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HUNTER AND ANGLER MOTIVATIONS, PREFERENCES, AND BARRIERS TO
WATERFOWL HUNTING IN THE CENTRAL UNITED STATES

By

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A Thesis

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HUNTER AND ANGLER MOTIVATIONS, PREFERENCES, AND BARRIERS TO WATERFOWL HUNTING IN THE CENTRAL UNITED STATES

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University of Nebraska, 2019

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Since the mid-1980s, there has been a decrease in individuals participating in waterfowl hunting in the United States. The decline in participation has over-arching consequences for state and federal wildlife agencies in their ability to fund and manage habitat and waterfowl populations. There is a fundamental need to understand why individuals participate in waterfowl hunting and what barriers there are to participating in waterfowl hunting. An online survey was conducted in the summer and fall of 2018 asking waterfowl hunters, anglers, big game hunters, combination users (i.e., hunters that have multiple hunting and fishing permits), and small game hunters about their motivations, barriers toward waterfowl hunting, stated preferences, mentorship, and demographics. Results suggested that all respondents, regardless of the activity they preferred, were strongly motivated by being outside and connecting with nature. In addition, big game hunters were strongly motivated by consumptive motivations, such as eating meat and knowing where their food came from. The most limiting barrier toward waterfowl hunting was land access (i.e., lack of public land and private land access), crowding at hunting locations, and encounters with other hunters. All individuals were likely to increase participation in waterfowl given the scenarios provided but highest ranked scenarios were to hunt an area with a quality hunt or someone to take them hunting. Further, respondents who had never participated in waterfowl hunting were more likely to hunt waterfowl with a mentor who is someone they know (i.e., family,

friend, co-worker). The study results provides information on factors associated with hunting participation and future. By understanding multiple attributes of hunters and anglers within the central United States, we gain further insight into participation trends and recreationists needs and expectations, with important implications to the recruitment, retention, and reactivation of hunters and anglers

Glossary

Term	Definition
Avid	Users who purchased a waterfowl stamp 4 or more years between 2012 – 2016.
Barrier	Limit or prevent participation in an activity.
Combination user	Users who purchase multiple different licenses (i.e., big game, small game, fishing).
Dissociated	Users who used to waterfowl hunt but not between 2012 – 2016.
Motivations	The reasons for individuals to initiate and participate in an activity.
Sporadic	Users who purchased a waterfowl stamp 1-3 times between 2012 – 2016.

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Preface

When one thinks of the origins of hunting in the United States, Theodore Roosevelt often comes to mind. Teddy Roosevelt, the grandfather of hunting and a president responsible for the creation of wild places for individuals to hunt and roam. He once said: *Animals only continue to exist at all when preserved by sportsmen. The excellent people who protest against all hunting, and consider sportsmen as enemies of wildlife, are ignorant of the fact that in reality the genuine sportsman is by all odds the most important factor in keeping the larger and more valuable wild creatures from total extermination.* This has never been more true than in this moment in time.

Hunting participation in the United States is decreasing and along with it, the funding for state and federal agencies to properly manage and maintain an abundance of wildlife, both game and non-game wildlife. When developing this thesis, I became ever more cognizant of the role hunters and anglers play in providing the revenue necessary to conserve wildlife and their habitat. I came to understand the importance of the North American Model of Conservation, the most successful model of wildlife conservation in the world. Additionally, when I set aside my own experiences and observed hunters and anglers objectively, I realized that not all hunters are the same. While hunters and anglers are diverse individuals, they are seeking the same outcome, to go hunting or fishing. Therefore, when developing this thesis I made a cognitive decision to prevent my hunting and fishing experiences from making judgements about why individuals hunt or fish and what may prevent them from participating in the future.

In Chapter 1, “Motivations of hunters and anglers in the Central United States,” I quantify the reasons why individuals hunt and fish based on their preferred hunting or

fishing activity. This information is used in a way to help influence how federal and state wildlife agencies, non-governmental organizations, and industry, market the benefits of hunting to address the needs of recruitment, retention, and reactivation. In chapter 2, “Barriers toward waterfowl hunting across hunters and anglers in the central United States,” I quantify what prevents an individual from participating in waterfowl hunting, and how non-waterfowl hunters view barriers compared to individuals who frequently participate in waterfowl hunting. This information highlights areas that should be addressed to help increase waterfowl hunting participation across the country. In Chapter 3, “An assessment of scenarios to increase waterfowl hunting participation,” I explore how different scenarios presented to waterfowl hunters and non-waterfowl hunters will influence (i.e., increase, decrease) participation in waterfowl hunting. Further, I explore who non-waterfowl hunters would accept as a mentor (i.e., to take them hunting), and what prevents them from accepting other mentors. This information highlights a different approach on increasing waterfowl hunting participation, by providing distinct scenarios, which are easily manipulated and quantifiable by state agencies. Throughout the thesis, I took a unique approach to directly compare hunters and anglers and those who participate in waterfowl hunting and those that do not, and compare individuals across several states in the central United States.

CHAPTER 1: MOTIVATIONS OF HUNTERS AND ANGLERS IN THE CENTRAL UNITED STATES

INTRODUCTION

Participation in hunting and fishing in the United States has been on a steady decline since the mid-1980s and likely to continue into the future (Bureau of the Census and United States Fish and Wildlife Service [USFWS] 1993, 2018, Decker et al. 1993). Therefore, gaining a better understanding of hunters and anglers has increased in importance as state and federal wildlife and fisheries agencies become concerned about future funding prospects (Enck, Decker, & Brown, 2000). One way to better understand hunters and anglers and the decline in participation is to better understand what motivates hunters and anglers to participate.

Motivations are the multitude of diverse goals that drive interest in activities prior to participation (Decker, Brown, & Gutierrez, 1980; Reiss, 2004; Watkins, Poudyal, Caplenor, Buehler, & Applegate, 2018). For example, motivations for participating in hunting and fishing include spending time outdoors, being with friends and family, and harvesting meat for consumption. By understanding motivations, agencies can minimize conflict between user groups and assess the demand for outdoor recreation (Vaske, 2008). Motivations can also aid agencies in predicting levels of support for management decisions and the development of specific programs (Schroeder, Fulton, & Lawrence, 2006; Ward, Stedman, Luloff, Shortle, & Finley, 2008; Watkins et al., 2018). Further, by recognizing the diversity in why hunters and anglers participate, they can tailor opportunities to meet the varying needs and wants of these groups (Watkins et al., 2018).

For example, agencies may be able to use motivations as a way to establish new avenues or adjust current recruitment, retention, and reactivation (R3) efforts to promote participation in activities that individuals do not currently participate in, such as promoting big game hunting to spring turkey hunters as a way to appeal to the motivation of providing meat for the family.

Numerous studies have examined the motivations among hunting and angler groups. For example, motivations for anglers include companionship, food, nature, and sport (Beardmore, Haider, Hunt, & Arlinghaus, 2011; Finn & Loomis, 2001; Hunt, Haider, & Armstrong, 2002). Big game hunter motivations include being with friends and family, being outdoors, food, and excitement (Gigliotti, 2000; Gigliotti & Metcalf, 2016; More, 1973). Small game hunter motivations include spending time outdoors, and tradition (Grams, 2018; Guttery, 2011). Waterfowl hunter motivations include being with friends and family, being in nature, relaxation, and tradition (Enck, Swift, & Decker, 1993; Schroeder et al., 2006). There are commonalities among why individuals participate in hunting and fishing activities; spending time with companions, being outdoors, and tradition being among the most frequently cited. However, despite the assessment of motivations for hunters and anglers throughout the United States, there have been few direct comparisons among the motivations of different hunting and fishing groups. Hayslette et al. (2001) directly compared motivations of dove hunters and non-dove small game hunters in Alabama. Results indicated little differences in motivations between the dove and non-dove small game hunters; motivations such as companionship, nature, and tradition were rated similarly. Motivations of filling bag limits were rated greater for dove hunters than non-dove hunters. Understanding the similarity among

multiple hunting and fishing groups may indicate activities for more similarly motivated groups and aid in R3 efforts.

Motivations to participate in leisure activities have cultural underpinnings, and thus may vary across geographic locations. For example, three different non-western geographical locations (i.e., East-Asia, Middle-Eastern, and Aboriginal) had slightly different motivations for leisure activities (Iwasaki et al. 2007). Asian populations tended to participate in leisure activities that contained relaxation, harmony, and tranquility. Whereas, Middle-Eastern cultures focused on spending time with family and friends and relaxation. Aboriginal populations participated in activities that reinforced harmony and balance with others and nature (Iwasaki, Nishino, Onda, & Bowling, 2007). There may be differences among leisure motivations among more proximate groups as well. For example, in Nebraska deer hunters were highly motivated to spend time with family and friends (Grams, 2018) whereas, in South Dakota harvesting a deer was the most important motivation (Gigliotti & Metcalf, 2016). Differences in game availability and associated hunting culture among states may also influence why hunters participate in activities. For example, states dominated by big game (e.g., Wyoming, Montana) may be more influenced by harvesting game and filling the freezer (Shrestha & Burns, 2011), whereas states dominated by waterfowl and upland game (e.g., North Dakota, South Dakota) may be more motivated by camaraderie and working with dogs (Grams 2018).

There were two primary objectives for this study. First, to understand the similarity and differences among motivations among individuals who prefer big game, small and upland game, waterfowl hunting, and fishing. Second, to identify differences among motivations among individuals who prefer big game, small game, and waterfowl

hunting, and fishing among eight states in the central United States. A secondary objective was to identify activity types that were most similar to active waterfowl hunters in terms of motivations to identify potential groups that might best fit in with waterfowl hunters for R3 purposes.

HYPOTHESES

H₁: Seeing that individuals who participate in hunting and fishing are diverse (Arlinghaus, Bork, & Fladung, 2008; Beardmore, Hunt, Haider, Dorow, & Arlinghaus, 2014; Watkins et al., 2018), we hypothesized that the preferred activity type will influence motivations. Hunter and angler motivations have been identified to have similar motivations, yet few direct comparisons have been made.

H₂: Bearing in mind that there are differences in game availability and potential differences in hunting culture, we hypothesize that geographic locations will influence motivations. We expect that states that are more proximate to each other will have similar motivations than those states farther apart.

H₃: Small game and waterfowl hunters have been described as having similar motivations (i.e., working with dogs and appreciation for the tradition) (Grams, 2018; Schroeder et al., 2006). We hypothesize that small game and waterfowl hunters will have similar motivations and thus, small game hunters may be good

group to market waterfowl hunting. In addition, both user groups have similarly related equipment (i.e., shotgun and dog) and targeted species (i.e., avian species).

METHODS

STUDY SYSTEM

This study consisted of hunters and anglers across eight states in the Central and Mississippi Flyways (Chapter 1, Figure 1-1). States within each flyway were approached to determine interest in participating in a multi-state survey to better understand constituent motivations and what may limit or prevent the hunters and anglers from participating in waterfowl hunting. States that wished to participate in the study were required to have electronic license systems (ELS) that contained email addresses, license and stamp types, permit year, and birth year. License type and purchase year was needed to develop purchase histories and birth year was needed to comply with the University of Nebraska Institution Review Board (IRB) age requirements. Participating states and the University of Nebraska signed data sharing agreements with each individual state to ensure data security and appropriate use of data. All protocols and survey instruments were approved by the University of Nebraska-Lincoln Institutional Review Board (IRB Approval #: 20160215880 EX).

We developed six *a priori* groups based on license, permit, and stamp purchase histories between 2012 – 2016 for each state (Chapter 1, Table 1-1). The *a priori* groups consisted of anglers (i.e., only purchased a fishing license between 2012 and 2016), big game hunters only (i.e., only purchased a big game license between 2012 and 2016),

combination users (i.e., purchased a combination of licenses between 2012 and 2016), small game hunters only (i.e., only purchased a small game hunting license between 2012 and 2016) and waterfowl hunters (i.e., purchased the required combination of licenses and state stamps between 2012 and 2016). Waterfowl hunters were then categorized into two different classifications based on frequency they purchased the correct combination of licenses and stamps. Federal waterfowl stamps were not considered in breakdown because this information did not exist in state ELS. Avid waterfowl hunters (i.e., purchased the appropriate licenses and stamps four or more times between 2012-2016) and sporadic waterfowl hunters (i.e., purchased the appropriate licenses and stamps one to three times between 2012-2016).

DATA COLLECTION

SURVEY

A stratified random sample of up to 2,000 individuals were drawn from the six *a priori* groups in each state. Some groups did not allow us to draw 2,000 individuals; in those cases, we drew the entire sample (Table 1-2). A total of 88,613 individuals were selected to be included in the survey. Hunters and anglers were sent an email invitation (Appendix B) to an online survey (Appendix C) created with Qualtrics. The survey link was active between May to June 2018 and again from August – September 2018. The survey was opened during the two periods to maximize the number of respondents to the survey. Email reminders (Appendix D) sent on Mondays and Wednesdays mornings at 6:00 am central time to all non-respondents starting one week after initial invitation. A

total of four reminders were sent between May and June 2018 and three reminders were sent between August and September 2018.

DEFINING ACTIVITY GROUPS

While we sampled from the six *a priori* groups, we based analyses on individual's stated activity preference rather than a revealed preference (i.e., license sales). We focused on stated activity preference for a couple of reasons. (1) Our data was limited between 2012 and 2016 and respondents could have participated prior to this window; and (2) our data only contained resident permits and thus individuals could participate in other activities another state. By allowing an individual to state what they prefer to participate in, allowed for a more accurate representation activity preferences (Hendee, Gale, & Catton, 1971) and hence why the individual was motivated to participate.

