8%	22.3%	23.1%
	Total Respondents	231	299	492	994
Significance:		χ^2 (4)= 31.86*		Cramer's V= .13*	

Table 6.11 Acceptability of lower daily bag limit of 4 ducks of any kind (High Plains)

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Would you accept a lower daily bag limit of 4 ducks per day if you could harvest 4 ducks of any kind	Yes	50.3%	44.1%	38.7%	45.0%
	No	18.6%	18.3%	20.7%	19.2%
	Does not matter to me	31.1%	37.5%	40.6%	35.9%
	Total Respondents	281	366	566	1192
Significance:		χ^2 (4)= 11.72*		Cramer's V= .07*	

Table 6.12 Perception of drake mallard daily bag limit in past 5 years in state hunted most (High Plains)

		Flyway Substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
How do you feel about the drake mallard bag limit over the last 5 years	Drake mallard daily bag limit too low	7.4%	7.0%	7.4%	7.3%
	Drake mallard daily bag limit about right	59.7%	69.0%	69.5%	65.3%
	Drake mallard daily bag limit too high	2.3%	2.1%	1.6%	2.0%
	No opinion	30.6%	22.0%	21.5%	25.3%
	Total Respondents	281	366	567	1193
Significance:		χ^2 (6)= 10.77		Cramer's V= .07	

Table 6.13 Most preferred liberal season (High Plains)

		Flyway Substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Liberal season length most preferred	Reduce from 97 to 81 days	18.8%	12.1%	16.5%	16.2%
	Maintain length of 97 days	45.1%	51.8%	44.6%	46.8%
	Increase from 97 to 104 days	14.8%	21.5%	11.2%	15.6%
	No preference	21.3%	14.7%	27.6%	21.4%
	Total Respondents	280	365	567	1189
Significance:		χ^2 (6)= 39.57*		Cramer's V= .13*	

Section 7. Avidity

Avidity can refer to several aspects of a recreational experience—here, it was assessed via the respondents' involvement and identification with conservation groups and the centrality or importance of hunting for the individual. Respondents described their level of involvement with Delta Waterfowl, Ducks Unlimited, and their regional or state waterfowl association, and most indicated no involvement with Delta Waterfowl (83-92%; Table 7.1). Involvement with Ducks Unlimited was more varied, with respondents in the Upper Central most likely to indicate no involvement (54%), compared to the Lower (49%) or Middle Central (44%), and analyses suggest these differences are small but significant (Table 7.2). Most respondents also indicated no involvement with their regional or state waterfowl association, with no differences between the substrata (83-88%; Table 7.3).

Social identity was assessed for 5 different identities relevant to waterfowl management (birdwatcher, duck hunter, goose hunter, other type of hunter, or conservationist), with respondents indicating the degree to which they identify with each. Respondents on average most identified as a conservationist ($\overline{x}$ = 3.9) or other type of hunter ($\overline{x}$ = 4.1) and least identified as a birdwatcher ($\overline{x}$ = 2.5-2.6; Table 7.4). Analyses revealed significant differences between the substrata, but effect sizes were only substantive for identification as a goose hunter—the level of identification as a goose hunter was lower in the Lower Central ($\overline{x}$ = 2.7) than in the Middle ($\overline{x}$ = 3.7) or Upper Central ($\overline{x}$ = 3.5; Table 7.4).

Respondents could indicate their agreement with a series of statements related to waterfowl hunting, with the highest average agreement with the statement, "Waterfowl hunting is one of the most enjoyable activities I do," ($\overline{x}$ = 3.9-4.1; Table 7.5). The lowest average agreement was with the statement, "If I couldn't go waterfowl hunting I am not sure what I would do instead," ($\overline{x}$ = 2.5-2.8). Analyses revealed significant differences between the substrata, but effect sizes suggest these were not substantive (Table 7.5).

Table 7.1 Involvement: Delta Waterfowl

	Flyway substrata			Flyway ID
	Lower Central	Middle Central	Upper Central	Central
No involvement	82.8%	91.8%	83.9%	85.6%
Slight involvement	12.5%	6.2%	10.4%	10.2%
Moderate involvement	4.4%	2.0%	4.1%	3.7%
High involvement	.3%	0.0%	1.6%	.6%
Total Respondents	331	388	613	1329
Significance:	χ^2 (6)= 22.45*		Cramer's V= .09*	

Table 7.2 Involvement: Ducks Unlimited

	Flyway substrata			Flyway ID
	Lower Central	Middle Central	Upper Central	Central
No involvement	49.4%	44.4%	54.0%	49.3%
Slight involvement	34.4%	32.5%	33.3%	33.5%
Moderate involvement	11.9%	17.1%	9.7%	12.7%
High involvement	4.3%	6.1%	3.0%	4.4%
Total Respondents	369	449	677	1493
Significance:	χ^2 (6)= 23.36*		Cramer's V= .09*	

Table 7.3 Involvement: Regional or State Waterfowl Association

	Flyway substrata			Flyway ID
	Lower Central	Middle Central	Upper Central	Central
No involvement	88.4%	85.3%	82.7%	85.9%
Slight involvement	8.0%	10.5%	11.6%	9.7%
Moderate involvement	2.3%	3.1%	4.4%	3.2%
High involvement	1.3%	1.1%	1.2%	1.2%
Total Respondents	326	393	602	1319
Significance:	χ^2 (6)= 6.44		Cramer's V= .05	

Table 7.4 Social Identity

	Flyway substrata									Flyway ID		
	Lower Central			Middle Central			Upper Central			Central		
	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N
Identify yourself as a Birdwatcher	2.5	1.20	377	2.6	1.19	450	2.5	1.18	679	2.5	1.19	1509
Identify yourself as a Duck Hunter	3.9	1.02	381	3.8	1.12	455	3.6	1.08	687	3.8	1.07	1525
Identify yourself as Goose Hunter	2.7	1.20	378	3.7	1.09	455	3.5	1.13	687	3.2	1.24	1520
Identify yourself as an Other type of hunter	4.1	1.00	380	4.1	1.01	455	4.1	.97	683	4.1	.99	1521
Identify yourself as a Conservationist	3.9	.99	378	3.9	1.11	454	3.9	1.04	683	3.9	1.04	1517

Scale from 1=Not at all to 5=Very strongly

Level of social identification with group types response distribution

	Response					
Item	Not at all	Slightly	Moderately	Strongly	Very strongly	Total
Identify yourself as a Birdwatcher	23.2%	28.5%	27.2%	14.3%	6.9%	1509
Identify yourself as a Duck Hunter	1.4%	11.8%	28.0%	26.4%	32.4%	1525
Identify yourself as Goose Hunter	8.7%	22.7%	26.5%	22.9%	19.2%	1520
Identify yourself as an Other type of hunter	2.2%	5.9%	15.3%	36.0%	40.6%	1521
Identify yourself as a Conservationist	2.2%	7.0%	24.2%	30.2%	36.4%	1517

Table 7.4a Social Identity ANOVA tests

		Sum of Squares	df	Mean Square	F	Sig.	Eta
Identify yourself as a Birdwatcher	Between Groups	0.35	2.00	0.17	0.12	0.88	
	Within Groups	2119.53	1502.94	1.41			
	Total	2119.88	1504.94				0.00
Identify yourself as a Duck Hunter	Between Groups	31.38	2.00	15.69	13.57	0.00	
	Within Groups	1757.06	1519.46	1.16			
	Total	1788.44	1521.46				0.02
Identify yourself as Goose Hunter	Between Groups	240.53	2.00	120.26	93.57	0.00	
	Within Groups	1948.87	1516.31	1.29			
	Total	2189.40	1518.31				0.11
Identify yourself as an Other type of hunter	Between Groups	0.52	2.00	0.26	0.26	0.77	
	Within Groups	1482.94	1514.83	0.98			
	Total	1483.45	1516.83				0.00
Identify yourself as a Conservationist	Between Groups	0.47	2.00	0.24	0.22	0.81	
	Within Groups	1659.23	1511.99	1.10			
	Total	1659.70	1513.99				0.00

Table 7.5 Centrality of waterfowl hunting

	Flyway substrata									Flyway ID		
	Lower Central			Middle Central			Upper Central			Central		
	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N
Waterfowl hunting is one of the most enjoyable activities I do	4.1	.93	382	4.1	.89	455	3.9	.94	688	4.1	.93	1528
Most of my friends are in some way connected with waterfowl hunting	3.3	1.09	382	3.3	1.15	453	3.3	1.08	688	3.3	1.11	1526
Waterfowl hunting has a central role in my life	3.1	1.14	382	3.4	1.15	455	3.2	1.13	688	3.2	1.15	1528
A lot of my life is organized around waterfowl hunting	2.8	1.13	382	3.1	1.16	455	2.8	1.15	688	2.9	1.15	1528
If I couldn't go waterfowl hunting I am not sure what I would do instead	2.5	1.23	382	2.8	1.30	455	2.5	1.24	688	2.6	1.26	1528

Scale from 1=Strongly disagree to 5=Strongly agree

Centrality of waterfowl hunting response distribution

	Response					
Item	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Waterfowl hunting is one of the most enjoyable activities I do	1.0%	5.4%	18.3%	38.1%	37.2%	1528
Most of my friends are in some way connected with waterfowl hunting	5.1%	21.7%	25.4%	34.0%	13.8%	1526
Waterfowl hunting has a central role in my life	6.1%	23.7%	30.4%	24.1%	15.7%	1528
A lot of my life is organized around waterfowl hunting	10.2%	31.2%	28.9%	19.3%	10.4%	1528
If I couldn't go waterfowl hunting I am not sure what I would do instead	22.0%	33.3%	20.3%	14.0%	10.5%	1528

Table 7.5a Centrality of waterfowl hunting ANOVA tests

		Sum of Squares	df	Mean Square	F	Sig.	Eta
Waterfowl hunting is one of the most enjoyable activities I do	Between Groups	13.32	2.00	6.66	7.82	0.00	
	Within Groups	1296.83	1522.03	0.85			
	Total	1310.15	1524.03				0.01
Most of my friends are in some way connected with waterfowl hunting	Between Groups	0.70	2.00	0.35	0.29	0.75	
	Within Groups	1863.41	1520.21	1.23			
	Total	1864.11	1522.21				0.00
Waterfowl hunting has a central role in my life	Between Groups	16.74	2.00	8.37	6.45	0.00	
	Within Groups	1974.80	1521.71	1.30			
	Total	1991.54	1523.71				0.01
A lot of my life is organized around waterfowl hunting	Between Groups	20.92	2.00	10.46	7.98	0.00	
	Within Groups	1996.30	1522.09	1.31			
	Total	2017.22	1524.09				0.01
If I couldn't go waterfowl hunting I am not sure what I would do instead	Between Groups	34.29	2.00	17.14	10.87	0.00	
	Within Groups	2400.15	1521.64	1.58			
	Total	2434.44	1523.64				0.01

Section 8. Engagement

PARTICIPATION IN NON-HUNTING ACTIVITIES

Respondents reported most often voting for candidates or ballot issues to support wetlands or waterfowl conservation ($\bar{x}$ = 2.1-2.4; Table 8.1, 8.1a), and least often contacting elected officials or government agencies about wetlands and waterfowl conservation ($\bar{x}$ = 1.3-1.5). While analyses revealed significant differences between the substrata on several items, effect sizes suggest none of the differences are substantive (Table 8.1b).