Each respondent was asked "If you could only participate in one activity, what would it be?" Respondents could select only one activity from the following activities: big game hunting (i.e., deer, elk, and turkey), fishing, small game hunting (i.e., pheasants, quail, and rabbits), non-waterfowl migratory bird hunting (i.e., doves, rails, cranes), and waterfowl hunting (i.e., ducks, geese). The response to this question determined the individuals preferred activity type. Very few individuals indicated a preference for non-waterfowl migratory bird hunting and thus, we included these individuals in the small and upland game hunting activity group.

MOTIVATIONS

Motivations were adapted from Beardmore et al. (2011) to include both hunting and fishing related motivations and also included the more salient motivations such as socializing, enjoying nature, and enjoying solitude (Decker & Connelly, 1989; Hayslette et al., 2001). The hunting and fishing-related motivations contained eight items represented by two distinct subdimensions: challenge factors (i.e., challenging hunt or fight, harvesting a trophy) and consumption factors (i.e., taste of fish and game, acquiring meat). The non-hunting and fishing related motivations contained six items represented by two distinct subdimensions within the non-hunting and fishing motivations: nature factors (i.e., spending time outdoors) and social factors (i.e., being with friends and family). Each motivation question asked the respondent to identify the importance of the factor on a five-point scale from not at all important (scaled to 1) to very important (scaled to 5). Each activity type had the same motivation orientation questions but were slightly re-worded for each specific activity. For example, big game hunters would read “Filling my tag” whereas, anglers would read “Harvesting my daily fish limit”, and waterfowl and small game hunters would read “Harvesting my daily bag limit” (Appendix C). Terminology was held consistent across all states.

DATA ANALYSIS

To compare demographics between the respondents of the survey and the non-respondents, we evaluated relative non-response bias in average age using methods described by Callegaro et al. (2015). Non-response bias is the difference between the expected value estimate based on respondents and the true value for population

characteristics (e.g., average age). Relative non-response bias is the proportion of the population characteristic of interest that the bias represents (Callegaro et al. 2015). Relative non-response bias is calculated by calculating the difference in mean of the value of interest from respondents and from non-respondents. The difference is multiplied by proportion of non-respondents relative to respondents and then the value of interest is divided by the mean of the entire sample population. Standard relative non-response benchmarks are between 5% and 10% (Callegaro et al. 2015).

We used descriptive statistics to understand the demographics of the preferred activity types. We first took all respondents who selected a preferred activity and linked their unique identification (ID) number to the electronic license database to have their age. We then took the survey responses for gender and ethnicity and linked the responses by the unique ID number. We filtered out all individuals who did not complete the gender and ethnicity section (N = 7,874). Then, we grouped the data by state and preferred activity and calculated the mean and standard deviation for age for across all states and preferred activity type. Next, we summarized and totaled all respondents' gender and ethnicity choices across all states and preferred activity type and divided by the total number of respondents by state and preferred activity type.

To compare the respondents preferred activity based on their *a priori* grouping, we used chi-squared analysis. We first filtered out all individuals who did not select a preferred activity and were left with a sample size of 7,915. Then we used the respondents' unique ID number and linked their preferred activity with the sampling frame, which contained the respondents' *a priori* group. We then grouped all the

respondents based off their *a priori* groupings and summarized the total number of respondents from each *a priori* group based on their selected preferred activity.

To quantify motivations, we then used an exploratory factor analysis (EFA) using the psych package (Revelle, 2018) in R (R Core Team, 2018). We used an EFA to understand the number of items that influence a variable and to understand which items are similar (DeCoster, 1998). In addition, a factor analysis can summarize data to decrease the number of items to work with, to help understand and visualize relationships and patterns (Yong & Pearce, 2013). We identified the appropriate number of factors with the parallel method using principal axis factor analysis with weighted least squares to find the minimum residual solution. We then fit the motivation model using factor analysis with oblique rotation to group the 14 items (reasons) into motivation domains. For factors with eigenvalues > 1.0 and factor loadings $> |0.4|$, a reliability analysis using the Cronbach's alpha criterion was calculated (Nunnally & Bernstein, 1994). Items were combined into factors if reliability was > 0.6 (Nunnally and Bernstein 1994) and the mean values from the items within a factor provided indices of motivation importance for each factor.

We compared motivation factors as a function of activity and state using an Analysis of Variance (ANOVA). For each main effect, we calculated partial eta squared (η_p^2) values using the lsr package (Navarro, 2015) in R (R Core Team 2018). Partial eta squared values express the amount of variance accounted for by the independent variables. The η_p^2 values < 0.01 are considered negligible, 0.01 to 0.05 are considered small, 0.06 to 0.13 are considered medium, and > 0.14 are considered large. Effect sizes were important because with a large enough sample size, a significant p-value ($p = 0.05$)

is likely even when the differences among groups are negligible (Sullivan & Feinn, 2012). For factors that were considered more than negligible, we used Scheffe's test using the agricolae package (Mendiburu, 2017) in R to compare between the preferred activity types. Scheffe's test was chosen due the unique ability to conduct complex comparisons across multiple means (Ruxton & Beauchamp, 2008). For motivation factors with effect sizes $\eta_p^2 > 0.00$, we assessed the differences among the individual motivations in each motivation type to identify individually important and similar motivations.

RESULTS

SURVEY RESULTS

Of the 88,613 survey invitations emailed to participants, 7,797 emails bounced (i.e., the recipient did not receive the invitation), and a total of 17,120 individuals responded to the survey, resulting in an adjusted response rate of 21%. Of the 17,120 that responded to the survey, 7,875 agreed to participate in the survey and completed all the relevant questions to assess motivations.

RELATIVE NON-RESPONSE BIAS

In general, the average age (\pm SD) of the survey respondents ranged between 40 ± 13 years and 54 ± 16 years. Respondent age was greater than the average age of the non-respondents, and the sample population (Table 1-4). There were two exceptions to this in Montana only. The average age of big game hunters was the same (45 ± 13 years) across the survey respondents, non-respondents, and sample population. The average age of

Montana small game hunters of the survey respondents (47 ± 12 years) was less than that of the non-respondents (48 ± 14 years) but the same as the sample population (47 ± 14 years). Relative non-response bias for age varied across the groups and states. For example, avid waterfowl hunters ranged from (2 to 14%), sporadic waterfowl hunters ranged from (2 to 13%), anglers ranged from (4 to 16%), big game hunters ranged from (0 to 14%), combination users ranged from (2 to 18%), and small game hunters ranged from (-2 to 15%) (Table 1-3).

DEMOGRAPHICS

Overall, respondents among the preferred activity types in each state were predominately older white males (Table 1-4). The average age (\pm SD) for anglers ranged between 45 ± 13 and 52 ± 16 years, with Oklahoma being the youngest and Michigan being the oldest. The proportion of male anglers ranged between 72% (Montana) and 90% (Kansas and Nebraska) and the proportion of white anglers ranged between 81% (Oklahoma) and 98% (Michigan). The average age for big game hunters ranged between 42 ± 1 and 50 ± 14 years, with Oklahoma being the youngest and Wyoming being the oldest. The proportion of male big game hunters ranged between 83% (Montana) and 95% (Michigan) and the proportion of white big game hunters ranged between 83% (Oklahoma) and 98% (Nebraska). The average age for small game hunters ranged between 43 ± 14 and 56 ± 14 years, with Oklahoma being the youngest and Montana being the oldest. The proportion of male small game hunters ranged between 88% (Wyoming) and 98% (Kansas) and the proportion of white small game hunters ranged between 83% (Oklahoma) and 98% (Nebraska). The average age for waterfowl hunters

ranged between 41 ± 13 and 48 ± 16 years, with Oklahoma being the youngest and Wyoming being the oldest. The proportion of male waterfowl hunters ranged between 95% (Wyoming) and 99% (Oklahoma) and the proportion of white waterfowl hunters ranged between 78% (Montana) and 98% (South Dakota and Wyoming).

PREFERRED ACTIVITY PREFERENCES

Thirty-three percent of *a priori* avid waterfowl hunters selected waterfowl hunting as their preferred activity followed by big game hunting (31%). For anglers, big game hunters, and small game hunters, most ($> 43\%$) selected the same activity as their *a priori* groupings. Combination users and sporadic waterfowl hunters selected big game hunting more often (54% and 44%, respectively) than the *a priori* grouping. Overall, more individuals preferred big game hunting (41%), then fishing (31%), then waterfowl hunting (15%), and small game hunting (13%) (Table 1-5). Some states varied slightly from this generalization (Table 1-6). Respondents from Kansas tended to prefer big game hunting (44%), then small game hunting (23%), fishing (21%), and waterfowl hunting (12%). In Oklahoma, respondents preferred big game hunting (35%) followed by waterfowl hunting (30%), fishing (28%), and small game hunting (7%). In South Dakota, individuals preferred big game hunting (38%), then fishing (32%), followed by small game hunting (19%), and waterfowl hunting (11%).

FACTOR ANALYSIS

Of the 14 questions observing motivations, all activity groups ranked spending time outdoors as their most important motivation (Table 1-7). Our initial EFA revealed

four motivation factors, however one motivation item (being alone) was not well discriminated among factors and therefore was removed from the EFA. After dropping that item, a four-factor solution was still the most appropriate number of factors (Table 1-7; Figure 1-2). Factor 1 (Cronbach's $\alpha = 0.82$) explained 33% of the variance and represented consumptive components, factor 2 (Cronbach's $\alpha = 0.77$) explained 26% of the variance and represented nature components, factor 3 (Cronbach's $\alpha = 0.72$) explained 25% of the variance and represented challenge components, and factor 4 (Cronbach's $\alpha = 0.56$) explained 16% amount of variance and represented social components. Overall, the model fit reasonably well ($\chi^2 = 322.51$; Tucker Lewis Index = 0.954; RMSEA = 0.047).

COMPARING ACTIVITY TYPE AND STATE

Activity type and locations both had a significant ($p < 0.01$) influence on motivations (Table 1-8). Effect sizes for preferred activity types varied among the motivation types. The social ($\eta_p^2 = 0.00$) motivation type had a negligible effect size, but challenge ($\eta_p^2 = 0.01$) and nature ($\eta_p^2 = 0.01$) motivation types had small effect size values, and the consumptive ($\eta_p^2 = 0.14$) motivation type having a large effect size. Effect sizes among locations were negligible for all motivation factors ($\eta_p^2 = 0.00$). Given the relatively small influence of location on motivations, all further analysis focused on just activity type.

COMPARING MOTIVATION TYPES

Of all the motivation types assessed regardless of effect sizes, nature motivations (i.e., viewing wildlife, connecting with nature) was viewed as the most important across all the activity types (Table 1-9). On average (mean \pm SD), big game hunters (3.44 ± 1.28) viewed challenge motivations as the least important and anglers (2.29 ± 1.32), small game hunters (2.38 ± 1.29), and waterfowl hunters (2.62 ± 1.29) viewed consumptive motivations (i.e., knowing where food comes from, eating game meat) as the least important motivations.

Of the motivation types with effect sizes >0.01 (i.e., consumptive, nature, challenge), anglers, small game hunters, and waterfowl hunters viewed the consumptive motivations as the least important and was the third most important motivation for a big game hunter (Table 1-9). The only similarities between the preferred activity types were within the nature motivation type, where big game and waterfowl hunters were similar and anglers and small game hunters were similar. (Table 1-9).

SPECIFIC MOTIVATIONS

All the individual motivations within the consumptive, nature, and challenge motivation types were significant ($p \leq 0.01$) and the effect size values (η_p^2) for all individual motivations were ≥ 0.03 with the exception of spending time outdoors ($\eta_p^2=0.00$) and connecting with nature ($\eta_p^2=0.00$). Big game hunters viewed knowing where my food comes from, filling the freezer, eating meat, and obtaining limit greater than the other preferred activity types. Therefore, big game hunters were different among

the other preferred activity types (Table 1-10). Additionally, the individual consumptive motivation (mean \pm SD) that was viewed most important across all activity types was eating meat. For example, big game hunters (3.89 ± 1.11), anglers (2.88 ± 1.34), small game hunters (3.04 ± 1.21), and waterfowl hunters (3.07 ± 1.22). The least important motivations for big game hunters (2.94 ± 1.20) and anglers (1.74 ± 1.01) was obtaining daily limit and for small game hunters (1.88 ± 1.09) and waterfowl hunters (2.21 ± 1.22) it was filling your freezer. Generally, the preferred activity types viewed the individual consumptive motivations different, with a few exceptions. Waterfowl and small game hunters viewed eating meat similarly, whereas anglers and small game hunters and viewed filling your freezer and knowing where your food comes from similarly and were viewed as the least important motivations between the groups (Table 1-10).

Big game hunters viewed connecting with nature, spending time outdoors, and viewing wildlife greater than the other preferred activity types. Additionally, the individual nature motivation (mean \pm SD) that was viewed most important across all activity types was spending time outdoors. Big game hunters (4.63 ± 0.63), anglers (4.58 ± 0.62), small game hunters (4.48 ± 0.73), and waterfowl hunters (4.63 ± 0.61) all rated spending time outdoors as important to very important. Generally, the preferred activity types viewed the individual nature motivations differently, with one exception. Big game hunters and waterfowl hunters viewed viewing wildlife greater than anglers and small game hunters. This suggests that big game hunters and waterfowl hunters were more similar as were anglers and small game hunters (Table 1-10).

Big game hunters and waterfowl hunters viewed harvesting a trophy, using equipment and skills, having a challenging hunt or fight, and being an expert greater than

anglers and small game hunters. Additionally, the individual challenge motivation (mean \pm SD) that was viewed most important for big game hunters (3.97 ± 1.04) and small game hunters (3.52 ± 1.15) was a challenging hunt or fight. For anglers (3.71 ± 1.08) and waterfowl hunters (4.00 ± 1.02) it was using skills and equipment. The least important challenge motivation across all preferred activity types was harvesting a trophy (Table 1-10). Generally, the preferred activity types viewed the individual challenge motivations different, with one exception; big game and waterfowl hunters viewed using skills and equipment similarly.

DISCUSSION

Our results comparing motivations across locations indicates that location had negligible effects on motivations, which suggests commonality of hunting and fishing motivations across the central United States. This is not a surprising result given that hunting and fishing is often passed down through generations and hunters and anglers often speak of experiences and seek out social networks of other hunters and anglers, which extend across generations (Arnett & Southwick, 2015). As such, motivations would in theory be consistent across locations. For example, a big game hunter in Oklahoma is similarly motivated to a big game hunter in Kansas or Wyoming. Knowing that hunter and angler motivations are not strongly affected by location, state agencies can collaborate with each other and provide multiple different marketing campaigns. If a marketing campaign that targets motivations in Nebraska is identified to increase hunting participation among waterfowl hunters, it could be shared and applied in other states to appeal to their hunters. Further, the similarity of motivations among motivations suggests

that implementation of the National R3 plan (Council to Advance Hunting and The Shooting Sports, 2016) may be simplified by developing broad campaigns that appeal to broad motivations of hunters and anglers. Instead of developing marketing and education campaigns for each state, a fewer number of campaigns could be used to target regions (i.e., multiple states) rather campaigns for each individual state.

Spending time outdoors, viewing wildlife, connecting with nature, and spending time with family or friends are among the strongest motivations for all activity types and is consistent with existing literature (Enck et al., 1993; Gigliotti & Metcalf, 2016; Grams, 2018; More, 1973; Schroeder et al., 2006; Woods & Kerr, 2010). It is not surprising to see these motivations rated the strongest given that modern hunters and anglers generally speak of the experiences they have (i.e., being in nature, memories) and not necessarily the act of harvesting the animal (Arnett & Southwick, 2015). Yet, our results also indicate that there are differences in nature (i.e., spending time outdoors), challenge (i.e., being an expert), and consumptive (i.e., knowing where my food comes from) motivations among the different preferred activity types. However, the strength of the nature (i.e., spending time outdoors, viewing wildlife, connecting with nature) motivations varied slightly among preferred activity types. Big game and waterfowl hunters on average rated spending time outdoors, viewing wildlife, and connecting with nature stronger than anglers and small game hunters. Yet, viewing wildlife was the only nature motivation with an effect size > 0.00 and had similarities among the preferred activity types. For example, big game and waterfowl hunters were similar in regards to the motivation viewing wildlife, whereas anglers and small game hunters viewed viewing wildlife different among the preferred activity types. In addition, there was a difference in

the ages of these groups. On average, the big game and waterfowl hunter group are younger than the angler and small game hunter group (Table 1-4). Further, Kellert (1978) and Wentz and Seng (2000) suggested that as individuals age and progress as hunters and anglers, they begin to hunt and fish for nature-related reasons over number of harvested animals or skills. Although it is uncertain why there are similarities among viewing wildlife among the hunters and anglers, we can speculate on why big game and waterfowl hunters rated this motivation similarly. First, Needham and Vaske (2013) found that big game hunters in the Midwest were more likely to select waterfowl hunting as a substitute activity to participate if they were not able to participate in big game hunting. This is notable considering the Midwest is renowned for abundant waterfowl populations and hunting opportunities (Duda, Jones, & Criscione, 2010). Second, big game and waterfowl hunters generally have a similar hunting setting where they hunt around dawn and dusk and may have the ability to view an abundant amount of wildlife. Third, our *a priori* groupings of avid and sporadic waterfowl hunters selected big game hunting as a preferred activity more frequently than fishing or small game hunting that suggests that there is crossover among the two groups, which may result in similarities in the ranking of motivation types. Lastly, the similarities may be a product of relative non-response bias, since our respondents were generally older than the non-respondents and sampling population. Yet, the similarities between the hunter and angler groups may provide a state agency an avenue to promote activities between the activity types. For example, an individual who participates in waterfowl hunting, but not big game hunting, may be more likely to big game hunt than go fishing based on the similarity of the viewing wildlife motivation.

Consumptive motivations were viewed slightly or moderately important among the different preferred activity types, big game hunters view consumptive motivations greater than the other hunter and angler groups, which is consistent with established literature (Black, Jensem, Newman, & Boulanger, 2018; Gigliotti & Metcalf, 2016; Shrestha & Burns, 2011). It is not surprising to see consumptive motivations rated strongly among big game hunting because it provides a large quantity (i.e., pounds) of meat and is viewed as an important source of subsistence (Arnett & Southwick, 2015). Understanding that big game hunters were strongly motivated by eating meat, knowing where my food comes from, and filling my freezer can provided important information to state and federal agencies along with non-governmental organizations (NGOs). Although consumptive motivations may not be rated importantly as a whole to non-big game hunters, individual consumptive motivations such as, eating meat or fish is viewed importantly among the preferred activity types, suggesting that hunters and angler are concerned with eating what they harvest more so than having an abundant amount of game in their freezer. Additionally, waterfowl hunters view knowing where my food comes from as a moderately important motivation for participating in waterfowl hunting. The information is important as there are more individuals participating in hunting to obtain a sustainable, natural, and local form of meat (McWhirter & Elinson, 2019; Severson, 2019; Watkins et al., 2018). The locavore movement provides an opportunity for state and federal agencies along with NGOs to highlight the importance of knowing where my food comes from to not only big game hunting but waterfowl hunting as well. State and federal agencies can begin to collaborate with NGOs and industry to market and promote programs that teach an individual how to properly butcher and cook a

variety of wild game. Programs such as ‘From Field to Plate’ (<https://fromfieldtoplate.com>) and ‘Field to Fork’ currently exist and are successful in targeting individuals who have never hunted but want locally sourced food (Evans, 2018).

Our results suggest that hunters and anglers are more motivated by using skills and equipment and a having a challenging hunt or fight strongly is consistent with previous research (Grams, 2018). Challenges are synonymous with effort and the more effort given, the more important that something is to you (Dweck, 1999). Further, mastery or challenges are similar to an asymptote, as you can approach but never fully attain it, which drives individuals, as is the case in hunters and anglers (Pink, 2009). It is especially true considering the respondents are generally older and have been participating in their preferred activity for a longer period of time. Given that hunters and anglers may target a specific species, sex of species, or use primitive equipment, it is not surprising to see challenge motivations rated highly (Adams, 2018). As such, big game and waterfowl hunters view using skills and equipment similarly, which is not surprising given these hunting types. Both hunting activities may rely on certain aspects of the hunt such as: using calls, using decoys, and scouting. Each requires the necessary equipment and the knowledge and skills on how and when to implement them for success. While challenge motivations may be more desired among current hunters and anglers, there are individuals who have never participated who may be driven by the idea of something challenging (Adams, 2018). Further, agencies can market amongst different hunter and anglers to apply learned skills into a different activity. For example, big game hunters

may use scouting as a tool to gain an advantage on a difficult game species and scouting can be similarly applied within waterfowl hunting.

MANGEMENT IMPLICATIONS

Hunters and anglers have different motivations for hunting and fishing, of which do not change based on where they live. Considering state wildlife agencies often have limited resources, there is a unique opportunity to collaborate with other state agencies. Instead of investing resources on a variety of marketing campaigns aimed at increasing hunting and fishing participation, agencies can share ideas and repurpose ideas that worked while disregarding the ideas that did not. Furthermore, depending on the goal of the state or federal agencies and NGOs, marketing hunting and fishing should vary. For example, if the agency wants to promote different hunting and fishing activities current hunters and anglers they should use a campaign that highlights the nature and social motivations of hunting and fishing. Those motivations are viewed importantly among the current hunters and anglers. If an agency wants to promote hunting and fishing to users who have never participated in the activity, it may require a different message. For example, with the current locavore movement (McWhirter & Elinson, 2019; Severson, 2019; Watkins et al., 2018) promoting a sustainable and locally sourced organic meat may be extremely beneficial even though current hunters and anglers do not view consumptive based motivations strongly. Agencies need to continue understanding why individuals hunt and fish but a greater focus should be placed on new users who have never participated or been seen in the agencies license database. With motivations

changing as your progress as a hunter and angler (Kellert 1978; Wentz and Seng 2000), understanding why an individual initially participates in hunting and fishing and if it changes throughout time may better prepare an agency to promote hunting and fishing to non-users. Thus, taking a proactive approach and continuing to understand why individuals hunt or fish will allow for an agency or NGO to continually adapt to a changing society and make sure an appropriate message is being used at all times.

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TABLES

Table 1-1

Licenses and permit types for each main hunting and fishing activity from each state included in the study. Columns represent the type of activity and the rows are each state.

State	Big game hunting	Fishing	Small game hunting	Waterfowl hunting
Kansas	Any Antelope, Deer, Elk, and Turkey Permit	Any annual fishing license	Hunting license	Hunting license AND state waterfowl stamp
Michigan	Any Bear, Deer, Elk, Wolf, and Turkey permits	Any annual fishing license	Base Hunting license	Base hunting license AND state waterfowl stamp
Missouri	Any Deer and Turkey permits	Any annual fishing license	Small game hunting permit	Small game hunting permit AND migratory bird hunting permit
Montana	Any Antelope, Deer, Elk, Goat, Moose, and Sheep permits	Any annual fishing license	Base license and upland bird license	Conservation and base hunting licenses and migratory bird license
Nebraska	Any Deer and Turkey permits	Any annual fishing license	Hunting license	Hunting license AND state waterfowl stamp
Oklahoma	Any Antelope, Bear, Deer, Elk, Turkey permits	Any annual fishing license	Annual hunting license or fiscal year hunting license	Hunting license AND state waterfowl stamp

Table 1-1 continued

State	Big game hunting	Fishing	Small game hunting	Waterfowl hunting
South Dakota	Any Antelope, Bison, Deer, Elk, Goat, Mountain Lion, Sheep, Turkey permits	Any annual fishing license	Small game license	Small game license and migratory bird certificate
Wyoming	Any Antelope, Bison, Deer, Elk, Goat, Moose, Sheep permits	Any annual fishing license	Annual game bird AND /OR small game	Annual game bird AND small game

Table 1-2

Total number of individuals sampled from each *a priori* group from each state included in the study. Columns indicate *a priori* groups and rows are the participating states. A maximum of 2,000 individuals were sampled among each group and state. If there were not 2,000 samples in a group, all individuals were sampled.

State	Avid Waterfowl Hunters	Sporadic Waterfowl Hunters	Anglers Only	Big Game Hunters Only	Small Game Hunters Only	Combination Hunters/Anglers
Kansas	2,000	2,000	2,000	2,000	2,000	2,000
Michigan	2,000	2,000	2,000	2,000	2,000	2,000
Missouri	2,000	2,000	2,000	2,000	2,000	2,000
Montana	2,000	2,000	2,000	1,797	60	2,000
Nebraska	2,000	2,000	2,000	2,000	2,000	2,000
Oklahoma	1,076	2,000	2,000	1,998	0	2,000
South Dakota	2,000	2,000	2,000	2,000	2,000	2,000
Wyoming	48	1,634	2,000	2,000	2,000	2,000

Table 1-3

Relative non-response bias. Columns indicate mean \pm SD age of the respondents, non-respondents, sampling frame, and relative non-response bias. Rows indicate the participating states preceded by the *a priori* activity type in bold.