Across substrata, 90% or more respondents reported spending time in nature away from home or fishing in the past 12 months, while over 80% reported hunting any other game animals, viewing wildlife or participating in backyard/at-home nature activities in the past 12 months (Table 8.2). Responses to hunting other game birds was significantly different between the substrata, with 68% selecting this activity in the Lower Central, compared to 90% in the Middle Central and 94% in the Upper Central (Table 8.2a).

Most respondents in each flyway substrata reported watching birds at their home in the past 12 months (88-90%) and watching birds away from home (72-76%; Table 8.3). Feeding birds at home was significantly less reported in the Middle Central (56%) than in either the Lower (70%) or Upper Central (63%; Table 8.3a), but these differences were small.

COMMUNITY

We used a social network approach to understand the diversity of relationships and connections that individuals have in their personal networks (Harshaw and Tindall 2005; Lin, Fu & Hsung 2001). Respondents were presented with a list of 24 avocational, occupational, and organizational structural positions and asked what relationship if any they had associated with the position through an acquaintance, close friend, relative, or self. The percentage of

respondents reporting ties to the positions at each level of relationship are summarized in Tables 8.4a through 8.4f.

TRUST

Respondents were asked to rate their trust (1 = Do not trust at all to 5 = Trust completely) in several governmental institutions. Trust was highest in state wildlife agencies ($\bar{x}$ = 3.3-3.5) and waterfowl hunting/conservation organizations ($\bar{x}$ = 3.3-3.6; Table 8.4, 8.4a), and was lowest for elected officials ($\bar{x}$ = 1.9-2.2). While analyses revealed significant differences between the substrata on several items, effect sizes suggest none of the differences are substantive (Table 8.4b).

SUPPORT

Monetary support for conservation can take the form of donations, permit purchases, and fees. Respondents were asked about their previous support in the past year to wetland or waterfowl conservation, conservation of other birds, birdwatching and related issues, and waterfowl hunting. Possible responses to this item were $0, less than $250, $250-$999, $1000-$2499, $2500-$4999, $5000-$9999, and $10,000 or more. Because of the non-normal distribution of donations (see Tables 8.5b-8.5e), responses were dichotomized as $0 donation or more than $0. Most respondents reported having donated to waterfowl hunting (87-91%; Table X), as well as wetland or waterfowl conservation (81-89%). Few reported donating to causes related to birdwatching and related issues (10-13%). Analyses revealed significant but differences (Table 8.5a), particularly in donations to wetland or waterfowl conservation (Lower: 88%; Middle: 89%; Upper: 81%). While most respondents indicated that they had not spent money on wetland management on private lands in the previous 12 months (Lower: 77%; Middle: 88%; Upper: 80%), more respondents spent money in the Middle Central and in the Upper or Lower Central (Table 8.5a). Money spent averaged $600 in the past year, and there were no significant differences between the substrata.

Table 8.1 Level of involvement in wetlands or waterfowl conservation in past 12 months

	Flyway substrata									Flyway ID		
	Lower Central			Middle Central			Upper Central			Central		
	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N
Worked on land improvement project related to wetlands or waterfowl conservation	1.7	1.07	371	1.7	1.05	446	1.6	1.04	675	1.7	1.06	1493
Attended meetings about wetlands or waterfowl conservation	1.5	.82	370	1.6	.96	444	1.6	.94	676	1.6	.90	1490
Volunteered my personal time and effort to conserve wetlands and waterfowl	1.5	.85	371	1.6	1.00	443	1.5	.92	671	1.5	.91	1487
Contacted elected officials or government agencies about wetlands and waterfowl conservation	1.3	.72	372	1.4	.86	447	1.5	.89	679	1.4	.81	1498
Voted for candidates or ballot issues to support wetlands or waterfowl conservation	2.1	1.37	371	2.2	1.34	447	2.4	1.42	680	2.2	1.38	1497
Advocated for political action to conserve wetlands and waterfowl	1.6	1.02	372	1.8	1.18	442	1.7	1.15	676	1.7	1.10	1491

Scale from 1=Never to 5=Very often

Table 8.1a Participation in conservation activities response distribution

Item	Response					
	Never	Rarely	Sometimes	Often	Very often	Valid N
Worked on land improvement project related to wetlands or waterfowl conservation	65.7%	13.5%	12.7%	5.6%	2.5%	1493
Attended meetings about wetlands or waterfowl conservation	65.5%	18.2%	12.5%	2.5%	1.3%	1490
Volunteered my personal time and effort to conserve wetlands and waterfowl	69.6%	14.5%	11.3%	3.2%	1.4%	1487
Contacted elected officials or government agencies about wetlands and waterfowl conservation	77.8%	10.1%	8.9%	2.3%	0.9%	1498
Voted for candidates or ballot issues to support wetlands or waterfowl conservation	48.6%	9.0%	19.5%	15.3%	7.6%	1497
Advocated for political action to conserve wetlands and waterfowl	66.6%	11.0%	13.4%	6.0%	3.1%	1491

Table 8.1b Level of involvement in wetlands or waterfowl conservation in past 12 months ANOVA tests

		Sum of Squares	df	Mean Square	F	Sig.	Eta
Worked on land improvement project related to wetlands or waterfowl conservation	Between Groups	3.11	2.00	1.55	1.41	0.25	
	Within Groups	1648.18	1489.81	1.11			
	Total	1651.29	1491.81				0.00
Attended meetings about wetlands or waterfowl conservation	Between Groups	2.52	2.00	1.26	1.49	0.23	
	Within Groups	1256.65	1487.57	0.84			
	Total	1259.17	1489.57				0.00
Volunteered my personal time and effort to conserve wetlands and waterfowl	Between Groups	3.69	2.00	1.84	2.14	0.12	
	Within Groups	1277.36	1482.77	0.86			
	Total	1281.05	1484.77				0.00
Contacted elected officials or government agencies about wetlands and waterfowl conservation	Between Groups	7.47	2.00	3.74	5.31	0.01	
	Within Groups	1051.13	1495.04	0.70			
	Total	1058.60	1497.04				0.01
Voted for candidates or ballot issues to support wetlands or waterfowl conservation	Between Groups	31.77	2.00	15.89	8.27	0.00	
	Within Groups	2874.11	1495.23	1.92			
	Total	2905.88	1497.23				0.01
Advocated for political action to conserve wetlands and waterfowl	Between Groups	6.10	2.00	3.05	2.41	0.09	
	Within Groups	1882.35	1487.00	1.27			
	Total	1888.44	1489.00				0.00

Table 8.2 Nature Based Recreation

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Spending time in nature away from home	%	93.7%	95.3%	94.1%	94.3%
	Valid N	376	452	681	1510
Viewing wildlife	%	83.3%	83.6%	83.4%	83.4%
	Valid N	373	453	679	1506
Learning about nature	%	47.2%	48.8%	50.1%	48.5%
	Valid N	371	448	677	1496
Backyard/at home nature activities	%	88.1%	90.6%	90.1%	89.4%
	Valid N	371	452	679	1501
Fishing	%	93.7%	93.3%	93.9%	93.6%
	Valid N	376	453	681	1511
Hunting migratory birds other than waterfowl	%	88.3%	81.2%	59.6%	78.0%
	Valid N	375	453	675	1278
Hunter other game birds	%	67.8%	89.9%	93.7%	81.5%
	Valid N	371	454	681	1287
Hunting any other game animals	%	87.0%	80.2%	88.4%	85.5%
	Valid N	376	451	681	1508
Other	%	10.7%	8.1%	9.4%	9.6%
	Valid N	133	306	247	537

Table 8.2a Nature Based Recreation significance tests

		Chi-Square	df	Cramer's V
Activity	Spending time in nature away from home	1.26	2	.03
	Viewing wildlife	0.10	2	.01
	Learning about nature	0.55	2	.02
	Backyard/at home nature activities	0.22	2	.01
	Fishing	0.38	2	.02
	Hunting migratory birds other than waterfowl	120.76*	2	.28*
	Hunter other game birds	130.50*	2	.29*
	Hunting any other game animals	15.12*	2	.10*

Table 8.3 Wild Bird Activities

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Watching birds at my home	%	89.5%	89.4%	87.5%	88.9%
	Valid N	375	452	679	1506
Feeding birds at my home	%	70.9%	56.1%	63.3%	64.6%
	Valid N	372	450	674	1498
Watching birds away from my home	%	71.6%	74.5%	76.2%	73.7%
	Valid N	372	451	676	1500
Photographing or filming birds	%	30.6%	33.0%	30.3%	31.2%
	Valid N	362	444	666	1470
Counting/monitoring birds	%	11.8%	13.8%	12.3%	12.5%
	Valid N	362	443	658	1463
Keeping track of the birds you see on a list	%	7.5%	12.8%	11.7%	10.2%
	Valid N	364	442	660	1467
Installing or maintaining next boxes for birds	%	29.2%	23.4%	31.1%	28.1%
	Valid N	367	446	667	1480

Table 8.3a Wild bird activities significance tests

		Chi-Square	df	Cramer's V
Wild bird activities	Watching birds at my home	9.65*	2	.08*
	Feeding birds at my home	18.26*	2	.11*
	Watching birds away from my home	0.56	2	.02
	Photographing or filming birds	2.26	2	.04
	Counting/monitoring birds	1.03	2	.03
	Keeping track of the birds you see on a list	5.04	2	.02
	Installing or maintaining nest boxes for birds	7.86*	2	.06

Table 8.4a Personal community: Recreation

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Personal Community: Birdwatcher	Acquaintance	43.9%	42.8%	44.7%	43.8%
	Close Friend	30.0%	29.9%	25.4%	28.5%
	Relative	36.0%	39.4%	42.2%	38.8%
	Myself	53.8%	48.3%	51.6%	51.6%
	Valid N	240	303	469	1000
Personal Community: Angler	Acquaintance	52.2%	54.1%	59.2%	54.8%
	Close Friend	75.9%	72.2%	76.0%	74.9%
	Relative	69.2%	68.5%	72.8%	70.0%
	Myself	80.4%	79.8%	85.4%	81.7%
	Valid N	367	438	668	1474
Personal Community: Waterfowl Hunter	Acquaintance	58.6%	58.1%	60.3%	59.0%
	Close Friend	79.8%	77.4%	76.0%	78.1%
	Relative	66.1%	65.8%	69.0%	66.9%
	Myself	90.1%	89.9%	91.5%	90.4%
	Valid N	376	450	681	1507
Personal Community: Other hunter	Acquaintance	64.3%	63.3%	63.2%	63.7%
	Close Friend	83.3%	79.8%	79.1%	81.1%
	Relative	80.4%	75.9%	78.0%	78.5%
	Myself	90.0%	89.0%	93.7%	90.8%
	Valid N	370	443	676	1489