State	Mean age \pm SD			Relative non-response bias
	Respondents	Non-respondents	Sampling Frame	
Avid Waterfowl Hunter				
Kansas	50 \pm 14	44 \pm 14	46 \pm 15	10%
Michigan	50 \pm 14	46 \pm 15	47 \pm 15	7%
Missouri	48 \pm 13	41 \pm 14	42 \pm 14	14%
Montana	52 \pm 16	51 \pm 18	51 \pm 17	2%
Nebraska	47 \pm 14	46 \pm 13	46 \pm 13	2%
Oklahoma	43 \pm 13	37 \pm 12	38 \pm 13	12%
South Dakota	49 \pm 14	46 \pm 16	47 \pm 16	5%
Wyoming	57 \pm 11	52 \pm 16	53 \pm 15	9%
Sporadic Waterfowl Hunter				
Kansas	46 \pm 14	44 \pm 15	45 \pm 15	2%
Michigan	46 \pm 16	43 \pm 15	44 \pm 16	6%
Missouri	46 \pm 14	39 \pm 14	40 \pm 14	9%
Montana	50 \pm 14	49 \pm 20	50 \pm 19	2%
Nebraska	48 \pm 14	43 \pm 15	44 \pm 15	10%
Oklahoma	40 \pm 13	35 \pm 12	36 \pm 12	13%

Table 1-3 continued

State	Mean age \pm SD			Relative non-response bias
	Respondents	Non-respondents	Sampling Frame	
South				
Dakota	47 \pm 14	42 \pm 15	42 \pm 15	10%
Wyoming	49 \pm 15	45 \pm 15	46 \pm 15	7%
Angler				
Kansas	49 \pm 13	46 \pm 14	46 \pm 14	6%
Michigan	52 \pm 15	46 \pm 16	47 \pm 16	12%
Missouri	48 \pm 13	44 \pm 14	44 \pm 14	9%
Montana	47 \pm 13	44 \pm 13	44 \pm 13	6%
Nebraska	48 \pm 12	43 \pm 14	44 \pm 14	11%
Oklahoma	47 \pm 12	43 \pm 13	44 \pm 13	9%
South				
Dakota	49 \pm 15	47 \pm 15	47 \pm 15	4%
Wyoming	49 \pm 13	42 \pm 15	43 \pm 15	16%
Big Game Hunter				
Kansas	54 \pm 14	52 \pm 17	52 \pm 17	3%
Michigan	51 \pm 14	48 \pm 17	48 \pm 17	6%
Missouri	48 \pm 14	43 \pm 15	43 \pm 15	11%
Montana	45 \pm 13	45 \pm 14	45 \pm 14	0%
Nebraska	49 \pm 14	45 \pm 17	46 \pm 17	8%
Oklahoma	45 \pm 13	40 \pm 13	41 \pm 13	11%
South				
Dakota	52 \pm 15	46 \pm 17	47 \pm 17	12%
Wyoming	52 \pm 14	45 \pm 15	46 \pm 15	14%
Combination User				
Kansas	52 \pm 14	50 \pm 15	50 \pm 15	4%

Table 1-3 continued

State	Mean age \pm SD			Relative non-response bias
	Respondents	Non-respondents	Sampling Frame	
Michigan	49 \pm 13	48 \pm 15	48 \pm 15	2%
Missouri	48 \pm 15	43 \pm 14	43 \pm 14	11%
Montana	46 \pm 14	45 \pm 14	45 \pm 14	2%
Nebraska	54 \pm 16	49 \pm 18	50 \pm 18	9%
Oklahoma	42 \pm 12	38 \pm 11	38 \pm 11	9%
South Dakota	50 \pm 15	45 \pm 16	46 \pm 16	10%
Wyoming	54 \pm 14	45 \pm 15	46 \pm 15	18%
Small game hunter				
Kansas	52 \pm 14	46 \pm 14	47 \pm 14	12%
Michigan	52 \pm 15	45 \pm 17	45 \pm 17	15%
Missouri	51 \pm 14	45 \pm 15	46 \pm 15	12%
Montana	47 \pm 12	48 \pm 14	47 \pm 14	2%
Nebraska	52 \pm 13	45 \pm 15	45 \pm 15	15%
Oklahoma	-	-	-	-
South Dakota	50 \pm 14	44 \pm 15	45 \pm 15	13%
Wyoming	50 \pm 14	45 \pm 15	45 \pm 15	10%

Table 1-4

Demographic characteristics of survey respondents based on the preferred activity types from each state included in the study. Columns indicated the preferred activity types (i.e., big game hunting, fishing). Rows indicate mean age \pm SD, proportion of respondents that were male, and proportion of respondents that were Caucasian. Each state is in bold and proceeds their respective demographics. Generally, respondents were older (mean age > 41) white (>78%) men (>72%).

	Demographics			
	Big game hunting	Fishing	Small game hunting	Waterfowl hunting
Kansas				
Mean age	48 \pm 14	52 \pm 14	53 \pm 14	48 \pm 14
Proportion Male	0.92	0.90	0.98	0.97
Proportion Caucasian	0.94	0.95	0.98	0.96
Michigan				
Mean age	47 \pm 14	52 \pm 16	53 \pm 15	45 \pm 15
Proportion Male	0.95	0.87	0.91	0.98
Proportion Caucasian	0.96	0.98	0.95	0.97
Missouri				
Mean age	46 \pm 13	49 \pm 13	53 \pm 13	47 \pm 15
Proportion Male	0.94	0.85	0.97	0.98
Proportion Caucasian	0.94	0.93	0.93	0.97
Montana				
Mean age	47 \pm 16	50 \pm 15	56 \pm 14	48 \pm 15
Proportion Male	0.83	0.72	0.95	0.95
Proportion Caucasian	0.91	0.93	0.96	0.78

Table 1-4 continued

	Demographics			
	Big game hunting	Fishing	Small game hunting	Waterfowl hunting
Nebraska				
Mean age	47 ± 14	51 ± 14	51 ± 13	47 ± 15
Proportion Male	0.94	0.90	0.95	0.98
Proportion Caucasian	0.98	0.97	0.98	0.97
Oklahoma				
Mean age	42 ± 13	45 ± 13	43 ± 14	41 ± 13
Proportion Male	0.90	0.80	0.96	0.99
Proportion Caucasian	0.83	0.81	0.84	0.87
South Dakota				
Mean age	46 ± 14	50 ± 14	52 ± 14	48 ± 15
Proportion Male	0.90	0.86	0.94	-
Proportion Caucasian	0.96	0.97	0.98	0.98
Wyoming				
Mean age	50 ± 14	52 ± 14	50 ± 15	48 ± 16
Proportion Male	0.90	0.83	0.88	0.95
Proportion Caucasian	0.95	0.96	0.93	0.98

Table 1-5

The total number of individuals from the *a priori* groups across the preferred activity type (all states combined). Columns indicated the preferred activity types and rows are the *a priori* groupings. All p-values < 0.01 and significant. Generally, the *a priori* groups reflected the preferred activity type with the exception of sporadic waterfowl hunters and combination users who selected big game hunting more frequently.

<i>A priori</i>	Big game hunting	Fishing	Small game hunting	Waterfowl hunting	χ^2
Avid waterfowl	758	554	296	801	265.77
Sporadic waterfowl	725	456	204	266	398.50
Angler	84	639	27	22	1386.50
Big game	762	201	52	21	1374.00
Combination user	670	432	91	38	865.67
Small game	228	176	335	47	218.55

Table 1-6

The total number of individuals from each state included in the study across the preferred activity participation groups. Columns indicate the preferred activity groups and rows indicate the participating states. More respondents selected big game hunting as their more preferred activity and fishing was generally the second most selected response.

State	Totals			
	Big Game	Fishing	Small Game	Waterfowl
Kansas	526	246	270	142
Michigan	345	264	90	150
Missouri	358	295	121	243
Montana	559	378	59	64
Nebraska	376	324	174	180
Oklahoma	246	200	50	215
South Dakota	383	333	192	112
Wyoming	437	257	59	60

Table 1-7

Mean \pm SD for each individual barrier regardless of preferred activity type and factor loadings from exploratory factor analysis categorized into generalizable items (e.g. nature, social). Rows indicated the individual barrier preceded by the motivation type in bold. The columns indicate mean \pm SD and the factors. Factors begin with the factor that explains the most variance (i.e., consumptive) and ends with the factor that explains the least variance (i.e., social). Nature based motivations were rated most important followed by spending time with family and friends.

Motivations	Mean \pm SD	Factors			
		Factor 1	Factor 2	Factor 3	Factor 4
Consumptive					
Obtaining my daily limit or filling my tag	2.36 \pm 1.23	0.57	-0.15	0.23	-0.03
Knowing where my food comes from	3.08 \pm 1.42	0.63	0.17	-0.04	0.10
Filling my freezer	2.59 \pm 1.43	0.88	-0.04	0.03	-0.05
Eating fish/meat	3.34 \pm 1.30	0.78	0.05	-0.08	0.05
Nature					
Viewing wildlife	4.17 \pm 0.92	0.02	0.64	0.04	0.03
Connecting with nature	4.22 \pm 0.93	0.01	0.82	0.02	-0.04
Spending time outdoors	4.60 \pm 0.65	-0.02	0.65	0.05	0.05
Challenge					
Harvesting a trophy	2.36 \pm 1.24	-0.04	-0.12	0.57	-0.02
Being an expert	3.03 \pm 1.35	0.02	0.01	0.68	0.04

Table 1-7 continued

Motivations	Mean \pm SD	Factors			
		Factor 1	Factor 2	Factor 3	Factor 4
Using skills and equipment	3.81 \pm 1.10	0.03	0.14	0.59	0.04
Challenge hunt or fight	3.66 \pm 1.12	0.00	0.13	0.57	0.04
Social					
Spending time with family and friends	4.28 \pm 0.96	-0.04	0.07	-0.01	0.43
Teaching someone to hunt or fish	3.69 \pm 1.17	0.01	-0.03	0.02	0.86

Table 1-8

Analysis of Variance (ANOVA) results for the motivation components and the effect of preferred activity type and location on motivation components. Rows indicate the different motivation components and columns indicate the independent variables (i.e., preferred activity type and state), F-values and partial eta squared (e.g., effect size) values. Additionally, all motivation components were significant ($p < 0.01$). Effect sizes were generally negligible across all components for location and were ranged from small to large across all component types for preferred activity type. Partial eta squared values >0.01 are negligible, 0.01 to 0.05 are small, 0.06 to 0.13 are medium, and > 0.14 are considered large.

Motivation Component	Variable	F-value	P	η_p^2
Consumptive	Activity	1735.76	<0.01	0.14
	Location	202.94	<0.01	0.00
Nature	Activity	82.88	<0.01	0.01
	Location	6.96	<0.01	0.00
Challenge	Activity	311.16	<0.01	0.03
	Location	14.15	<0.01	0.00
Social	Activity	40.28	<0.01	0.00
	Location	5.31	<0.01	0.00

Table 1-9

Motivation type means \pm SD for each motivation factor (i.e., Consumptive, Nature) across different preferred activity types. Rows indicated the motivation types and columns indicate the preferred activity type. Superscripts next to mean values indicate similarities within the respective row across the preferred activity types. Superscripts represent all the motivation types (i.e., consumptive, nature, and challenge), which had effect size values > 0.00 (Table 1-8). Motivation types are in order of which motivation type explains the most variance to the least variance. Nature and social motivations are viewed as the most important across all preferred activity types.

Motivation Types	Mean \pm SD			
	Big game	Fishing	Small game	Waterfowl
Consumptive	3.47 \pm 1.28 ^a	2.29 \pm 1.32 ^d	2.38 \pm 1.29 ^c	2.62 \pm 1.29 ^b
Nature	4.41 \pm 0.81 ^a	4.23 \pm 0.91 ^b	4.20 \pm 0.93 ^b	4.38 \pm 0.80 ^a
Challenge	3.44 \pm 1.28 ^a	3.02 \pm 1.32 ^c	2.82 \pm 1.39 ^d	3.32 \pm 1.37 ^b
Social	4.00 \pm 1.11	3.93 \pm 1.08	3.82 \pm 1.20	4.20 \pm 1.01

Table 1-10

Individual motivations from the consumptive motivation type which had an effect size value > 0.05 (Table 1-9). Rows indicate the individual motivations preceded by motivation type in bold. Columns indicate the preferred activity type along with the F-values and partial eta squared (e.g., effect size) values. Additionally, all individual motivations were significant ($p < 0.01$). Superscripts next to mean values indicate similarities within the respective row across the preferred activity types. Superscripts only represent the individual motivations that had an effect size value > 0.01 . Effect sizes were medium (0.06 - 0.13) for eating game meat and knowing where my food comes from and large for filling my freezer (0.28) and obtaining daily limit (0.18). Big game hunters were not similar to any other preferred activity type among the individual motivations. Fishing and small game viewed filling the freezer and knowing where my food came from similarly. Small game and waterfowl hunters viewed eating game meat similar. Partial eta squared values > 0.01 are negligible, 0.01 to 0.05 are small, 0.06 to 0.13 are medium, and > 0.14 are considered large.

Motivations	Mean \pm SD				F-value	η_p^2
	Big game	Fishing	Small game	Waterfowl		
Consumptive						
Eating	3.89 \pm 1.11 ^a	2.88 \pm 1.34 ^c	3.04 \pm 1.21 ^b	3.07 \pm 1.22 ^b	387.12	0.13
Filling Freezer	3.49 \pm 1.30 ^a	1.86 \pm 1.13 ^c	1.88 \pm 1.09 ^c	2.21 \pm 1.22 ^b	1030.32	0.28
Obtaining daily limit	2.94 \pm 1.20 ^a	1.74 \pm 1.01 ^d	2.02 \pm 1.10 ^c	2.33 \pm 1.10 ^b	578.71	0.18
Knowing where food comes from	3.57 \pm 1.31 ^a	2.70 \pm 1.40 ^c	2.61 \pm 1.37 ^c	2.91 \pm 1.38 ^b	258.57	0.08
Nature						
Viewing wildlife	4.32 \pm 0.84 ^a	3.98 \pm 0.99 ^b	4.07 \pm 0.97 ^b	4.25 \pm 0.84 ^a	72.71	0.03
Connecting with nature	4.30 \pm 0.90	4.16 \pm 0.94	4.04 \pm 1.00	4.25 \pm 0.88	24.18	0.00

Table 1-10 continued

Motivations	Mean \pm SD				F-value	η_p^2
	Big game	Fishing	Small game	Waterfowl		
Spending time outdoors	4.63 \pm 0.63	4.58 \pm 0.62	4.48 \pm 0.73	4.63 \pm 0.61	16.03	0.00
Challenge						
Harvesting a trophy	2.65 \pm 1.22 ^a	2.43 \pm 1.24 ^b	1.59 \pm 0.93 ^d	2.07 \pm 1.51 ^c	238.89	0.09
Being an expert	3.20 \pm 1.31 ^b	2.66 \pm 1.32 ^d	2.85 \pm 1.32 ^c	3.49 \pm 1.29 ^a	136.90	0.05
Using skills and equipment	3.96 \pm 1.03 ^a	3.71 \pm 1.08 ^b	3.33 \pm 1.22 ^c	4.00 \pm 1.02 ^a	107.21	0.04
Challenge hunt or fight	3.97 \pm 1.04 ^a	3.29 \pm 1.20 ^d	3.52 \pm 1.15 ^c	3.75 \pm 1.10 ^b	181.04	0.06

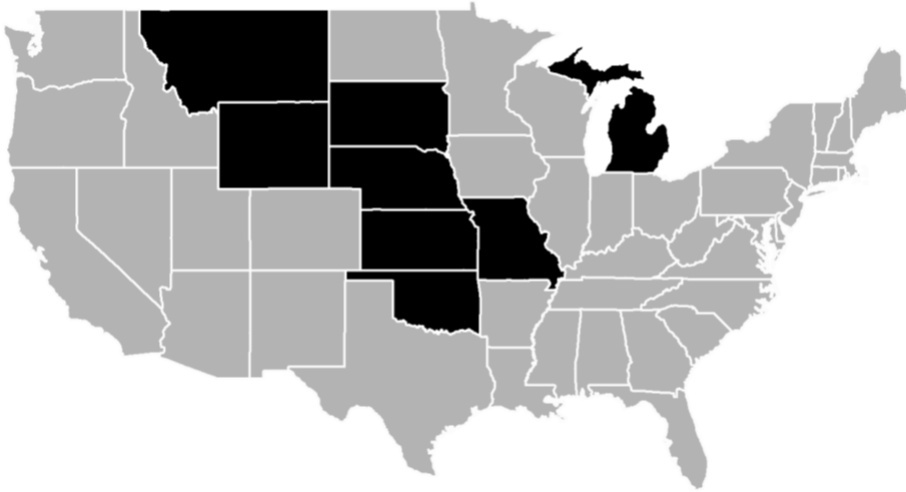
FIGURES

Figure 1-1

Map of the United States with states who participated in the survey are highlighted in black. States include; Kansas, Michigan, Missouri, Montana, Nebraska, Oklahoma, South Dakota, and Wyoming.

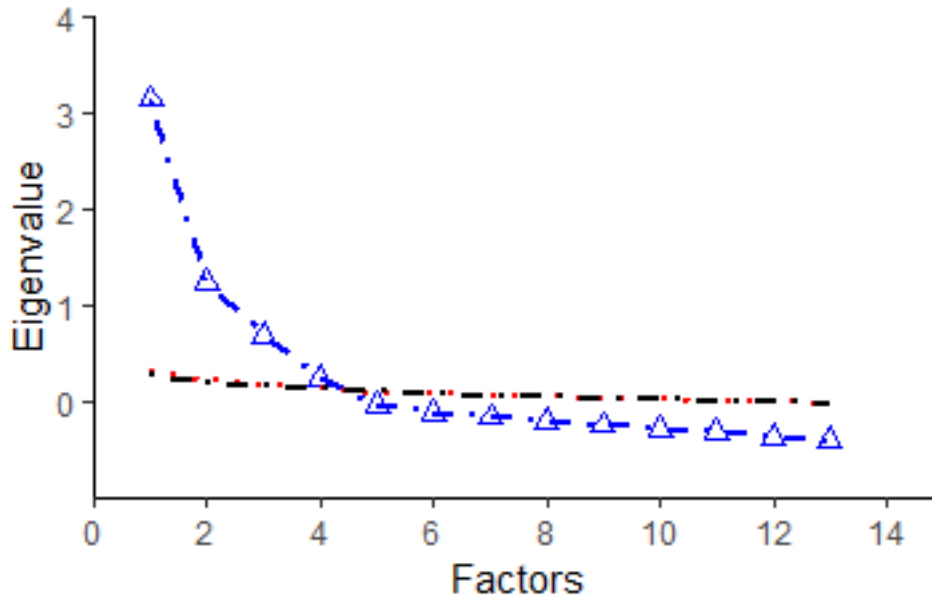


Figure 1-2

Parallel analysis scree plot from the motivation factor analysis. Blue line with a triangle is the factor analysis actual data, the red dot line is the simulated data, and the red dash line is the resampled data. The Y-axis represents the eigen values and the x-axis represents the number of factors. There are four factors in the “Factor Analysis” parallel analysis lie above the corresponding simulated data line suggesting a four factor solution.

CHAPTER 2: BARRIERS TOWARD WATERFOWL HUNTING ACROSS HUNTERS AND ANGLERS IN THE CENTRAL UNITED STATES

INTRODUCTION

Since the mid-1980s, there has been a decrease in individuals participating in waterfowl hunting in the United States (United States Fish and Wildlife Service [USFWS] et al. 2012a). The decline in participation has over-arching consequences for state and federal wildlife agencies. Waterfowl hunters are required to purchase not only state hunting licenses and permits but also must purchase a federal migratory bird hunting stamp. Revenue generated from the federal stamp is greater than \$960 million U.S. dollars and has protected approximately 6 million acres of habitat and national wildlife refuges (Wait, 2017). However, fewer waterfowl hunters has resulted in fewer hunting licenses and duck stamps (both federal and state) being sold, which equates to less funding available for the management of wildlife and their habitats (Vrtiska, Gammonley, Naylor, & Raedeke, 2013).

In 2012, the North American Waterfowl Management Plan of 1986 (NAWMP 1986) (USFWS and Canadian Wildlife Service 1986) was revised to specifically include an objective to increase participation among waterfowl hunters and to gain support of waterfowl and wetland conservation among waterfowl viewers and the public (USFWS et al. 2012a). To offset the decline in waterfowl hunting, the NAWMP Action Plan (USFWS et al. 2012b) provided four objectives: (1) assess current trends in waterfowl hunting, viewing, and associated activities, (2) develop quantifiable and realistic objectives for waterfowl hunting, viewing, and support of conservation, (3) develop a

framework to meet objectives, and (4) create institutional capacity to implement and evaluate strategies. The Human Dimensions Working Group (HDWG) and the Public Engagement Team (PET) was created to meet the objectives laid out in the NAWMP Action Plan. An important task of the he HDWG and PET is to gain a greater understanding what causes individuals to stop participating or inhibiting individuals from starting to participate in waterfowl hunting (Enck, Swift, & Decker, 1993).

Leisure barriers prevent or limit participation in outdoor recreation activities (Hawkins, Peng, Hsieh, & Eklund, 1999; Jackson, Crawford, & Godbey, 1993). Leisure barriers have been described to exist in a three-level hierarchy (Crawford & Godbey, 1987). The first level in the hierarchy consists of intra-personal barriers (e.g., stress, skill, or attitudes) that come from within an individual and must be overcome first. Intra-personal barriers have been suggested as the most important barriers affecting participation in leisure activities (Crawford, Jackson, & Godbey, 1991). Next in the barrier hierarchy are inter-personal barriers, which include family obligations and lack of friends who hunt. The last barrier in the hierarchy are structural barriers, which include lack of land availability, cost of permits, or regulations (Crawford & Godbey, 1987). More recently it has been suggested that barriers do not need to exist in a purely hierarchical structure (Scott 1991, Godbey et al. 2010). For example, a structural barrier such as lack of time can lead to an inter-personal barrier such as no one to hunt with.

While the theoretical understanding of leisure barriers is important, it can be difficult for state and federal wildlife agencies to develop management actions to address the barriers. Thus, greater attention has been paid to identifying barriers to hunting in more detail (Hawkins et al., 1999; Schroeder, Fulton, Lawrence, & Cordts, 2012;

Shrestha & Burns, 2011). For example, anglers viewed poor weather, lack of opportunity and access, and regulations as barriers to fishing (Kuehn, Luzadis, & Brincka, 2013; Ritter, Ditton, & Riechers, 1992). Big game hunters viewed inadequate and crowded hunting areas, lack of game, and complex rules as barriers to hunting (Shrestha and Burns 2011, Metcalf et al. 2015). Small game hunters viewed crowded hunting locations, lack of public land and game availability as barriers to hunting small game (Grams, 2018). Montgomery and Blalock (2010) conducted an extensive literature review among all hunting barriers and found crowding, public and private access were amongst the biggest barriers to hunting in general. However, despite the assessment of barriers for hunting and angling groups throughout the United States, there have been few direct comparisons among the barriers of different hunting and fishing groups.

Fewer studies have focused on barriers specific to waterfowl hunting. During the 1980s and 1990s, several factors occurred that affected waterfowl hunting participation. First, waterfowl populations were at historically low abundances due to anthropogenic causes such as agriculture, urbanization, and industrial activities (USFWS and Canadian Wildlife Service 1986). Second, a change in federal regulations made non-toxic shot mandatory for all waterfowl hunting (USFWS 1985). Waterfowl hunters that only participated sporadically or no longer participated in waterfowl hunting in New York indicated that confusing regulations about huntable duck species, low waterfowl populations, and dislike of the steel shot regulation as the top three barriers to participation (Enck et al. 1993). Further, overcrowded hunting areas and lack of huntable land were indicated as reasons that hunters stopped hunting waterfowl (Enck et al. 1993). Since the early 1990s, waterfowl populations in the United States have rebounded and

bag limits have been liberalized (Vrtiska et al., 2013) and the non-toxic shot regulation has been in place for decades. North Dakota has been known as a “renowned waterfowl mecca” and has attracted more than 15,000 hunters from Minnesota each year (Smith, 2003). Among these Minnesotan waterfowl hunters, four types of barriers to waterfowl hunting in North Dakota were identified: costs, hunting conditions, work and family conditions, and preferences, skills, and companions (Schroeder et al. 2012). Not surprising, these same barriers are cited as barriers to other hunting activities.

Our study focuses on understanding waterfowl hunting barriers among current, former, and individuals who have never participated in waterfowl hunting across the several states in the central United States. While there has been a decline in waterfowl hunters nationally, there is variation in waterfowl hunting participation among states (Kruse 2015, Fronczak 2016) (Figure 2-1). For example, the number of active waterfowl hunters in Kansas, Missouri, Montana, and Oklahoma have been relatively stable since 2000, whereas Michigan, Nebraska, and South Dakota have been steadily declining. The variation among states in waterfowl hunting participation offers the unique opportunity to explore potential differences in barriers (realized or perceived) among hunters in these states. Further, the perception of barriers to waterfowl hunting may be different among those hunters that have engaged in the activity and overcome the barriers (i.e., current waterfowl hunters), engaged in the activity and were unable to overcome the barriers (i.e., previous waterfowl hunters), and those that never engaged in the activity but participated in other hunting or fishing activities (i.e., non-waterfowl hunters). Understanding how barriers among states and activity types to waterfowl hunting should provide considerable insight for the creation of regulations and programs to meet current

recruitment, retainment, and reactivation (R3) objectives for waterfowl hunting. The objectives of this study were to: (1) understand how activity type and geographic location influenced individual's perceived barriers and (2) compare barriers of waterfowl and non-waterfowl hunters.

HYPOTHESES

H₁: Individuals who participate in hunting and fishing are diverse (Arlinghaus, Bork, & Fladung, 2008; Beardmore, Hunt, Haider, Dorow, & Arlinghaus, 2014; Watkins, Poudyal, Caplenor, Buehler, & Applegate, 2018). Thus, we hypothesize that the stated participation activity types will influence barriers. Hunter and angler barriers toward waterfowl hunting have yet to be identified and no direct comparisons have been made.

H₂: With differences in quantities of public land, game availability, and license and permit costs among the participating states, we hypothesize that depending where an individual lives (i.e., state) will influence barriers.

H₃: Individuals within the study who were dissociated waterfowl hunters continued to participate in hunting and fishing activities. Therefore, we hypothesize their barriers will be more similar to the non-waterfowl hunting stated participation activity types.

METHODS

STUDY SYSTEM

This study consisted of hunters and anglers across eight states in the Central and Mississippi Flyways (Chapter 1, Figure 1-1). States within each flyway were approached to determine interest in participating in a multi-state survey to better understand constituent motivations and what may limit or prevent the hunters and anglers from participating in waterfowl hunting. States that wished to participate in the study were required to have electronic license systems (ELS) that contained email addresses, license and stamp types, permit year, and birth year. License type and purchase year was needed to develop purchase histories and birth year was needed to comply with the University of Nebraska Institution Review Board (IRB) age requirements. Participating states and the University of Nebraska signed data sharing agreements with each individual state to ensure data security and appropriate use of data. All protocols and survey instruments were approved by the University of Nebraska-Lincoln Institutional Review Board (IRB Approval #: 20160215880 EX).

We developed six *a priori* groups based on license, permit, and stamp purchase histories between 2012 – 2016 for each state (Chapter 1, Table 1-1). The *a priori* groups consisted of anglers (i.e., only purchased a fishing license between 2012 and 2016), big game hunters only (i.e., only purchased a big game license between 2012 and 2016), combination users (i.e., purchased a combination of licenses between 2012 and 2016), small game hunters only (i.e., only purchased a small game hunting license between 2012 and 2016) and waterfowl hunters (i.e., purchased the required combination of licenses and state stamps between 2012 and 2016). Waterfowl hunters were then broken down

into two different classifications based on frequency they purchased the correct combination of licenses and stamps. Federal waterfowl stamps were not considered in breakdown because this information did not exist in state ELS. Avid waterfowl hunters (i.e., purchased the appropriate licenses and stamps four or more times between 2012-2016) and sporadic waterfowl hunters (i.e., purchased the appropriate licenses and stamps one to three times between 2012-2016).