Table 8.4b Personal community: Agencies

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Personal Community: State/provincial park manager/employee	Acquaintance	78.5%	78.5%	74.6%	77.2%
	Close Friend	27.8%	29.3%	29.2%	28.8%
	Relative	11.5%	6.8%	11.1%	9.9%
	Myself	4.3%	2.2%	3.9%	3.5%
	Valid N	101	178	274	518
Personal Community: National Park Manager/Employee	Acquaintance	76.6%	78.5%	78.0%	77.7%
	Close Friend	24.1%	23.5%	24.8%	24.2%
	Relative	16.2%	8.8%	9.5%	11.6%
	Myself	2.2%	0.0%	1.4%	1.2%
	Valid N	100	165	261	496
Personal Community: Federal wildlife agency manager/employee	Acquaintance	84.7%	83.9%	75.0%	80.7%
	Close Friend	28.0%	24.0%	32.7%	28.8%
	Relative	7.9%	7.6%	7.9%	7.8%
	Myself	3.7%	4.3%	7.6%	5.4%
	Valid N	88	116	258	427
Personal Community: State/provincial wildlife agency manager/employee	Acquaintance	78.9%	78.8%	73.7%	77.0%
	Close Friend	31.6%	32.7%	36.5%	33.7%
	Relative	11.4%	12.2%	11.2%	11.6%
	Myself	4.7%	6.3%	5.7%	5.5%
	Valid N	123	188	346	611

Table 8.4c Personal community: Environmental Occupations

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Personal Community: Farmer/Rancher	Acquaintance	52.4%	56.4%	58.1%	55.1%
	Close Friend	57.2%	59.3%	59.3%	58.4%
	Relative	48.0%	45.2%	60.7%	51.0%
	Myself	30.3%	22.7%	21.4%	25.6%
	Valid N	348	405	643	1393
Personal Community: Outdoor Educator	Acquaintance	65.6%	64.9%	66.5%	65.7%
	Close Friend	35.3%	37.3%	35.5%	35.9%
	Relative	19.0%	14.7%	17.4%	17.2%
	Myself	21.2%	16.9%	18.6%	19.1%
	Valid N	156	217	358	703
Personal Community: Wildlife artist	Acquaintance	63.4%	66.3%	69.7%	66.0%
	Close Friend	24.2%	23.3%	16.2%	21.6%
	Relative	18.3%	13.8%	15.7%	16.3%
	Myself	8.5%	9.0%	8.5%	8.6%
	Valid N	110	130	197	439
Personal Community: Wildlife biologist	Acquaintance	67.9%	73.8%	70.6%	70.3%
	Close Friend	34.0%	39.3%	33.7%	35.2%
	Relative	14.0%	13.5%	12.3%	13.3%
	Myself	9.5%	8.4%	9.5%	9.3%
	Valid N	147	169	326	622
Personal Community: Wildlife photographer	Acquaintance	60.2%	60.4%	61.2%	60.5%
	Close Friend	35.1%	32.2%	26.3%	31.6%
	Relative	23.6%	24.5%	19.6%	22.7%
	Myself	25.8%	21.8%	25.7%	24.6%
	Valid N	170	226	333	177

Table 8.4d Personal community: Conservation organizations

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Personal Community: Member of fishing/conservation organizations	Acquaintance	60.1%	58.7%	60.8%	60.0%
	Close Friend	61.3%	55.6%	50.9%	56.9%
	Relative	40.1%	30.1%	38.2%	37.0%
	Myself	47.7%	38.1%	38.5%	42.6%
	Valid N	207	214	355	787
Personal Community: Member of national conservation organization	Acquaintance	70.7%	70.9%	62.4%	68.2%
	Close Friend	32.6%	33.2%	40.7%	35.3%
	Relative	19.2%	25.8%	27.4%	23.5%
	Myself	20.1%	23.4%	20.5%	21.1%
	Valid N	86	97	167	347
Personal Community: Member of local conservation organization	Acquaintance	66.0%	57.0%	62.6%	62.6%
	Close Friend	61.5%	50.8%	55.0%	56.6%
	Relative	42.9%	32.6%	37.2%	38.4%
	Myself	56.4%	49.5%	51.4%	53.0%
	Valid N	136	156	301	575
Personal Community: Member of local naturalist organization	Acquaintance	76.0%	75.4%	70.6%	74.2%
	Close Friend	30.6%	33.6%	29.4%	31.0%
	Relative	22.7%	11.7%	17.4%	18.3%
	Myself	18.0%	19.5%	13.2%	16.9%
	Valid N	54	57	104	214

Table 8.4e Personal community: Hunting organizations

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Personal Community: Member of Ducks Unlimited	Acquaintance	55.5%	53.4%	58.1%	55.6%
	Close Friend	70.9%	66.0%	61.9%	67.0%
	Relative	50.8%	49.7%	47.6%	49.6%
	Myself	53.7%	60.4%	45.5%	53.3%
	Valid N	321	390	538	1265
Personal Community: Member of Delta Waterfowl	Acquaintance	65.1%	56.9%	62.8%	62.6%
	Close Friend	61.4%	53.3%	50.7%	56.2%
	Relative	32.3%	30.2%	25.6%	29.7%
	Myself	34.7%	25.3%	23.8%	29.1%
	Valid N	137	120	257	515
Personal Community: Member of state waterfowl association	Acquaintance	63.9%	62.6%	63.2%	63.4%
	Close Friend	64.9%	57.3%	45.0%	56.8%
	Relative	19.7%	28.2%	19.7%	21.7%
	Myself	22.1%	30.0%	23.7%	24.5%
	Valid N	106	105	200	410
Personal Community: Member of non-waterfowl hunting organization	Acquaintance	61.8%	54.4%	58.6%	58.5%
	Close Friend	62.3%	67.7%	64.8%	64.7%
	Relative	44.9%	45.1%	50.6%	46.8%
	Myself	46.0%	55.5%	54.2%	51.5%
	Valid N	199	295	442	905

Table 8.4f Personal community: Bird groups

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Personal Community: Member of birding group	Acquaintance	71.8%	74.6%	69.1%	71.7%
	Close Friend	29.6%	20.7%	27.2%	26.5%
	Relative	16.8%	17.2%	19.6%	17.8%
	Myself	5.9%	9.9%	7.3%	7.4%
	Valid N	79	92	165	329
Personal Community: Member of bird conservation group	Acquaintance	62.6%	73.4%	64.7%	66.0%
	Close Friend	40.3%	24.9%	38.4%	25.7%
	Relative	24.9%	23.6%	23.0%	24.0%
	Myself	19.4%	18.1%	20.8%	19.5%
	Valid N	98	108	183	388
Personal Communication: Member of ornithological group	Acquaintance	75.5%	80.7%	77.9%	77.6%
	Close Friend	31.7%	20.3%	26.4%	27.0%
	Relative	8.6%	9.2%	12.1%	9.9%
	Myself	10.8%	6.9%	6.9%	8.5%
	Valid N	50	58	107	209

Table 8.4 Trust in state wildlife agencies

	Flyway substrata									Flyway ID		
	Lower Central			Middle Central			Upper Central			Central		
	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N
State wildlife agencies	3.5	.92	377	3.3	1.02	450	3.5	.96	682	3.4	.97	1511
Federal wildlife and land management agencies	3.1	1.12	373	3.0	1.07	450	3.1	1.05	684	3.1	1.09	1506
Elected officials	2.0	.93	376	1.9	.87	447	2.2	.99	684	2.0	.93	1507
Waterfowl hunting/conservation organizations	3.6	.89	378	3.6	.97	452	3.3	.99	682	3.5	.95	1514
Birding/bird conservation organizations	2.8	1.09	367	2.7	1.09	433	2.8	1.04	658	2.8	1.08	1463
Other conservation organizations	2.7	.99	367	2.8	1.01	436	2.8	.95	668	2.8	.98	1472
University researchers/scientists	2.9	1.06	372	2.9	1.08	446	2.9	1.04	680	2.9	1.06	1498

Scale from 1=Do not trust at all to 5=Trust completely

Table 8.4a Trust in various institutions response distribution

Item	Response					
	Do not trust at all	Trust a little	Trust somewhat	Trust a lot	Trust completely	Valid N
State wildlife agencies	4.1%	11.2%	32.4%	41.4%	11.0%	1511
Federal wildlife and land management agencies	9.3%	18.3%	34.1%	29.6%	8.6%	1506
Elected officials	34.6%	36.1%	23.4%	4.8%	1.1%	1507
Waterfowl hunting/conservation organizations	3.1%	10.9%	28.8%	44.5%	12.7%	1514
Birding/bird conservation organizations	14.8%	24.6%	35.1%	21.3%	4.2%	1463
Other conservation organizations	11.4%	25.7%	41.4%	18.3%	3.2%	1472
University researchers/scientists	10.8%	22.1%	38.5%	22.1%	6.4%	1498

Table 8.4b Trust in state wildlife agencies ANOVA tests

		Sum of Squares	df	Mean Square	F	Sig.	Eta
State wildlife agencies	Between Groups	11.74	2.00	5.87	6.23	0.00	
	Within Groups	1418.64	1506.22	0.94			
	Total	1430.38	1508.22				0.01
Federal wildlife and land management agencies	Between Groups	1.64	2.00	0.82	0.71	0.49	
	Within Groups	1747.06	1504.09	1.16			
	Total	1748.70	1506.09				0.00
Elected officials	Between Groups	18.24	2.00	9.12	10.32	0.00	
	Within Groups	1329.42	1503.96	0.88			
	Total	1347.66	1505.96				0.01
Waterfowl hunting/conservation organizations	Between Groups	33.66	2.00	16.83	18.21	0.00	
	Within Groups	1394.97	1508.99	0.92			
	Total	1428.63	1510.99				0.02
Birding/bird conservation organizations	Between Groups	1.18	2.00	0.59	0.52	0.60	
	Within Groups	1660.44	1455.52	1.14			
	Total	1661.62	1457.52				0.00
Other conservation organizations	Between Groups	1.21	2.00	0.61	0.63	0.53	
	Within Groups	1404.48	1468.22	0.96			
	Total	1405.69	1470.22				0.00
University researchers/scientists	Between Groups	0.69	2.00	0.34	0.31	0.73	
	Within Groups	1669.08	1495.86	1.12			
	Total	1669.77	1497.86				0.00

Table 8.5 Percent making donation greater than $0 in past year

	Flyway substrata			Flyway
	Lower Central	Middle Central	Upper Central	Central
Wetland or Waterfowl conservation	88.3%	89.0%	81.1%	86.5%
Conservation of other birds	25.3%	37.4%	37.1%	32.1%
Birdwatching and related issues	10.0%	10.5%	12.9%	11.0%
Waterfowl hunting	87.0%	85.5%	86.1%	86.3%
Valid N	439	508	806	1753

Table 8.5a Percent making donation greater than $0 in past year significance tests

		Chi-Square	df	Cramer's V
Percent making donation greater than $0 in past year	Wetland or Waterfowl conservation	17.68*	2	.11*
	Conservation of other birds	10.31*	2	.09*
	Birdwatching and related issues	0.57	2	.02
	Waterfowl hunting	4.66	2	.06

Table 8.5b Donations to wetland or waterfowl conservation

		Flyway substrata			Flyway
		Lower Central	Middle Central	Upper Central	Central
Wetland or waterfowl conservation	$0	36.3%	31.2%	43.4%	37.0%
	Less than $250	47.5%	50.1%	43.3%	47.0%
	$250 to $999	12.0%	14.4%	11.1%	12.4%
	$1000 to $2499	3.5%	2.3%	1.0%	2.4%
	$2500 to $4999	0.5%	0.7%	0.4%	0.6%
	$5000 to $9999	0.0%	0.5%	0.0%	0.1%
	$10,000 or more	0.0%	0.9%	0.9%	0.5%
	Valid N	375	443	675	1496

Table 8.5c Donations to conservation of other bird species

		Flyway substrata			Flyway
		Lower Central	Middle Central	Upper Central	Central
Conservation of other bird species	$0	79.3%	68.9%	72.7%	74.4%
	Less than $250	18.0%	24.8%	22.4%	21.2%
	$250 to $999	2.4%	4.9%	3.9%	3.5%
	$1000 to $2499	0.3%	0.7%	0.3%	0.4%
	$2500 to $4999	0.0%	0.7%	0.3%	0.3%
	$5000 to $9999	0.0%	0.0%	0.0%	0.0%
	$10,000 or more	0.0%	0.2%	0.3%	0.1%
	Valid N	333	411	638	1370

Table 8.5d Donations to birdwatching and related issues

		Flyway substrata			Flyway
		Lower Central	Middle Central	Upper Central	Central
Birdwatching and relating issues	$0	91.8%	91.0%	90.4%	91.2%
	Less than $250	7.6%	7.7%	7.9%	7.7%
	$250 to $999	0.6%	0.7%	1.4%	0.9%
	$1000 to $2499	0.0%	0.2%	0.0%	0.1%
	$2500 to $4999	0.0%	0.2%	0.0%	0.1%
	$5000 to $9999	0.0%	0.0%	0.0%	0.0%
	$10,000 or more	0.0%	0.0%	0.3%	0.1%
	Valid N	330	402	633	1353

Table 8.5e Donations to waterfowl hunting and hunting related issues

		Flyway substrata			Flyway Central
		Lower Central	Middle Central	Upper Central	
Waterfowl hunting and hunting related issues	$0	36.1%	33.7%	40.0%	36.5%
	Less than $250	40.8%	42.5%	41.9%	41.6%
	$250 to $999	16.3%	15.8%	14.2%	15.5%
	$1000 to $2499	4.9%	6.1%	2.8%	4.6%
	$2500 to $4999	1.1%	0.5%	1.0%	0.9%
	$5000 to $9999	0.0%	0.7%	0.0%	0.2%
	$10,000 or more	0.8%	0.5%	0.3%	0.6%
	Valid N	368	442	675	1484

Table 8.6 Money spent on wetlands management on private lands in past 12 months

		Flyway substrata			Flyway
		Lower Central	Middle Central	Upper Central	Central
In the past 12 months did you personally spend money for wetlands management on private lands?	No	77.4%	79.5%	87.7%	81.0%
	Yes	10.2%	8.3%	4.2%	7.9%
	Yes, but I'd rather not say how much	12.4%	12.2%	8.1%	11.1%
Amount?	Median	600.0	500.0	1,000.0	600.0
	Valid N	378	452	685	1517
Spent money-Y/N significance:		χ^2 (4) = 25.21*		Cramer's V = .09*	
Amount significance:		F (2, 92) = 0.73		η^2= .01	

Section 9. Respondent Characteristics

Respondents answered a series of sociodemographic questions regarding race, ethnicity, gender, age, education, profession, rural land ownership, urban/rural residence, urban/rural upbringing, income, and state of residence. Respondents were largely white (97-99%; Tables 9.1, 9.1a), non-Hispanic (97-99%, Table 9.2), and male (94-97%; Table 9.3). There were some significant but small differences between the flyway substrata.

After removing any respondents under the age of 18, the average age of respondents was 48 years old, with no differences between the substrata (Table 9.4). Around half of respondents reported graduate or professional-level education or a Bachelor's degree (53-61%; Table 9.5), with significant but small differences between the substrata. Most respondents indicated that a nature related profession was not their primary source of personal income across substrata (79-92%), with significantly fewer reporting a nature related profession in the Lower (8%) than in the Middle (20%) or Upper Central (22%; Table 9.6). Across substrata, 33-56% made less than $75,000 per year in personal income, while 27% made more than $150,000 in the Lower Central, significantly more than either the Middle (11%) or Upper Central (9%; Table 9.7). Analyses indicate significantly higher incomes in the Lower Central substrata, with lower representation in the lower income brackets and higher representation in the higher income brackets than either the Upper or Middle Central substrata.

A majority of respondents did not own rural land (53-61%), and those that did owned an average of X acres to X acres. There were significant but small differences in rural land ownership between the substrata, with respondents in the Lower Central most likely to own land (47%) and respondents in the Upper Central least likely to own land (39%; Table 9.8). In the Lower substrata about half of respondents reported living in a medium or large urban area, with significantly more rural residents in the Upper and Middle Central (Upper: 30%, Middle: 24, and Lower: 14%; Table 9.9). Respondents also reported the population size of the area where they grew up, and respondents in the Lower Central were almost evenly distributed between the available responses, with a skew towards rural upbringing in the Middle and Upper Central (Upper: 44%, Middle: 28, and Lower: 17%; Table 9.10). Differences in residence and upbringing were statistically significant, and effect sizes suggest these differences were small.

Table 9.1 Percent reporting race

		Flyway substrata			Flyway
		Lower Central	Middle Central	Upper Central	Central
Race	American Indian/Native American	1.9%	5.1%	4.6%	4.3%
	Asian	.9%	1.1%	1.1%	1.1%
	Black or African American	.2%	.8%	.3%	.5%
	Native Hawaiian or Central Islander	.2%	.8%	.3%	.5%
	White	99.1%	96.8%	98.9%	98.3%
	Valid N	373	445	674	1495

Table 9.1a Race significance tests

		Chi-Square	df	Cramer's V
Race	American Indian/Native American	17.03*	2	.11*
	Asian	2.51	2	.04
	Black or African American	0.05	2	.01
	Native Hawaiian or Central Islander	2.23	2	.04
	White	4.10	2	.05

Table 9.2 Ethnicity

		Flyway Substrata			Flyway
		Lower Central	Middle Central	Upper Central	Central
Hispanic or Latino	Yes	2.9%	1.6%	.7%	1.9%
	No	97.1%	98.4%	99.3%	98.1%
	Valid N	372	446	672	1492
Significance:		χ^2 (2)= 7.72*		Cramer's V=.07*	

Table 9.3 Gender

		Flyway substrata			Flyway
		Lower Central	Middle Central	Upper Central	Central
Gender	Male	97.4%	96.8%	94.2%	96.3%
	Female	2.6%	3.2%	5.8%	3.7%
	Valid N	379	450	678	1512
Significance:		χ^2 (2) = 7.72*		Cramer's V= .07*	

Table 9.4 Age

		Flyway substrata			Flyway
		Lower Central	Middle Central	Upper Central	Central
Age	Mean	48	48	48	48
	SD	14.42	14.97	15.49	14.88
	Range	95	68	92	95
	Valid N	374	450	678	1504
Significance:		F (2, 1502)= 0.22		η^2=.00	

Table 9.5 Education

		Flyway substrata			Flyway
		Lower Central	Middle Central	Upper Central	Central
Level of education	Some high school or less	.6%	.4%	.5%	.5%
	High school diploma or GED	10.3%	12.1%	12.7%	11.5%
	Some college (no degree)	20.0%	20.7%	12.9%	18.1%
	Associate's degree (2 years)	8.4%	14.0%	17.2%	12.5%
	Bachelors degree (4 years)	38.6%	32.0%	36.7%	36.2%
	Graduate or professional school	22.1%	20.8%	20.0%	20.7%
	Valid N	373	442	670	1488
Significance:		χ^2 (10)= 30.36*		Cramer's V= .10*	

Table 9.6 Nature-related profession

		Flyway substrata			Flyway
		Lower Central	Middle Central	Upper Central	Central
Is a nature-related profession primary source of personal income?	Yes	8.2%	19.5%	21.5%	15.2%
	No	91.8%	80.5%	78.5%	84.8%
	Valid N	378	448	680	1509
Significance:		χ^2 (2)= 31.17*		Cramer's V= .14*	

Table 9.7 Income

		Flyway substrata			Flyway
		Lower Central	Middle Central	Upper Central	Central
Personal income	Less than $24,999	6.1%	8.2%	7.2%	7.0%
	$25,000 to $49,999	10.5%	18.4%	18.1%	14.9%
	$50,000 to $74,999	16.4%	28.9%	24.8%	22.3%
	$75,000 to $99,999	15.8%	16.4%	21.6%	17.6%
	$100,000 to $124,999	16.6%	11.5%	14.3%	14.5%
	$125,000 to $149,999	8.2%	5.3%	5.3%	6.5%
	$150,000 to $199,999	8.0%	5.5%	3.4%	6.0%
	$200,000 to $249,999	5.1%	2.0%	1.6%	3.2%
	$250,000 to $299,999	5.6%	1.6%	.8%	3.1%
	$300,000 or more	7.8%	2.2%	2.9%	4.8%
	Valid N	348	425	632	1405
Significance:		χ^2 (18)= 97.58*		Cramer's V=.19*	

Table 9.8 Rural land ownership

		Flyway substrata			Flyway
		Lower Central	Middle Central	Upper Central	Central
Do you own land in a rural area	Yes	47.1%	40.7%	39.3%	43.1%
	No	52.9%	59.3%	60.7%	56.9%
How many acres of rural land?	Mean				
	SD				
	Range				
	Valid N	373	450	681	1504
Own land Y/N significance:		χ^2 (2)= 6.16*		Cramer's V= .06*	
Acreage owned significance:		F (2,)=		η^2=	

Table 9.9 Urban vs Rural Residence

		Flyway substrata			Flyway
		Lower Central	Middle Central	Upper Central	Central
Where you live now	Large Urban area (500,000 or more)	33.7%	14.4%	1.6%	19.0%
	Medium Urban area (50,000 to 499,999)	22.0%	23.7%	29.4%	24.6%
	Small city (10,000 to 49,999)	16.8%	20.7%	23.1%	19.7%
	Small town (2,000 to 9,999)	14.1%	17.6%	15.8%	15.6%
	Rural area (less than 2,000)	13.5%	23.5%	30.1%	21.1%
Total	Respondents	373	450	681	1504
Significance:		χ^2 (8)= 224.28*		Cramer's V= .27*	

Table 9.10 Urban vs Rural Upbringing

		Flyway substrata			Flyway
		Lower Central	Middle Central	Upper Central	Central
Where you grew up	Large Urban area (500,000 or more)	21.4%	13.9%	5.0%	14.6%
	Medium Urban area (50,000 to 499,999)	20.5%	16.9%	14.7%	17.8%
	Small city (10,000 to 49,999)	20.6%	20.6%	20.3%	20.5%
	Small town (2,000 to 9,999)	20.1%	21.0%	16.1%	19.2%
	Rural area (less than 2,000)	17.3%	27.7%	43.9%	27.9%
	Valid N	372	440	667	1483
Significance:		χ^2 (8)= 122.19*		Cramer's V= .20*	

Section 10. Non-response Survey Summary

We developed a shortened, mail-out survey to assess differences between those who completed the NWHS online and those who did not (Appendix B). We mailed the non-response survey to 4,037 individuals in the Central Flyway (Upper Central = 1366, Middle Central = 1344, Lower Central = 1337) who did complete a survey online. A total of 483 (12.0%) returned a survey in the mail by May 31, 2017 (Upper Central = 204, Middle Central = 176, Lower Central = 103).