DATA COLLECTION

SURVEY

A stratified random sample of up to 2,000 individuals were drawn from the six *a priori* groups in each state. Some groups did not allow us to draw 2,000 individuals; in those cases, we drew the entire sample (Chapter 1, Table 1-2). A total of 88,613 individuals were selected to be included in the survey. Hunters and anglers were sent an email invitation (Appendix B) to an online survey (Appendix C) created with Qualtrics. The survey link was active between May to June 2018 and again from August – September 2018. The survey was opened during the two periods to maximize the number of respondents to the survey. Email reminders (Appendix D) sent on Mondays and Wednesdays mornings at 6:00 am central time to all non-respondents starting one week after initial invitation. A total of four reminders were sent between May and June 2018 and three reminders were sent between August and September 2018.

BARRIERS

Barriers were adapted from the 2005 National Survey of Waterfowl Hunters (National Flyway Council & Wildlife Management Institute, 2006) and input from waterfowl managers in the Central and Mississippi Flyways (Table 2-1). Barrier questions were grouped into six categories: access (N = 11), cost (N = 7), rules and regulations (N = 11), social (N = 4), waterfowl hunting knowledge and skills (N = 6), and waterfowl identification and population (N = 9). Each barrier question asked the respondent to identify the strength of the limitation on a five-point scale from not at all limiting (scaled to 0) to very limiting (scaled to 4).

DEFINING ACTIVITY GROUPS

While we sampled from the six *a priori* groups, we based analyses on individual's stated activity participation rather than revealed preference (i.e., license sales). We focused on stated activity participation because our data was limited to 2012 and 2016 (i.e., respondents could have participated prior to this window) and resident permits (i.e., could participate in other activities another state). In addition, purchasing a permit does not guarantee how much or if they participated in the activity. By allowing an individual to state what they have participated in and how frequently, allows for a more accurate representation activity preferences (Hendee, Gale, & Catton, 1971). Further, this approach allowed us to distinguish individuals who used to participate in waterfowl hunting but no longer do (i.e., dissociated waterfowl hunter), which was an important type to distinguishing real and perceived barriers to waterfowl hunting.

Each respondent was asked “What activities have you ever participated in?” and they could choose multiple options such as big game hunting, fishing, non-waterfowl migratory bird hunting, small and upland game hunting, and waterfowl hunting. Depending what activities individuals selected determined the groups they were assigned. For example, individuals who selected only small game hunting were placed in a small game hunter group, whereas individuals who selected fishing and big game hunting was placed in the combination group. Additionally, if an individual selected waterfowl hunting, they were considered a waterfowl hunter despite any additional activities they may have participated in. Each respondent was then asked, “Between 2012-2016, how many years did you purchase the required licenses, permits, or stamps?” for all the activities they had specified to the previous question. We used this question to categorize the individual into one of three types of waterfowl hunters: (1) avid waterfowl hunters participated 4 or more years; (2) sporadic waterfowl hunters participated 1-3 years; or (3) dissociated waterfowl hunters participated 0 years during 2012-2016. Individuals who selected non-waterfowl migratory bird hunting were grouped into a small and upland game hunting group.

DATA ANALYSES

To compare demographics between the respondents of the survey and the non-respondents, we evaluated relative non-response bias in average age and residency using methods described by Callegaro et al. (2015). Non-response bias is the difference between the expected value estimate based on respondents and the true value for population characteristics (e.g., average age). Relative non-response bias is the proportion

of the population characteristic of interest that the bias represents (Callegaro et al. 2015). Relative non-response bias is calculated by calculating the difference in mean of the value of interest from respondents and from non-respondents. The difference is multiplied by proportion of non-respondents relative to respondents and then the value of interest is divided by the mean of the entire sample population. Standard relative non-response benchmarks are between 5% and 10% (Callegaro et al. 2015).

We used descriptive statistics to understand the demographics of the individuals. We first took all respondents who selected a stated activity participation type and linked their unique identification (ID) number to the electronic license database to have their age. We then took the survey responses for gender and ethnicity and linked the responses by the unique ID number. We filtered out all individuals who did not complete the gender and ethnicity section (N = 7,915). Then we grouped the data by state and stated activity participation type. We then calculated the mean age and standard deviation for across all states and stated activity participation type. Next, we summarized and totaled all respondents gender and ethnicity choices across all states and preferred activity type and divided by the total number of respondents by state and stated activity participation type.

To compare the respondents stated activity participation based on their *a priori* grouping, we used a chi-squared analysis. We first filtered out all individuals who did not select a stated activity participation (N = 7,885). Then we used the respondents unique ID number and linked their stated activity participation with the sampling frame, which contained the respondents *a priori* group. We then grouped all the respondents based off their *a priori* groupings and summarized the total number of respondents from each *a priori* group based on their selected stated activity participation.

To understand the underlying structure of the barrier scale, we used an exploratory factor analysis (EFA) using the psych package (Revelle, 2018) in R (R Core Team, 2018). We used an EFA to understand the number of factors that influence a variable and to understand which variables are similar (DeCoster, 1998). In addition, a factor analysis can summarize data to decrease the number of items to work with, to help understand and visualize relationships and patterns (Yong & Pearce, 2013). We identified the appropriate number of factors using the parallel method using principal axis factor analysis with weighted least squares to find the minimum residual solution. Once we found the appropriate number of factors, we fit the barrier model using factor analysis with oblique rotation to group the 48 items (reasons) into barrier domains. For factors with eigenvalues > 1.0 and factor loadings $> |0.3|$, a reliability analysis using the Cronbach's alpha criterion was calculated (Nunnally and Bernstein 1994). Items were combined into factors if reliability was > 0.6 (Nunnally & Bernstein, 1994) and the mean values from the items within a factor provided indices of barrier importance for each factor.

We ran an analysis of variance (ANOVA) to test for differences between the barrier factors described by the EFA as a function of activity type and state. We calculated the effect size using partial eta squared (η_p^2) values using lsr package (Navarro, 2015) in R (R Core Team 2018). Partial eta squared values test the effect size of the factor and values < 0.01 are negligible, 0.01 to 0.05 are small, 0.06 to 0.13 are medium, and > 0.14 are considered large. Effect sizes were important because with a large enough sample size, a significant p-value is likely even when the differences among groups are negligible (Sullivan & Feinn, 2012). We used Scheffe's test using the agricolae package

(Mendiburu, 2017) in R to compare barriers between avid, sporadic, dissociated waterfowl hunters, anglers, big game hunters, combination users, and small game hunters and barrier. Scheffe's test was chosen due the unique ability to conduct complex comparisons across multiple means (Ruxton & Beauchamp, 2008). For barrier factors with effect sizes $\eta_p^2 > 0.05$, we assessed the differences among the individual barrier types in each factor to identify individually important barriers.

RESULTS

SURVEY RESULTS

Of the 88,613 survey invitations emailed to participants, 7,797 emails bounced (i.e., the recipient did not receive the invitation) and a total of 17,120 individuals responded to the survey, resulting in an adjusted response rate of 21%. Of the 17,120 that responded to the survey, 7,915 agreed to participate in the survey and completed all the relevant questions to assess barriers.

RELATIVE NON-RESPONSE BIAS

The average age (\pm SD) of the survey respondents ranged between 40 ± 13 years and 54 ± 16 years. Respondent age was greater than the average age of non-respondents and the sample population (Chapter 1, Table 1-3). There were two exceptions to the respondent age being older than the average age of non-respondents and sample size in Montana. The average age of big game hunters was the same (45 ± 14 years) across the survey respondents, non-respondents, and sample population. In addition, the average age

among Montana small game respondents (47 ± 12 years) was less than that of the non-respondents (48 ± 14 years) but the same as the sample population (47 ± 14 years). Relative non-response bias varied across the groups and states. For example, avid waterfowl hunters ranged from (2 to 14%), sporadic waterfowl hunters ranged from (2 to 13%), anglers ranged from (4 to 16%), big game hunters ranged from (0 to 14%), combination users ranged from (2 to 18%), and small game hunters ranged from (-2 to 15%) (Table 1-3).

DEMOGRAPHICS

Overall, respondents among the stated activity types in each state were predominately older, white males (Table 2-2). Depending on the state, avid waterfowl hunters average age (mean \pm SD) ranged between 42 ± 13 to 51 ± 15 and the proportion of males and Caucasians ranged between 95 and 99% and 86 and 98%, respectively. The sporadic waterfowl hunters average age ranged between 41 ± 13 to 48 ± 14 and the proportion of males and Caucasians ranged between 91 and 97% and 86 and 95%, respectively. The dissociated waterfowl hunters average age ranged between 44 ± 13 to 59 ± 11 and the proportion of males and Caucasians ranged between 88 and 98% and 89 and 98%, respectively. The anglers average age ranged between 45 ± 12 to 54 ± 15 and the proportion of males and Caucasians ranged between 31 and 62% and 76 and 95%, respectively. The big game hunters average age ranged between 44 ± 12 to 49 ± 18 and the proportion of males and Caucasians ranged between 58 and 76% and 79 and 100%, respectively. The combination users average age ranged between 42 ± 12 to 49 ± 14 and

the proportion of males and Caucasians ranged between 65 and 91% and 76 and 99%, respectively. Finally, the small game hunters average age ranged between 42 ± 13 to 53 ± 29 and the proportion of males and Caucasians ranged between 33 and 96% and 80 and 100%, respectively.

STATED ACTIVITY PREFERENCES

In general, the *a priori* groupings reflected the stated activities of the individuals (Table 2-3). For example, 80% of avid waterfowl hunters were defined as an avid waterfowl hunter based on their stated activity participation ($\chi = 8616.2$; $p < 0.01$). For sporadic waterfowl hunters ($\chi = 1916.5$; $p < 0.01$), anglers ($\chi = 923.9$; $p < 0.01$), and combination users ($\chi = 1538.8$; $p < 0.01$) most ($> 39\%$) were defined similarly based on their stated activity participation. Big game ($\chi = 1392.5$; $p < 0.01$) and small game hunters ($\chi = 563.8$; $p < 0.01$) were defined as combination users more often (52% and 38%, respectively) than their *a priori* selected category.

FACTOR ANALYSIS

Our initial EFA revealed a ten-factor solution for barriers. Five barriers (physical demands, private land cost, travel cost, time to scout, and using a gun) were not well discriminate across factors and therefore dropped. After dropping those five items, a 10-factor solution was maintained (Table 2-4; Figure 2-2). Factor 1 (Cronbach's $\alpha = 0.95$) explained 24% amount of variance and represented rules and regulations, factor 2 (Cronbach's $\alpha = 0.94$) explained 15% amount of variance and represented waterfowl

identification, factor 3 (Cronbach's $\alpha = 0.87$) explained 11% amount of variance and represented cost, factor 4 (Cronbach's $\alpha = 0.91$) explained 11% amount of variance and represented waterfowl hunting skills, Factor 5 (Cronbach's $\alpha = 0.87$) explained 10% amount of variance and represented land access, factor 6 (Cronbach's $\alpha = 0.85$) explained 7% amount of variance and represented other hunters, factor 7 (Cronbach's $\alpha = 0.90$) explained 7% amount of variance and represented traveling, factor 8 (Cronbach's $\alpha = 0.86$) explained 6% amount of variance and represented no hunters, factor 9 (Cronbach's $\alpha = 0.73$) explained 5% amount of variance and represented waterfowl populations, and factor 10 (Cronbach's $\alpha = 0.68$) explained 4% amount of variance and represented views. Overall the model fit reasonably well ($\chi^2 = 1681.82$; TLI = 0.957; RMSEA = 0.038).

COMPARING ACTIVITY TYPE AND STATE

Activity type and geography were both significant ($p < 0.001$) across all barrier factors (Table 2-5). Effect sizes for activity type were small and large effects on nine of the ten barrier factors. The waterfowl population (i.e., timing of migration, low waterfowl populations) ($\eta_p^2 = 0.00$) factor had a negligible effect size. No hunters (i.e., lack of family and friends who hunt) ($\eta_p^2 = 0.09$), waterfowl identification (i.e., identifying flying ducks) ($\eta_p^2 = 0.09$), and waterfowl hunting skills (i.e., using calls and decoys) ($\eta_p^2 = 0.14$) factors had large effect size values, with the remaining factors (cost, land access, other hunters, rules and regulations, travel, and views) (η_p^2 between 0.01 and 0.01) having a small effect size. Effect sizes among states were negligible or small for all barrier factors

($\eta_p^2 \leq 0.01$). Given the relatively small influence of geography on barriers, all further analysis focused on just activity type with medium or large effect sizes ($\eta_p^2 \geq 0.06$).

COMPARING BARRIER TYPES

Of all the barrier types assessed regardless of effect sizes, views (i.e., the views of someone important or community) was rated the lowest across all the activity types (Table 2-6). Big game hunters (1.79 ± 1.46), combination users (1.90 ± 1.46), dissociated waterfowl hunters (2.07 ± 1.41), small game hunters (1.91 ± 1.41), and sporadic waterfowl hunters (2.17 ± 1.36) viewed land access (i.e., lack of public land) as the most limiting barrier type. The most limiting barrier types for avid waterfowl hunters (2.10 ± 1.29) was interference or encounters with other hunters and for anglers (1.50 ± 1.49) it was waterfowl hunting skills (i.e., using duck or goose call and decoys).