Non-respondents in the Central Flyway reported that they were slightly younger on average (16.5) than web survey respondents (20.0) when they began hunting waterfowl. Compared to web survey respondents (4.5%), a larger percentage of non-respondents indicated that they do not hunt either ducks or geese (15.5%). However, there were no substantive difference in the number of years in the past 5 or the number of days non-respondents and respondents reported hunting each year.

Similar percentages of non-respondents and respondents shared the circumstances under which they hunted and whether they took single or multiple-day hunting trips, and a majority of respondents and non-respondents reported hunting on public lands or waters. Non-respondents and respondents rated the importance of different species very similarly, with over 60% indicating mallards as very or extremely important.

Although, only about 10% of hunters who responded to the web survey indicated that would need to harvest 5 or more ducks a day to feel satisfied, almost 25% of non-respondents reported they needed to harvest 5 or more ducks to feel satisfied. However, respondents and non-respondents reported similar levels of acceptability of daily bag limits season lengths.

Slightly larger percentages of non-respondents perceived crowding, hunting pressure, interference from other hunters, conflict with other hunters and lack of public place to hunt to be sever or very severe problems. However, non-respondents and respondents reported very similar ratings of satisfaction with different characteristics of their hunting experiences and similar rating of priority for duck hunting regulations.

Non-respondents had similar mean scores as respondents on items measuring the centrality of waterfowl hunting to their personal lives. The gender, age, and ethnicity of respondents and non-respondents also were very similar, but non-respondents had slightly lower average education and income levels and tended to be more rural in residence.

Table 10.1 Age at first waterfowl hunt and general pursuits

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
How old were you when you started waterfowl hunting	Mean	20.8	16.8	14.1	16.5
	Median	16.0	15.0	12.0	14.0
	SD	13.82	8.63	6.78	10.30
	Valid N	75	160	158	393
Pursuits in waterfowl hunting	I hunt only ducks	43.9%	7.4%	4.7%	17.0%
	I hunt ducks and geese	42.7%	67.7%	72.6%	62.4%
	I hunt only geese	0.0%	8.5%	6.3%	5.2%
	I hunt neither ducks nor geese	13.4%	16.4%	16.3%	15.5%
	Valid N	82	189	190	461
Pursuits significance:		χ^2 (6) = 91.23***		Cramer's V = .32***	

Table 10.2 Years hunted waterfowl of previous 5

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
How many years of the last 5 years have you hunted waterfowl?	None	1.4%	2.5%	2.5%	2.2%
	1 Year	1.4%	0.0%	1.3%	0.7%
	2 Years	10.8%	9.2%	10.6%	10.0%
	3 Years	8.1%	10.4%	6.9%	8.7%
	4 Years	12.2%	11.7%	11.3%	11.5%
	5 Years	66.2%	66.3%	67.5%	66.8%
	Valid N	74	163	160	397
Significance:		χ^2 (10) = 3.92		Cramer's V= .07	

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Table 10.3 Average number of days per year hunting waterfowl

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Over the last five years, about how many days did you usually hunt waterfowl in a year?	5 days or less	32.9%	20.8%	29.3%	26.9%
	6 to 10 days	23.3%	25.2%	33.1%	26.9%
	11 to 20 days	27.4%	27.7%	19.1%	25.4%
	21 to 30 days	9.6%	6.9%	12.1%	9.4%
	More than 30 days	6.8%	19.5%	6.4%	11.4%
	Valid N	73	159	157	389
Significance:		χ^2 (8) = 24.5**		Cramer's V= .18**	

Table 10.4 Circumstances for hunting trip

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Under what circumstances do you typically go hunting?	When I plan the hunt myself	14.9%	18.6%	23.7%	18.7%
	When someone else invites me	20.3%	11.2%	10.3%	13.4%
	Both when I plan the hunt or someone else invites me	64.9%	70.2%	66.0%	67.8%
	Valid N	74	161	156	391
Significance:	χ^2 (4) = 6.92		Cramer's V= .09		

Table 10.5 Hunting trips primarily day trips or overnight trips

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Do you primarily take day trips or overnight/multi-day trips when you waterfowl hunt?	Primarily day trips	65.8%	76.4%	71.2%	71.9%
	Primarily overnight or multi-day trips	11.0%	6.4%	11.8%	9.3%
	Both about equally	23.3%	17.2%	17.0%	18.8%
	Valid N	73	157	153	383
Significance:	χ^2 (4)= 4.70		Cramer's V= .08		

Table 10.6 Public vs private lands waterfowl hunting

Please indicate where you do most of your waterfowl hunting:	Flyway substrata: Lower Central	Flyway substrata: Middle Central	Flyway substrata: Upper Central	Flyway ID: Central
Public lands or waters	35.7%	35.8%	32.7%	34.4%
Private property owned by you, your family or in partnership with someone else	20.0%	14.6%	21.1%	18.3%
Private property owned by a friend or another landowner who give you permission to hunt for free	20.0%	33.1%	46.3%	33.6%
Private property you lease or pay to hunt on	24.3%	16.6%	0.0%	13.7%
Valid N	70	151	147	368
Significance:	χ^2 (8)= 42.23***	Cramer's V= .24***		

Table 10.7 Minimum number of ducks harvested per day to feel satisfied

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Minimum number of ducks you have to harvest in a day to feel satisfied?	0	4.3%	20.9%	17.1%	14.4%
	1	4.3%	9.2%	11.8%	8.9%
	2	15.7%	16.3%	16.4%	15.7%
	3	22.9%	19.6%	22.4%	22.0%
	4	10.0%	15.0%	15.1%	13.6%
	5	22.9%	12.4%	14.5%	16.0%
	6	14.3%	2.6%	0.7%	5.2%
	7	1.4%	0.7%	0.7%	0.8%
	>7	4.3%	3.3%	1.3%	3.1%
	Valid N	70	153	152	375
Significance:		χ^2 (16)= 42.03***		Cramer's V= .24***	

Table 10.8 Smallest acceptable daily bag limit of ducks

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
What is the smallest daily bag limit you would accept before you would no longer hunt?	1 duck	6.8%	7.9%	5.4%	6.6%
	2 ducks	5.5%	10.6%	12.2%	9.3%
	3 ducks	23.3%	23.2%	20.3%	22.3%
	4 ducks	19.2%	11.3%	12.8%	14.4%
	5 ducks	13.7%	7.3%	7.4%	9.6%
	6 ducks	12.3%	4.0%	3.4%	6.1%
	I'll hunt with any size daily bag limit	19.2%	35.8%	38.5%	31.6%
	Valid N	73	151	148	372
Significance:		χ^2 (12)= 22.36*		Cramer's V= .17*	

Table 10.9 Minimum acceptable number of days for duck hunting

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
What is the minimum number of days in a waterfowl hunting season you would accept before you would no longer hunt?	10 days	1.4%	5.3%	4.8%	4.0%
	15 days	0.0%	0.7%	0.0%	0.3%
	20 days	8.3%	6.0%	3.4%	5.6%
	25 days	0.0%	3.3%	2.0%	1.9%
	30 days	6.9%	13.3%	8.2%	9.6%
	35 days	2.8%	0.7%	3.4%	2.4%
	40 days	6.9%	6.7%	5.4%	6.6%
	45 days	11.1%	4.7%	4.1%	6.6%
	50 days	6.9%	4.7%	0.7%	4.0%
	55 days	0.0%	0.7%	0.7%	0.5%
	60 days	13.9%	12.7%	13.6%	13.0%
	I'll hunt with any season length	41.7%	41.3%	53.7%	45.5%
	Valid N	72	150	147	369
Significance:		χ^2 (22)= 28.37		Cramer's V= .20	

Table 10.10 Importance of hunting species in Central

	Flyway substrata									Flyway ID		
	Lower Central			Middle Central			Upper Central			Central		
	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N
Diving ducks	3.0	1.37	72	2.3	1.29	147	2.2	1.22	147	2.5	1.34	366
Mallards	3.8	1.20	72	4.0	1.25	153	3.9	1.14	154	3.9	1.19	379
Pintails	3.8	1.17	70	3.2	1.38	148	2.9	1.26	147	3.3	1.32	365
Other dabbling ducks	3.9	1.09	72	3.4	1.34	148	2.9	1.25	145	3.4	1.30	365
Geese	2.7	1.35	66	3.9	1.15	155	3.7	1.12	155	3.5	1.29	376

Scale from 1=Not at all important to 5=Extremely important

Table 10.10a Importance of hunting species in Central Flyway response distribution

	Response					
Item	Not at all important	Slightly important	Moderately Important	Very important	Extremely important	Valid N
Diving ducks	31.4%	20.6%	23.3%	14.5%	10.2%	366
Mallards	6.8%	4.9%	21.4%	25.8%	41.1%	379
Pintails	13.4%	12.9%	28.2%	22.3%	23.1%	365
Other dabbling ducks	12.7%	9.2%	28.6%	25.1%	24.5%	365
Geese	10.3%	11.6%	24.3%	25.4%	28.3%	376

Table 10.11 Perceptions of problems with crowding, hunting pressure, interference, and conflict

	Flyway substrata									Flyway ID		
	Lower Central			Middle Central			Upper Central			Central		
	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N
Crowding at hunting areas	2.6	1.52	70	2.6	1.35	147	2.1	1.01	151	2.4	1.31	368
Hunting pressure	2.6	1.55	72	2.7	1.27	149	2.2	1.07	152	2.5	1.31	373
Interference from other hunters	2.2	1.33	72	2.4	1.25	152	2.1	0.99	151	2.3	1.22	375
Conflict with other hunters in places I hunt	1.8	1.10	72	2.1	1.06	152	1.9	1.06	152	2.0	1.11	376
Lack of public places for waterfowl hunting	2.8	1.68	63	3.1	1.50	148	2.2	1.27	148	2.7	1.52	359

Scale from 1=Not at all a problem, 2 = Slight problem, 3 = Moderate Problem, 4 = Severe Problem, 5=Very severe problem

Table 10.11a Perceptions of problems with crowding, hunting pressure, interference and conflict (Flyway Level)

Item	Response					
	Not at all	Slight Problem	Moderate Problem	Severe Problem	Very Severe Problem	Valid N
Crowding at hunting areas	30.9%	27.2%	21.2%	9.7%	11.0%	368
Hunting pressure	29.1%	24.3%	25.1%	10.3%	11.1%	373
Interference from other hunters	35.4%	27.0%	21.3%	10.0%	6.3%	375
Conflict with other hunters in places I hunt	48.0%	22.5%	19.8%	6.3%	3.4%	376
Lack of public places for waterfowl hunting	34.6%	13.3%	22.2%	10.2%	19.7%	359