Of the barriers with large effect sizes (i.e., no hunters, skills, and identification), avid waterfowl hunters rated those three-barrier types the lowest (Table 2-6). The combination users consistently rated the three-barrier types greater (mean \pm SD) than the other activity types with an exception to waterfowl hunting skills (i.e., using duck or goose calls and decoys), which anglers (1.50 ± 1.49) rated higher than the combination users (1.45 ± 1.33). Additionally, the sporadic and dissociated waterfowl hunters rated the barrier types lower than the non-waterfowl hunting activity types with an exception. Dissociated waterfowl hunters rated the barrier type no hunters (i.e., lack of family or friends to hunt with; 1.38 ± 1.39) greater than big game hunters (1.28 ± 1.39), which had the lowest ranking among the non-waterfowl hunters.

Generally, across the barrier types, avid waterfowl hunters were not similar to any other activity type. Whereas sporadic and dissociated waterfowl hunters were more similar across all barrier factors. Additionally, there were overlap in similarities with the non-waterfowl hunting types for the three barrier factors. For example, anglers, big game and small game hunters were related to sporadic and dissociated waterfowl hunters respectively among the lack of other waterfowl hunters to hunt with barrier type (Table 2-6). There were slight variations among the other two barrier factors with big game hunters being similar in both remaining factors (waterfowl identification and waterfowl hunting skills) and small game hunters being similar in waterfowl identification.

SPECIFIC BARRIERS

All the individual barriers within the three barrier types (e.g., lack of other hunters to hunt with, waterfowl identification, and waterfowl hunting skills), all were significant ($p \leq 0.001$). Additionally, the effect size values (η_p^2) were > 0.06 , with the exception of finding identification resources and identifying female ducks, which had effect size values of $\eta_p^2 = 0.01$ and $\eta_p^2 = 0.00$, respectively. The avid waterfowl hunters rated all the barriers within the three barrier types (e.g., lack of other hunters to hunt with, waterfowl identification, and waterfowl hunting skills) as the least limiting among all the groups and anglers and combination users rated all the barriers the most limiting.

Additionally, the trends in similarities between the activity types with effect sizes > 0.06 varied slightly. For example, avid waterfowl hunters were generally different between the activity types and among all the barriers with the exception of using calls,

where avids and big game hunters were similar to each other. The most limiting barrier (mean \pm SD) was identifying flying waterfowl for the dissociated (1.35 ± 1.17) and sporadic (1.43 ± 1.23) waterfowl hunter, big game hunter (1.38 ± 1.38), and the combination user (1.77 ± 1.41). Whereas, anglers (1.56 ± 1.53) rated how to scout the most limiting and for small game hunters (1.59 ± 1.31) it was using calls (Table 2-7).

DISCUSSION

Our results comparing waterfowl hunting barrier types indicated differences across states. However, only two of the barrier types (i.e., cost and land access) had a small effect size; not surprising considering the variation among states in land availability and cost of hunting licenses. For example, in Nebraska, only 2.8% of the land is publicly owned and it costs \$53 U.S. dollars in 2018 to obtain the required licenses, permits and stamps to hunt waterfowl (Bureau of the Census, 1991; Nebraska Game and Parks Commission, 2018). Conversely, in Montana, 32.3% of land is publicly owned and costs \$49 U.S. dollars in 2018 to obtain the required licenses, permits, and stamps (Bureau of the Census, 1991; Montana Fish Wildlife and Parks, 2018). Given the variability in public huntable land and cost of licenses or permits, costs and land access associated with waterfowl hunting should be taken into consideration at the state level when examining waterfowl hunting barriers. Considering Nebraska has far less land publicly owned than Montana, individual barriers associated with the barrier type land access, may not be similar across states.

Our results comparing activity types to barrier types indicated differences in perceptions of barriers between activities. Several barrier types had medium effect sizes, suggesting that perceptions of barrier types such as lack of friends or family who waterfowl hunt, waterfowl identification, and waterfowl hunting skills (e.g., using duck and goose calls) vary depending on the activity type. Generally, avid waterfowl hunters viewed those barrier types as not limiting whereas the non-waterfowl hunters and anglers viewed the barriers as more limiting. Additionally, avid waterfowl hunters viewed barriers such as lack of friends or family who waterfowl hunt, waterfowl identification, and waterfowl hunting skills (e.g., using duck and goose calls) differently across all other groups, whereas those that never participated in waterfowl hunting (e.g., anglers, big game hunters, small game hunters, and combination users) viewed those barriers similarly amongst each other. Interestingly, sporadic and dissociated waterfowl hunters were more similar to the non-waterfowl hunters than the avid waterfowl hunters for the lack of family and friends who hunt waterfowl. This relationship of sporadic and dissociated waterfowl hunters being more similar to non-waterfowl hunters was also observed among barriers identifying flying waterfowl, identification requirement, and using calls. Given that non-waterfowl hunters and dissociated waterfowl hunters view barriers similarly to sporadic waterfowl hunters but do not participate in waterfowl hunting, may suggest that an unknown barrier we did not assess may influence on participation. Crawford and Godbey (1987) suggested intra-personal barriers (i.e., personal views and beliefs) is the first of three levels and the most important form of leisure barrier to overcome. Specifically, we did not consider intra-personal barriers in this assessment of barriers as we attempted to limit the barriers to topics that wildlife agencies could address. Overall,

most barriers among non-waterfowl hunters were not viewed strongly (mean < 2.24; Somewhat limiting), suggesting there is not a clear single barrier inhibiting non-waterfowl hunters from hunting and suggests several possibilities. First, non-waterfowl hunters may simply not view the barriers in this study as strong barriers keeping them from hunting. Second, the relationship of stated barriers may not equate to changes in actual participation (Kay & Jackson, 1991; Shaw, Bonen, & McCabe, 1991). Lastly, while there may not be one single barrier inhibiting participation, there are a lot of barriers that are somewhat limiting to participating in waterfowl hunting. It may be the accumulation of many small barriers, that collectively act to inhibit participation in waterfowl hunting.

Our results suggest that land access and conflict with other hunters were generally seen as stronger barriers (means from 1.34 to 2.17) among the hunting and fishing groups, with waterfowl hunters rating them as more limiting. Individual barriers within these two barrier types consisted of crowding, interference and encounters from other hunters, amount of public land, knowing location of public land, knowing who to ask for private land, asking for permission, and obtaining permission. Within the specific barriers above, waterfowl hunters (current and former) and non-waterfowl hunters tend to view (1) asking for permission, (2) crowding, (3) knowing who to ask for permission, (4) obtaining permission, which is consistent with previous hunting barrier research (Backman, Shelia & Wright, 1993; Grams, 2018; Metcalf et al., 2015; Montgomery & Blalock, 2010). Further, avid and sporadic waterfowl hunters view these as strong barriers but does not necessarily prevent participation in an activity (Kay and Jackson, 1991; Shaw et al. 1991). This suggests that while these barriers are viewed strongly

among all hunter and angler groups, they do not currently influence participation among current waterfowl hunters, yet, with potential increases in participation, crowding may cause individuals to dissociate from waterfowl hunting (Enck et al., 1993).

The low effect size of activity type for land access and disruption by other hunters indicates that these barriers are not distinct to only waterfowl hunters. By increasing public or private land availability, agencies can provide more areas to hunt or and indirectly decrease conflicts among waterfowl hunters. Yet, increasing public land access is challenging so increasing access to disperse hunters on the landscape may provide benefits (Wzola, 2017). Additionally, agencies should work to alleviate other barriers potentially influencing non-waterfowl hunters from participating such as: costs of equipment, lack of family or friends who hunt waterfowl, and alleviating complex identification requirement. Potential barriers can be reduced by allowing the ability to rent waterfowl hunting equipment, which is done in Nebraska for university students, teaching a waterfowl hunting course to build skill sets and develop relationships among current and non-participants at different universities or colleges (i.e., delta waterfowl university hunting program), and removing the complex waterfowl identification regulations. As agencies continue to alleviate barriers and waterfowl participation begins to increase among new (recruitment), current (retention), and dissociated (reactivate) waterfowl hunters, additional areas for individuals to hunt will be vital.

It is important to understand the complexities of increasing land access before this can be viewed as the solution to increasing waterfowl hunting participation. Acquiring land requires spending money to purchase, maintain, and pay taxes on the purchased land. It is likely unfeasible to continue purchasing land by government

agencies for public use, there may be other ways to increase or improve land access. For example, approximately 9.5 million acres of public land is not accessible to hunters (Theodore Roosevelt Conservation Partnership & OnX Maps, 2018) as it is surrounded by private land. Finding solutions to allow hunters the ability to utilize landlocked public land is important. Land access barriers also includes knowing what land owners to ask for permission, the act of asking for permission, and obtaining permission, which were all rated highly among all users (means 1.50 to 2.53). Another way to potentially increase areas for individuals to hunt are to educate new hunters of the proper social norms for approaching and talking to landowners about accessing their land for hunting opportunities. There are technological solutions to address these barriers as well. For example, Outdoor Access is a private company in the eastern United States who establishes partnerships with landowners who provide access for individuals to hunt their property for a small fee (Hart, 2017). Outdoor Access provides a website for hunters to look for landowners who will allow hunting on their property and landowners are afforded the opportunity to provide specific dates, times, and access fees (small or large) for hunters looking to hunt private land. Technological solutions improves the ability to communicate and provide landowners better knowledge of who wants to use their property, which may reduce some of the land access barriers and reduce conflict among other hunters.

MANAGEMENT IMPLICATIONS

Understanding barriers to specific hunting and fishing activities such as waterfowl hunting can be beneficial, but barriers likely fluctuate over time reacting to game

populations and regulations. Thus, monitoring barriers to hunting on a more regular basis, across larger spatial scales, and activity types will be important for fish and wildlife management agencies to better understand the dynamic nature of barriers to hunting and fishing.

Acquiring more areas for individuals to waterfowl hunt should be a state and federal agencies, and NGO's priority to increase hunting participation. However, we understand the complexities and difficulty of acquiring more land, but there may be educational and technological solutions than state or federal agencies purchasing additional land to hunt on. Improving current public lands to allow for better access to hunters may be beneficial. Also, educating current and non-waterfowl hunters on different types of waterfowl hunting such as "pass shooting" or "jumping" may get waterfowl hunters in areas where traditional waterfowl hunters usually do not hunt. Regardless of educations and improving current public lands, agencies should have a contingency plan in place for an increase of new waterfowl hunters and areas for them to participate at.

Broadening the issue of wetland conservation to larger number stakeholders could be important in getting important regulations and funding passed through governments to provide additional wetland access for waterfowl hunting. For example Quebec, which passed legislation in 2017 conserving wetlands and bodies of water, that focused on the benefits of wetlands such as, drought prevention, flood control, and safeguarding water resources, all without mentioning hunting but provided important opportunities for hunters (The National Assembly of Québec, 2017). Building public support for waterfowl

hunting is part of the NAWMP Action Plan and is necessary for state and federal agencies and NGO's (e.g., Ducks Unlimited, Delta Waterfowl).

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TABLES

Table 2-1

Barrier types and barriers generated from national duck hunter survey (2005) and waterfowl program managers to assess barriers toward waterfowl hunting. Barrier types included: access (N = 11), cost (N = 7), rules and regulations (N = 11), social (N = 4), waterfowl hunting knowledge and skills (N = 6), and waterfowl identification and population (N = 9). The left column is the barrier type in bold and the right column is the individual barrier. Each individual was asked how limiting the individuals barrier within each barrier type that limited their ability to participate in waterfowl hunting.

Barrier Type	Barrier
Access barriers to waterfowl hunting	
	Crowding on public land
	Encounters with other hunters
	Interference by other hunters (i.e., setting up too close)
	Knowing the location of public hunting land
	Amount or availability of public land in my area
	Travel distance to a hunting area
	Travel time to a hunting area
	Knowing who to ask for private hunting land access
	Asking for private hunting land access
	Obtaining permission for private hunting land access
	Having the time to scout

Table 2-1 continued

Barrier Type	Barrier
Cost barriers to waterfowl hunting	<p>The cost of decoys</p> <p>The cost of hunting blinds</p> <p>The cost of a shotgun</p> <p>The cost of other equipment (i.e., waders, calls)</p> <p>The cost of licenses or permits or stamps</p> <p>The cost of travel (i.e., gas lodging)</p> <p>The cost to lease private land</p>
Rules and regulations barriers to waterfowl hunting	<p>Frequency of rules and regulations change</p> <p>Duck species specific bag limit (i.e., mallards)</p> <p>The number of required licenses or permits or stamps</p> <p>Knowing what license or permits or stamps I need</p> <p>Knowing the season dates in specific areas (zones) within the state</p> <p>Knowing where zone boundaries are</p> <p>Knowing when seasons open and close</p> <p>Finding information on rules and regulations</p> <p>Understanding rules and regulations</p> <p>Fear of not complying with rules and regulations</p> <p>Required use of non-toxic shot</p>
Social barriers to waterfowl hunting	<p>My community's view toward waterfowl hunting</p>

Table 2-1 continued

Barrier Type	Barrier
	The views about waterfowl hunting by an important person in my life
	Not having a family member that hunts waterfowl
	Not having a friend that hunts waterfowl
	Waterfowl hunting skills and knowledge barriers to waterfowl hunting
	Knowing how to use duck or goose decoys
	Knowing how to use a duck or goose call
	Knowing how to use a shotgun
	Physical demands of waterfowl hunting
	Knowing what equipment I need to hunt waterfowl
	Knowing how to scout
	Waterfowl identification and population barriers to waterfowl hunting
	My ability to identify waterfowl in flight
	My ability to identify female species of ducks
	My ability to identify waterfowl in hand
	Requirement to identify waterfowl
	Finding resources to aid in waterfowl identification
	The population numbers of the duck species that I am interested in where I hunt (i.e., pintail)
	The timing of waterfowl migration competes with other activities
	The number of waterfowl I may see

National Flyway Council, & Wildlife Management Institute. (2006). National duck hunter survey, 2005 national report. Minnewaska, Indiana, USA.