Table 10.12 Satisfaction with hunting in most hunted state

	Flyway substrata									Flyway ID		
	Lower Central			Middle Central			Upper Central			Central		
	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N	Mean	SD	Valid N
The number of ducks you see during the season	3.3	1.23	73	3.1	1.14	151	3.8	1.10	150	3.4	1.19	374
The number of ducks you harvest during the season	3.4	1.10	74	3.0	1.11	152	3.7	1.00	147	3.4	1.11	373
The number of days in the duck season	3.6	1.08	74	3.2	1.12	152	3.9	1.14	150	3.6	1.14	376
The number of ducks in the daily limit	3.7	1.15	73	3.8	1.08	151	4.1	1.02	149	3.9	1.08	373
Your overall hunting experience	4.0	0.93	73	3.7	1.06	150	4.2	0.91	149	4.0	0.98	372
The number of ducks typically present during the hunting season	3.2	1.17	72	3.0	1.15	148	3.8	1.07	148	3.3	1.19	368
Quality of the habitat where you hunt	3.6	1.10	74	3.5	1.02	154	3.9	1.03	148	3.7	1.05	376

Scale from 1=Very dissatisfied to 5=Very satisfied

Table 10.12a Satisfaction with hunting response distribution (Flyway level)

Item	Response: Very dissatisfied	Somewhat dissatisfied	Neutral	Somewhat satisfied	Very satisfied	Valid N
The number of ducks you see during the season	5.8%	22.4%	20.3%	32.1%	19.5%	374
The number of ducks you harvest during the season	5.5%	17.9%	28.2%	32.9%	15.5%	373
The number of days in the duck season	4.2%	13.3%	32.1%	23.8%	26.6%	376
The number of ducks in the daily limit	2.1%	8.7%	28.2%	23.5%	37.5%	373
The number of ducks typically present during the hunting season	6.1%	23.0%	21.7%	31.3%	17.9%	372
Quality of the habitat where you hunt	2.9%	13.3%	21.7%	39.9%	22.2%	368
Your overall duck hunting experience	2.1%	6.6%	17.9%	39.8%	33.5%	376

Table 10.13 Preferred agency priorities for duck hunting regulations

	Flyway substrata									Flyway ID		
	Upper Central			Middle Central			Lower Central			Central		
	Valid			Valid			Valid			Valid		
	Mean	N	SD	Mean	N	SD	Mean	N	SD	Mean	N	SD
Having the largest bag limits possible	2.65	151	.938	2.75	153	1.061	3.05	73	.990	2.76	377	1.007
Having the longest seasons possible	3.14	151	1.034	3.38	153	1.076	3.42	73	.987	3.29	377	1.047
Avoiding different season lengths for different duck species	3.40	149	1.174	3.39	149	1.169	3.64	72	1.124	3.44	370	1.164
Reducing the number of species-specific bag limits	2.92	148	.935	2.76	150	.909	3.11	72	1.047	2.89	370	.954
Having the largest drake mallard bag limits possible	3.03	151	1.007	3.18	151	1.095	3.07	73	1.032	3.10	375	1.048

Scale from 1=very low, 2 = low, 3 = moderate, 4 = high, 5=very high priority

Table 10.13a Preferred agency priorities for duck hunting regulations response distribution (Flyway level distribution)

	Response					
Item	Very low	Low	Moderate	High	Very high	Valid N
Having the largest bag limits possible	11.3%	22.3%	47.6%	12.0%	6.8%	377
Having the longest seasons possible	6.8%	8.4%	45.0%	25.1%	14.7%	377
Avoiding different season lengths for different duck species	6.9%	9.6%	37.0%	22.9%	23.7%	370
Reducing the number of species-specific bag limits	9.0%	18.9%	50.0%	16.5%	5.6%	370
Having the largest drake mallard bag limits possible	9.2%	12.6%	46.9%	21.2%	10.2%	375

Table 10.14 Centrality of waterfowl hunting

	Flyway substrata									Flyway ID		
	Upper Central			Middle Central			Lower Central			Central		
	Mean	Valid N	SD	Mean	Valid N	SD	Mean	SD	Valid N	Mean	Valid N	SD
Waterfowl hunting is one of the most enjoyable activities I do	3.81	155	.917	4.14	160	.902	4.01	74	1.016	3.99	389	.940
Most of my friends are in some way connected with waterfowl hunting	3.31	155	.991	3.38	158	1.124	3.34	73	1.184	3.35	386	1.082
Waterfowl hunting has a central role in my life	3.12	153	1.054	3.37	160	1.078	3.22	74	1.131	3.24	387	1.082
A lot of my life is organized around waterfowl hunting	2.72	155	1.089	3.05	159	1.141	2.99	73	1.140	2.91	387	1.128
If I couldn't go waterfowl hunting I am not sure what I would do instead	2.62	154	1.122	2.78	160	1.276	2.55	73	1.240	2.67	387	1.211

Scale from 1=Strongly disagree to 5=Strongly agree

Table 10.15 Nature Based Recreation

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Spending time in nature away from home	%	85.9%	90.0%	84.7%	87.0%
	Valid N	85	190	190	465
Viewing wildlife	%	73.3%	77.8%	80.5%	77.1%
	Valid N	85	190	190	465
Learning about nature	%	34.1%	42.9%	36.8%	38.5%
	Valid N	85	190	190	465
Backyard/at home nature activities	%	87.1%	88.8%	88.9%	88.2
	Valid N	85	190	190	465
Fishing	%	96.5%	89.4%	92.1%	92.3
	Valid N	85	190	190	465
Hunting migratory birds other than waterfowl	%	88.4%	71.4%	47.1%	68.5%
	Valid N	85	190	190	465
Hunter other game birds	%	34.9%	70.9%	90.5%	66.6%
	Valid N	85	190	190	465
Hunting any other game animals	%	85.9%	77.7%	86.8%	83.0%
	Valid N	85	190	190	465

Table 10.16 Wild Bird Activities

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Watching birds at my home	%	74.1%	73.0%	72.1%	73.0%
	Valid N	85	190	190	465
Feeding birds at my home	%	54.1%	51.9%	53.4%	52.9%
	Valid N	85	190	190	465
Watching birds away from my home	%	50.0%	62.2%	62.4%	58.7%
	Valid N	85	190	190	465
Photographing or filming birds	%	20.0%	21.7%	20.1%	20.6%
	Valid N	85	190	190	465
Counting/monitoring birds	%	17.6%	11.2%	12.8%	13.7%
	Valid N	85	190	190	465
Keeping track of the birds you see on a list	%	3.5%	6.9%	4.7%	5.1%
	Valid N	85	190	190	465
Installing or maintaining next boxes for birds	%	28.2%	24.6%	23.8%	25.3%
	Valid N	85	190	190	465

Table 10.17 Gender

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Gender	Male	98.8%	97.3%	98.4%	98.3%
	Female	1.2%	2.7%	1.6%	1.7%
	Valid N	86	188	189	463
Significance:		χ^2 (2) = .91		Cramer's V= .04	

Table 10.18 Age

	Flyway substrata			Flyway ID
	Lower Central	Middle Central	Upper Central	Central
Mean	48.0	50.5	51.4	50.4
Median	49.0	53.0	55.0	53.0
SD	17.15	15.23	17.51	16.57
Valid N	85	186	189	460

Table 10.19 Education

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Level of education	Some high school or less	2.4%	3.8%	3.2%	3.3%
	High school diploma or GED	17.9%	19.4%	24.5%	20.7%
	Some college (no degree)	22.6%	21.0%	22.3%	21.8%
	Associate's degree (2 years)	11.9%	12.4%	16.5%	13.5%
	Bachelor's degree (4 years)	29.8%	26.3%	18.6%	24.8%
	Graduate or professional school	15.5%	17.2%	14.9%	15.9%
	Valid N	84	186	188	458
Significance:		χ^2 (10)= 7.8		Cramer's V= .09	

Table 10.20 Urban vs Rural Residence

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Where you live now	Large Urban area (500,000 or more)	22.0%	12.6%	0.5%	11.4%
	Medium Urban area (50,000 to 499,999)	15.9%	18.0%	23.8%	19.3%
	Small city (10,000 to 49,999)	20.7%	15.3%	16.4%	17.1%
	Small town (2,000 to 9,999)	23.2%	24.0%	12.7%	20.0%
	Rural area (less than 2,000)	18.3%	30.1%	46.6%	32.2%
	Valid N	82	183	189	454
Significance:		χ^2 (8)= 57.66***		Cramer's V= .25***	

Table 10.21 Rural land ownership

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Do you own land in a rural area	Yes	52.4%	47.6%	47.4%	49.2%
	No	47.6%	52.4%	52.6%	50.8%
	Valid N	84	185	190	459
Own land Y/N significance:		χ^2 (2)= .67		Cramer's V= .04	

Table 10.22 Income

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Personal income	Less than $24,999	11.3%	13.1%	12.9%	12.6%
	$25,000 to $49,999	22.5%	20.8%	28.1%	23.5%
	$50,000 to $74,999	13.8%	29.2%	24.0%	22.6%
	$75,000 to $99,999	13.8%	11.3%	12.9%	13.1%
	$100,000 to $149,999	18.8%	14.3%	13.5%	15.9%
	$150,000 to $199,999	6.3%	3.6%	5.8%	5.0%
	$200,000 to $249,999	6.3%	3.0%	0.6%	2.9%
	$250,000 to $299,999	1.3%	0.0%	1.2%	0.7%
	$300,000 or more	6.3%	4.8%	1.2%	3.8%
	Valid N	80	168	171	419
Significance:		χ^2 (18)= 23.85		Cramer's V=.17	

Table 10.23 Percent reporting race

		Flyway substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Race	American Indian/Native American	2.4%	2.6%	1.6%	2.5%
	Asian	0.0%	0.5%	0.5%	0.7%
	Black or African American	1.2%	0.0%	0.0%	0.2%
	Native Hawaiian or Pacific Islander	0.0%	0.0%	0.0%	0.0%
	White	95.3%	91.8%	96.9%	94.3%
	Valid N	85	194	193	472

Table 10.24 Ethnicity

		Flyway Substrata			Flyway ID
		Lower Central	Middle Central	Upper Central	Central
Hispanic or Latino	Yes	3.8%	2.8%	1.1%	2.7%
	No	96.2%	97.2%	98.9%	97.3%
	Valid N	79	176	182	437
Significance:		χ^2 (2)= 2.2		Cramer's V=.07	

Table 10.25 Percent reporting reason for not completing survey online

	Flyway substrata			Flyway ID
	Lower Central	Middle Central	Upper Central	Central
I didn't receive the invitation in the mail	5.8%	5.7%	4.1%	5.1%
I don't have access to the internet	11.6%	19.1%	17.6%	16.5%
I have internet access, but couldn't open the website	10.6%	12.9%	13.5%	12.2%
I didn't have time to complete the study earlier	42.4%	40.2%	35.8%	39.7%
I don't like to answer questions online	31.4%	23.7%	32.6%	28.7%
I don't hunt ducks or geese	7.1%	7.3%	6.2%	6.8%
I didn't think the survey applied to me	10.6%	6.2%	7.3%	7.6%
Valid N	85	194	193	472

References

Adamowicz, W. J. Louviere, and M. Williams. (1994). Combining revealed and stated preference methods for valuing environmental amenities. Journal of environmental economics and management, 26(3): 271-292.

Ajzen, I., & M. Fishbein. (1980). Understanding attitudes and predicting social behavior. Prentice-Hall, Englewood Cliffs, NJ.

Dillman, D. A., J. D. Smyth, and L.M. Christian. (2014). Internet, phone, mail, and mixed-mode surveys: The tailored design method. John Wiley & Sons, Hoboken, NJ.

Harshaw, H.W. and D.B. Tindall. (2005). Social structure, identities, and values: A network approach to understanding people's relationships to forests. Journal of Leisure Research 37 (4), 426.

Lin, N., Fu, Y., & Hsung, R.-M. (2001). The position generator: Measurement techniques for investigations of social capital. In N. Lin & K. Cook & R. R. Burt (Eds.), Social Capital: Theory and research (pp. 57-81). New York: Aldine de Gruyter.

Louviere, J., D. Hensher, and J. Swait. (2000). Stated choice methods: analysis and applications. Cambridge University Press, NY.

McFadden, D. (1981). Econometric models of probabilistic choice. Pages 198-272 in C. F. Manski, and D. McFadden, editors. Structural analysis of discrete choice with econometric applications. MIT Press, Cambridge, Massachusetts, USA.

National Flyway Council and Wildlife Management Institute. 2006. National Duck Hunter Survey 2005—National Report

Oh, C.O., R.B. Ditton, B. Gentner, and R. Riechers. (2005). A stated preference choice approach to understanding angler preferences for management options. Human Dimensions of Wildlife 10: 173-186.

Orme, B.K. (2014). Getting started with conjoint analysis: strategies for product design and pricing research. Manhattan Beach, CA: Research Publishers, LLC.

Raftovich, R.V., S. C. Chandler, and K.A. Wilkins. (2015). Migratory bird hunting activity and harvest during the 2013-14 and 2014-15 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland, USA.

Appendices

Appendix A. Survey Instrument

Please Refer to separate appendix document.

Appendix B. Non-response Survey

<IDNUM> National Waterfowl Hunter Survey

1. Which of the following statements best describes your pursuits in waterfowl hunting? (Check only one)
   - ❒ I hunt only ducks
   - ❒ I hunt ducks and geese
   - ❒ I hunt only geese
   - ❒ I hunt neither ducks nor geese →***GO TO QUESTION 17***

2. How old were you when you started waterfowl hunting? _____ Age (write in number)

3. How many of the last 5 years have you hunted WATERFOWL? (Circle one number below or check the box for "0")

1 2 3 4 5 Years ❒ **0 (None) → *GO TO QUESTION 17***

4. Over the last five years, about how many days did you usually hunt WATERFOWL in a year? (Check only one)
   - ❒ 5 days or less
   - ❒ 6 to 10 days
   - ❒ 11 to 20 days
   - ❒ 21 to 30 days
   - ❒ More than 30 days

5. Under what circumstances do you typically go hunting? (Check only one).
   - ❒ When I plan the hunt myself
   - ❒ When someone else invites me
   - ❒ Both when I plan the hunt or someone else invites me

6. In which state/province have you hunted ducks most over the last 5 years?_____

7. How important is it to you to hunt the following: (Check one box for each)

	Not at all important	Slightly important	Moderately important	Very important	Extremely important
Diving ducks (scaup/bluebills, canvasback, redheads, etc.)	❒	❒	❒	❒	❒
Mallards	❒	❒	❒	❒	❒
Pintails	❒	❒	❒	❒	❒
Other dabbling ducks (teal, wood ducks, gadwall, etc.)	❒	❒	❒	❒	❒
Geese	❒	❒	❒	❒	❒

8. Please indicate how much of a problem the following are in the state where you hunt ducks most. (Check one box for each)

	Not at all	Slight Problem	Moderate Problem	Severe Problem	Very Severe Problem	Don't Know
a. Crowding at hunting areas	❒	❒	❒	❒	❒	❒
b. Hunting pressure	❒	❒	❒	❒	❒	❒
c. Interference from other hunters	❒	❒	❒	❒	❒	❒
d. Conflict with other hunters in places I hunt	❒	❒	❒	❒	❒	❒
e. Lack of public places for waterfowl hunting	❒	❒	❒	❒	❒	❒

9. In the state where you hunt ducks most often, how satisfied or dissatisfied are you with: (Check one box for each)

	Very Satisfied	Somewhat Satisfied	Neutral	Somewhat Dissatisfied	Very Dissatisfied
a. The number of ducks you see during the season	❒	❒	❒	❒	❒
b. Number of ducks you harvest during the season	❒	❒	❒	❒	❒
c. The number of days in the duck season	❒	❒	❒	❒	❒
d. The number of ducks in the daily limit	❒	❒	❒	❒	❒
e. Your overall hunting experience	❒	❒	❒	❒	❒
f. The number of ducks typically present during the hunting season	❒	❒	❒	❒	❒
h. Quality of habitat where you hunt	❒	❒	❒	❒	❒

10. What is the minimum number of ducks you have to harvest in a day to feel satisfied with the hunt? (Circle one number)

0 1 2 3 4 5 6 7 More than 7 DUCKS

11. What is the smallest daily bag limit you would accept before you would no longer hunt ducks? (Circle one or check the box)

1 2 3 4 5 6 DUCKS or ❒ I'll hunt with any size daily bag limit

12. What is the minimum number of days in a waterfowl hunting season you would accept before you would no longer hunt ducks? (Circle one below or check the box)

10 15 20 25 30 35 40 45 50 55 60 Days

or ❒ I'll hunt with any season length

13. Do you primarily take day trips or overnight/multi-day trips when you waterfowl hunt? (Check only one)

❒ Primarily day trips ❒ Primarily overnight or multi-day trips ❒ Both about equally

14. Please indicate where you do most of your waterfowl hunting? (Check only one).

- ❒ Public land or waters
- ❒ Private property owned by you, your family or in partnership with someone else
- ❒ Private property owned by a friend or another landowner who gives you permission to hunt for free
- ❒ Private property you lease or pay to hunt on

15. How much priority should state and federal agencies give the following when setting annual duck hunting regulations? (Please rate the priority of each by checking a box).

	Very Low	Low	Moderate	High	Very High
Having the largest bag limits possible	❒	❒	❒	❒	❒
Having the longest seasons possible	❒	❒	❒	❒	❒
Avoiding different season lengths for different duck species	❒	❒	❒	❒	❒
Maintaining unique hunting traditions (e.g., diving duck hunting)	❒	❒	❒	❒	❒
Reducing the number of species-specific bag limits	❒	❒	❒	❒	❒
Having as large of mallard drake bag limits as possible	❒	❒	❒	❒	❒

16. We are interested in knowing how much waterfowl hunting means to you. Please indicate how much you disagree or agree with the following statements about your involvement in waterfowl hunting. (Check one for each)

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. Waterfowl hunting is one of the most enjoyable activities I do	❒	❒	❒	❒	❒
b. Most of my friends are in some way connected with waterfowl hunting	❒	❒	❒	❒	❒
c. Waterfowl hunting has a central role in my life	❒	❒	❒	❒	❒
d. A lot of my life is organized around waterfowl hunting	❒	❒	❒	❒	❒
e. If I couldn't go waterfowl hunting I am not sure what I would do instead	❒	❒	❒	❒	❒

17. A person can think of themselves in a variety of ways. On a scale of "1" to "7", where "1" is "not at all" and "7" is "completely", how much would you identify yourself as the following?

	Not at all			Moderately			Completely
Birdwatcher	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Duck Hunter	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Goose Hunter	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Other hunter	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Conservationist	**1**	**2**	**3**	**4**	**5**	**6**	**7**

18. In the last 12 months, have you participated in the following nature-based activities? *Please check Yes or No for each.*

❒ Yes	❒ No	Spending time in nature away from home (e.g., picnicking, relaxing in nature, camping, hiking)
❒ Yes	❒ No	Viewing wildlife (e.g., wildlife watching, bird watching, bird feeding, wildlife photography)
❒ Yes	❒ No	Learning about nature (e.g., attending festivals or lectures, visiting a nature center)
❒ Yes	❒ No	Backyard/at-home nature activities (e.g., gardening, landscaping)
❒ Yes	❒ No	Fishing
❒ Yes	❒ No	Hunting other migratory birds (doves, woodcock, rail, etc.)
❒ Yes	❒ No	Hunting other game birds (grouse, pheasants)
❒ Yes	❒ No	Hunting all other game animals (deer, elk, rabbit, etc.)
❒ Yes	❒ No	Watching birds at my home
❒ Yes	❒ No	Feeding birds at my home
❒ Yes	❒ No	Watching birds away from my home
❒ Yes	❒ No	Photographing or filming birds
❒ Yes	❒ No	Counting/monitoring birds (e.g. Christmas or Backyard Bird Count)
❒ Yes	❒ No	Recording the birds you see on a list, online or on paper
❒ Yes	❒ No	Installing or maintaining nest boxes for birds

About You To help us compare your responses to those of others, we have some questions about you. Please be assured that all of your answers will remain completely confidential.

19. In what year were you born? 19_____

20. Are you…? ❒ Male ❒ Female

21. What is the highest level of education you have completed? (*Check one).*

- ❒ Some high school or less
- ❒ High school diploma or GED
- ❒ Some college (no degree)
- ❒ Associate's degree (2 years)
- ❒ Bachelor's degree (4 years)
- ❒ Graduate or professional school

22. Do you own land in a rural area (outside of an urban or suburban area)?

❒ No ❒ Yes → **If YES how many acres do you own in total _____ACRES**

23. Which of these categories best describes the place where you live now? (*Check one*)

- ❒ Large urban area (population of 500,000 or more)
- ❒ Medium urban area (population between 50,000 and 499,999)
- ❒ Small city (population between 10,000 and 49,999)
- ❒ Small town (population between 2,000 and 9,999)
- ❒ Rural area (population less than 2,000)

24. Please indicate which of the following categories applies to your personal income for the last 12 months? *(Check one).*

- ❒ Less than $24,999
- ❒ $25,000-$49,999
- ❒ $50,000-$74,999
- ❒ $75,000-$99,999
- ❒ $100,000-$149,999
- ❒ $150,000-$199,999
- ❒ $200,000-$249,999
- ❒ $250,000-$299,999
- ❒ $300,000 or more

25. What ethnicity do you consider yourself? (*Check one).*

- ❒ Hispanic or Latino
- ❒ Not Hispanic or Latino

26. From what racial origin(s) do you consider yourself? (*Please <u>check all that apply</u>).*

- ❒ American Indian or Alaskan Native
- ❒ Asian
- ❒ Black or African American
- ❒ Native Hawaiian or other Pacific Islander
- ❒ White

27. Please let us know why you chose not to complete the survey online earlier? *(Check <u>all that apply</u>)*

- ❒ I didn't receive the invitation in the mail
- ❒ I don't have access to the internet
- ❒ I have internet access, but couldn't open the website
- ❒ I didn't have time to complete the study earlier
- ❒ I don't like to answer questions online
- ❒ I don't hunt ducks or geese
- ❒ I didn't think the survey applied to me

Appendix C. Contact Letters

November , 2016

<FirstName> <LastName>
<Address>
<City> <State> <Zip>

Dear <Name>,

We are contacting you to participate in a national study about waterfowl hunting and management. We are working in close collaboration with the **<Agency>** to complete this study. We are coordinating the study at the University of Minnesota for your state and the National Flyway Council (NFC). We are contacting you because you purchased a license to hunt migratory waterfowl in **<Homestate>**, and we believe you have a very important point-of-view to share about waterfowl hunting and management.

To simplify the survey process, the survey is designed to be completed online. To complete the survey, please go to the secure website: **https://duckhuntersurvey.org/login.html**

Because it is a secure website, you will need to enter the survey website address in your web browser (Internet Explorer, Mozilla Firefox, Safari, Chrome). Typically you will enter this address in the web address bar located in the upper left corner of your web browser screen. You CANNOT get to the survey website by searching for it on a search engine such as Google or Yahoo.

To start the survey, enter the following **Access Code**: **«Password»**

It is important to note that your survey code is unique and cannot be used more than once. If you have trouble getting to the web address please e-mail us at: **umn.duckhunter@gmail.com** and we will forward a link to the survey website.

The survey will take about 20 minutes to complete and we greatly appreciate your time and effort. Your participation and responses are very important because they will help guide waterfowl management into the future. Participation in this study is voluntary. If you decide to participate, you are free to not answer any question on the survey. We will treat your involvement in this study with confidentiality, and the records of this study will be kept private and secure.

Please contact us if you have any questions after reading this letter. Please e-mail us at **umn.duckhunter@gmail.com** or call **612-625-3718** if you have any questions. Thank you very much for helping us with this important study!

Regards,

State Logos in Text Box Here

December, 2016

<FirstName> <LastName>
<Address>
<City> <State> <Zip>

2nd ltr

Dear <Name>,

We contacted you about 10 days ago to participate in a national study of waterfowl hunters. We are working in close collaboration with the **<Agency>** to complete this study and contacting you because you purchased a license to hunt migratory waterfowl in **<Homestate>**. We believe you have a very important point-of-view to share about waterfowl hunting and management. If you have not already completed the survey, we ask that you do so now.

To simplify the survey process, the survey is designed to be completed online. To complete the survey, please go to the secure website: **https://duckhuntersurvey.org/login.html**

Because it is a secure website, you will need to enter the survey website address in your web browser (Internet Explorer, Mozilla Firefox, Safari, Chrome). Typically you will enter this address in the web address bar located in the upper left corner of your web browser screen. You CANNOT get to the survey website by searching for it on a search engine such as Google or Yahoo.

To start the survey, enter the following **Access Code**: **«Password»**

It is important to note that your survey code is unique and cannot be used more than once. If you have trouble getting to the web address please e-mail us at: **umn.duckhunter@gmail.com** and we will forward a link to the survey website.

The survey will take about 20 minutes to complete and we greatly appreciate your time and effort. Your participation and responses are very important because they will help guide waterfowl management into the future. Participation in this study is voluntary. We will treat your involvement in this study with confidentiality, and the records of this study will be kept private and secure.

Please contact us if you have any questions after reading this letter. Please e-mail us at **umn.duckhunter@gmail.com** or call **612-625-3718** if you have any questions. Thank you very much for helping us with this important study!

Regards,

Insert State Logos in Text Box Here

January, 2017

<FirstName> <LastName>
<Address>
<City> <State> <Zip>

3RD ltr

Dear <Name>,

About one month ago, we sent you a request to participate in a web-based nationwide study of waterfowl hunters. To the best of our knowledge we have not yet received a response from you. We are working in close collaboration with the **<**Agency**>** to complete this study. If you have not already completed the survey, we ask that you do so now.

The survey is designed to be completed online, and you can use a computer, tablet or smartphone. The following address should take you to a secure website:

https://duckhuntersurvey.org/login.html

Because it is a secure website, you will need to enter the survey website address in your web browser (Internet Explorer, Mozilla Firefox, Safari, Chrome). Typically you will enter this address in the web address bar located in the upper left corner of your web browser screen. You CANNOT get to the survey website by searching for it on a search engine such as Google or Yahoo.

To start the survey, enter the following **Access Code**: **«Password»**

It is important to note that your survey code is unique and cannot be used more than once. If you have trouble getting to the web address please e-mail us at: **umn.duckhunter@gmail.com** and we will forward a link to the survey website.

The survey will take about 20 minutes to complete and we greatly appreciate your time and effort. Your participation and responses are very important because they will help guide waterfowl management into the future. Participation in this study is voluntary. We will treat your involvement in this study with confidentiality, and the records of this study will be kept private and secure.

Please contact us if you have any questions after reading this letter. Please e-mail us at **umn.duckhunter@gmail.com** or call **612-625-3718** if you have any questions. Thank you very much for helping us with this important study!

Regards,

February 10, 2017

<FirstName> <LastName>
<Address>
<City> <State> <Zip>

Dear <Name>,

During the past couple of months, we contacted you to participate in a web-based nationwide study of waterfowl hunters. We are working in close collaboration with the **<Agency>** to complete this study. To the best of our knowledge we have not yet received a response from you. If you have not already completed the survey online, we ask that you do so now if at all possible.

We really want to include you in the online study if possible and are interested in your responses even if you have not hunted in a few years.

The survey is designed to be completed online, and you can use a computer, tablet or smartphone. The following address **https://duckhuntersurvey.org/login.html** will take you to the website.

To start the survey, enter the following **Access Code**: **<PASSWORD>**

You will need to enter the survey website address in your web browser (Internet Explorer, Mozilla Firefox, Safari, Chrome). Typically you will enter this address in the web address bar located in the upper left corner of your web browser screen. You CANNOT get to the survey website by searching for it on a search engine such as Google or Yahoo.

If you have trouble getting to the web address please e-mail us at: umnwild1@umn.edu and we will forward a link to the survey website.

The survey will take about 20 minutes to complete and we greatly appreciate your time and effort. Thank you so much for helping us with this important study!

Regards,

PS: If you cannot get access to the internet, we will be following up with a short mail survey in about 1 month.

March 31, 2017

<FirstName> <LastName>
<Address>
<City> <State> <Zip>

<idcode>

Dear <FirstName>,

During the past winter, we contacted you to participate in a web-based nationwide study of waterfowl hunters. We are working in close collaboration with the **<Agency>** to complete this study.

To the best of our knowledge you did not complete the survey online. We really want to include you in the study if possible. We have enclosed a shortened copy of the survey that you can complete and mail back to us in the enclosed postage paid envelope. We are interested in your responses regardless of how much you waterfowl hunt or even if you have not hunted in a few years.

The findings from this study will be used to help plan and manage for waterfowl across North America. Hearing from hunters like you is important to helping improve hunter experiences in the future.

The survey will take about 10 minutes to complete and we greatly appreciate your time and effort. The study is voluntary and all your responses will be kept confidential.

Thank you so much for helping us with this important study!

Regards,

Sue Schroeder, Research Associate

Appendix D. Institutional Review Board Determination

UNIVERSITY OF MINNESOTA

DETERMINATION OF HUMAN SUBJECT RESEARCH

Version 1.2

Updated June 2014, check http://www.irb.umn.edu for the latest version

Route this form to:	U Wide Form: UM 1571
See instructions below.	June 2014

This form is used to help researchers determine if a project requires IRB review. It also provided documentation that the IRB has reviewed the project description and issued a determination.

Additional information that may assist you in determining whether or not to submit an application can be found on the IRB website. See Does My Research Need IRB Review? and Guidance and FAQs IRB Review of Exempt Research.

Please allow up to five (5) business days for review and response.

Email completed form to irb@umn.edu

Based on the information provided, this project does not meet the regulatory definition of human subjects research. Additional IRB review is NOT required.

Jeffry Berkey

Project Title

Provide the grant title below if the project is funded.

Assessing the preferences of stakeholders and waterfowl management professionals to inform the implementation of the North American Waterfowl Management Plan

Section 1 Contact Information

Name (last name, First name MI)	**Highest Earned Degree**:
Fulton, David C.	PhD

Preferred contact information: dcfulton@umn.edu

Preferred email at which you may be contacted by IRB staff.

Affiliation and contact information

☒ University of Minnesota ☐ Fairview ☐ Gillette

U of M Required Contact information	**U of M Internet ID (x.500):**	dcfulton
	University Department:	FWCB

Section 2 Summary of Activities

2.1 Provide a brief description of your project. Include a description of what any participants will be asked to do and a description of the data accessed and/or collected (1,000 character limit).

Individuals will be asked to complete an online survey focused on waterfowl hunting regulations, conditions that influence the choice of waterfowl hunting or bird viewing recreational trips, importance of hunting and viewing, beliefs about wetland conservation, and some demographics including income within broad categories. We are targeting 10,000 completed surveys nationwide. The data will be aggregated at the regional and national levels and market analysis will be condcted to better understand the preferences for hunting and viewing experiences among different segments of the study population. Thi sinformation will be used to help set objectives for national level management plans of waterfowl, wetlands, and other bird species related to wetlands.

2.2 Are all of the data used in this project publicly available, e.g. blog, aggregate data,etc.?

Yes ☒ No

Section 3 Is this Project Human Subjects Research as Defined by Federal Regulations?

Research is defined in the Code of Federal Regulations, 45CFR46.102(d), as *a systematic investigation designed to develop or contribute to generalizable knowledge*

The Belmont report states "...the term 'research' designates an activity designed to test a hypothesis or answer a research question(s) [and] permit conclusions to be drawn... Research is usually described in a formal protocol that sets forth an objective and a set of procedures to reach that objective."

Research generally does **not** include operational activities such as routine outbreak investigations and disease monitoring and studies for internal management purposes such as program evaluation, quality assurance, quality improvement, fiscal or program audits, marketing studies or contracted-for services.

Generalizable knowledge is information where the intended use of the research findings can be applied to populations or situations beyond that studied. Note that publishing the results of a project does not automatically meet the definition of generalizable knowledge.

3.1 **Do you have a specific research question or hypothesis?**

☒ Yes ☐ No

3.2 **Is your primary intent to generate knowledge that can be applied broadly to the group/condition under study?**

☒ Yes ☐ No

Human subject is defined in the Code of Federal Regulations, 45CFR46.102(f)(1or2), as a living individual *about whom* an investigator obtains data through intervention or interaction or identifiable private information.

The specimen(s)/data/information must be collected from or be **about** live subjects. Research on cadavers, autopsy specimens or specimens/information from subjects now deceased is not human subjects research.

3.3 **Does this project involve intervention or interaction with a living individual or group of individuals? (e.g. confidential surveys, interviews, medical or educational testing)**

☒ Yes ☐ No

3.4 **Does this project involve access to identifiable private data or specimens from living individuals?**

☐ Yes ☒ No

3.5 **Does this project consist exclusively of interviewing or surveying subjects about his/her area of expertise, with a focus on policies, practices, and/or procedures (e.g. the collected data does not focus on personal opinion or private information)?**

☒ Yes ☐ No

3.6 **Is the project meant to record the stories, knowledge or experiences of individuals? Oral histories typically do not intend to answer a research question or hypothesis.**

☐ Yes ☒ No

If a protocol exists for this project it must be submitted for review. Submit this request along with any supplemental documents that may aid in review of your project to the University of Minnesota IRB at irb@umn.edu.