Table 2-2

Demographic characteristics of survey respondents based on stated activity participation types from each state included in the study. Columns indicate stated activity participation type (i.e., avid waterfowl hunter, angler). Rows indicate mean age \pm SD, proportion of respondents that were male, and proportion of respondents that were Caucasian. Each state is in bold and precedes their respective demographics. Generally, respondents were older white males with a few exceptions. Oklahoma was generally younger and had a significant Native American portion of respondents, and the angler group was more evenly split between males and female.

	Waterfowl hunters			Non-waterfowl hunters			
	Avid	Sporadic	Dissociated	Angler	Big Game	Combination user	Small game
Kansas							
Mean age SD	49 \pm 15	48 \pm 14	55 \pm 14	50 \pm 15	50 \pm 15	49 \pm 14	50 \pm 14
Proportion Male	0.97	0.96	0.97	0.62	0.76	0.91	0.96
Proportion Caucasian	0.96	0.94	0.95	0.90	0.79	0.96	1.00
Michigan							
Mean age SD	49 \pm 15	44 \pm 15	54 \pm 15	50 \pm 15	49 \pm 18	49 \pm 15	53 \pm 29
Proportion Male	0.99	0.95	0.90	0.54	-	0.87	0.33
Proportion Caucasian	0.97	0.95	0.98	0.94	1.00	0.97	1.00

Table 2-2 continued

	Waterfowl hunters			Angler	Non-waterfowl hunters		
	Avid	Sporadic	Dissociated		Big Game	Combination user	Small game user
Missouri							
Mean age SD	49 ± 14	46 ± 14	54 ± 14	47 ± 12	48 ± 16	46 ± 13	51 ± 13
Proportion Male	0.99	0.97	0.95	0.54	0.73	0.88	0.95
Proportion Caucasian	0.96	0.93	0.94	0.95	1.00	0.93	0.83
Montana							
Mean age SD	51 ± 16	47 ± 17	55 ± 14	48 ± 15	46 ± 13	45 ± 14	51 ± 17
Proportion Male	0.95	0.94	0.88	0.31	0.58	0.65	0.75
Proportion Caucasian	0.92	0.89	0.89	0.95	0.82	0.93	0.80
Nebraska							
Mean age SD	49 ± 15	47 ± 13	52 ± 13	49 ± 14	49 ± 13	48 ± 14	52 ± 17
Proportion Male	0.98	0.97	0.97	0.68	0.67	0.89	0.92
Proportion Caucasian	0.98	0.96	0.97	0.94	0.95	0.98	0.85
Oklahoma							
Mean age SD	43 ± 13	41 ± 13	45 ± 13	45 ± 12	44 ± 12	43 ± 12	42 ± 13
Proportion Male	0.98	0.95	0.97	0.32	0.75	0.77	-
Proportion Caucasian	0.86	0.86	0.97	0.76	1.00	0.76	1.00

Table 2-2 continued

	Waterfowl hunters			Angler	Non-waterfowl hunters		
	Avid	Sporadic	Dissociated		Big Game	Combination user	Small game
South Dakota							
Mean age SD	49 ± 15	47 ± 14	54 ± 13	49 ± 16	49 ± 12	47 ± 15	50 ± 12
Proportion Male	0.99	0.91	0.94	0.53	0.72	0.79	0.93
Proportion Caucasian	0.99	0.95	0.98	0.93	0.88	0.98	0.92
Wyoming							
Mean age SD	51 ± 15	47 ± 14	59 ± 11	47 ± 11	50 ± 18	49 ± 14	44 ± 19
Proportion Male	0.95	0.94	0.98	0.55	-	0.74	0.60
Proportion Caucasian	0.97	0.94	0.97	0.94	0.92	0.93	1.00

Table 2-3

The total number of individuals from the *a priori* groups across the stated activity participation types (all states combined). Columns indicate the stated activity groups and chi-square test and the rows indicate the *a priori* groupings. All p-values were < 0.01 and significant. The *a priori* groupings generally reflected individuals stated activity participation with the exception of more big and small game hunters identified within the combination user group than their *a priori* groupings.

<i>A priori</i>	Waterfowl hunters			Non-waterfowl hunters				χ^2
	Avid	Sporadic	Dissociated	Angler	Big game	Combination user	Small Game	
Avid waterfowl	1922	313	59	1	5	110	6	8616.2
Sporadic waterfowl	591	645	144	9	14	250	8	1916.5
Angler	31	47	102	313	1	276	4	923.9
Big game	87	112	215	8	75	537	4	1392.5
Combination user	144	182	245	21	23	611	7	1538.8
Small game	93	156	159	8	11	300	61	563.8

Table 2-4

Mean \pm SD for each individual barrier regardless of stated activity participation type and factor loadings from exploratory factor analysis broken into generalizable items (e.g. Regulations, Land access). Five individuals barriers were dropped from the analysis given they were not well discriminated among the factors and they included: (1) physical demands, (2) private land cost, (3) time to scout, (4) travel costs, and (5) using a gun. Rows indicate the individual barrier preceded by the barrier type in bold. The columns indicate mean \pm SD and the barrier factors. Factors in bold begin with the factor that explains the most variance (regulations) and ends with the factor that explains the least variance (views).

Barriers	Mean \pm SD	Factor Loadings									
		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10
Regulations											
Fear of not complying	1.05 \pm 1.26	0.74	0.13	0.00	-0.03	0.03	0.03	-0.01	0.07	-0.02	-0.06
Finding information	0.64 \pm 0.98	0.80	-0.03	-0.01	0.02	0.03	-0.01	0.01	-0.03	0.00	0.09
Know zone season dates	0.82 \pm 1.11	0.85	-0.05	-0.03	0.06	0.02	-0.02	0.02	-0.01	0.01	0.00
Knowing season dates	0.63 \pm 1.00	0.82	-0.05	-0.03	0.07	0.00	-0.01	0.01	-0.01	-0.01	0.06
Knowing zones	1.07 \pm 1.19	0.71	0.03	0.02	0.06	0.09	0.01	0.03	0.03	0.00	-0.01
Number of permits	0.96 \pm 1.17	0.74	-0.02	0.15	-0.07	-0.04	0.02	-0.01	0.02	0.07	-0.01

Table 2-4 continued

Barriers	Mean \pm SD	Factor Loadings									
		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10
Rule changes	0.98 \pm 1.14	0.79	-0.01	0.03	-0.06	-0.03	0.05	0.00	0.00	0.09	-0.01
Species bag limits	0.99 \pm 1.17	0.58	0.26	0.05	-0.06	-0.01	0.04	-0.02	0.01	0.05	-0.04
Understanding rules	0.84 \pm 0.11	0.82	0.08	-0.04	0.03	0.01	0.01	0.00	0.04	-0.02	-0.03
Use of steel shot	0.79 \pm 1.15	0.52	-0.05	0.10	-0.04	-0.05	0.05	-0.03	0.02	0.10	0.03
What kind of permit	0.74 \pm 1.08	0.79	0.02	0.01	0.07	-0.01	-0.02	0.03	0.02	-0.05	0.04
Waterfowl Identification											
Finding ID resources	0.73 \pm 1.03	0.15	0.54	0.01	0.07	0.03	-0.01	0.02	-0.03	0.11	0.10
ID female ducks	1.04 \pm 1.20	-0.03	0.92	0.02	-0.02	0.00	0.00	0.02	0.02	-0.01	0.00
ID flying waterfowl	1.29 \pm 1.26	0.00	0.78	0.01	0.04	0.01	0.02	-0.01	0.04	0.08	-0.06
ID male vs. females	0.96 \pm 1.19	-0.04	0.91	0.01	0.01	0.01	0.00	0.01	0.00	-0.03	0.03
ID requirement	1.06 \pm 1.19	0.10	0.78	0.00	0.00	0.01	0.00	0.00	0.02	0.08	-0.03
ID waterfowl in hand	0.82 \pm 1.12	0.03	0.74	0.01	0.11	0.00	-0.01	0.00	-0.01	-0.01	0.05
Cost											
Cost of blinds	1.50 \pm 1.30	-0.02	0.02	0.77	0.05	0.07	0.00	0.03	0.04	-0.01	-0.02
Decoy costs	1.61 \pm 1.31	-0.03	0.02	0.83	0.05	0.02	0.00	0.00	0.02	0.00	-0.05
Other equipment costs	1.47 \pm 1.25	-0.01	0.02	0.86	0.01	-0.01	0.00	0.01	0.02	0.00	0.00
Permit costs	1.04 \pm 1.17	0.26	-0.02	0.58	-0.12	-0.05	0.01	0.02	-0.04	0.04	0.08

Table 2-4 continued

Barriers	Mean \pm SD	Factor Loadings									
		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10
Shotgun cost	0.93 \pm 1.15	0.00	-0.03	0.62	0.02	0.01	0.02	-0.01	-0.08	0.01	0.14
Waterfowl Skills											
How to scout	0.90 \pm 1.16	0.00	0.03	0.00	0.78	0.04	-0.02	0.03	0.06	0.02	0.01
Using calls	1.19 \pm 1.26	-0.02	0.03	0.03	0.77	0.01	0.01	-0.01	-0.01	0.06	-0.03
Using decoys	0.97 \pm 1.17	0.02	-0.01	0.02	0.91	-0.02	0.02	-0.01	0.00	0.02	-0.02
What equipment to use	0.72 \pm 1.08	0.06	0.06	0.04	0.75	-0.02	0.01	-0.01	0.02	-0.03	0.07
Land Access											
Amount of public land	1.92 \pm 1.38	0.03	-0.01	-0.02	-0.01	0.39	0.18	0.27	-0.01	0.03	0.02
Asking for permission	2.12 \pm 1.41	0.02	0.01	0.02	-0.02	0.87	0.01	-0.01	0.00	0.01	0.02
Knowing public land location	1.43 \pm 1.31	0.15	0.07	0.01	0.11	0.37	0.03	0.19	0.02	-0.08	0.04
Obtaining permission	2.27 \pm 1.41	-0.02	-0.01	0.01	-0.03	0.85	0.05	-0.02	0.01	0.04	0.00
Who to ask for permission	2.21 \pm 1.44	0.01	0.02	0.01	0.05	0.83	-0.03	0.03	0.01	-0.01	-0.01
Other Hunters											
Crowding	2.22 \pm 1.39	-0.01	-0.03	0.01	-0.01	0.18	0.66	0.05	0.00	0.03	-0.03
Encounters	1.65 \pm 1.25	0.01	0.01	0.01	-0.01	0.00	0.78	0.01	0.00	0.00	0.03
Interference	1.82 \pm 1.33	0.00	0.00	0.00	0.02	-0.05	0.91	-0.02	0.00	-0.01	0.00
Travel											
Travel distance	1.63 \pm 1.26	0.00	0.00	0.00	0.00	0.01	0.00	0.91	-0.01	0.00	0.00

Table 2-4 continued

Barriers	Mean \pm SD	Factor Loadings									
		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10
Travel time	1.62 \pm 1.25	0.00	0.01	0.02	-0.01	-0.03	0.01	0.90	0.01	0.02	0.00
No Hunters											
Lack of family who hunt	1.13 \pm 1.38	0.01	0.00	0.01	0.00	-0.02	0.00	-0.01	0.87	-0.01	0.04
Lack of friends who hunt	1.17 \pm 1.34	0.00	-0.01	0.00	0.01	0.02	0.00	0.01	0.85	0.02	-0.01
Waterfowl Populations											
Low population numbers	1.11 \pm 1.17	0.01	0.13	0.03	0.05	0.01	0.02	0.01	-0.02	0.60	0.08
Number of waterfowl I see	1.29 \pm 1.19	0.00	-0.01	-0.02	0.06	0.05	-0.01	0.05	0.03	0.74	0.01
Timing of Migration	1.52 \pm 1.30	0.07	0.09	0.05	0.05	-0.05	0.05	0.03	0.11	0.39	-0.05
Views											
Community views	0.23 \pm 0.70	0.04	0.00	0.00	-0.01	0.04	0.03	0.02	0.02	0.05	0.66
Important person views	0.29 \pm 0.75	-0.03	0.05	0.01	0.02	-0.01	0.01	0.00	0.08	0.00	0.69

Table 2-5

Analysis of Variance (ANOVA) results for the barrier types and the effect of stated activity participation type and location on barrier types. Rows represent the different barrier factors and columns represent the independent variables (i.e., stated activity participation type and location), F-values and partial eta squared (e.g., effect size) values. Additionally, all barrier types were significant ($p < 0.01$). Effect sizes were generally negligible across all factors for location and were ranged from small to large across all type types for activity type. Partial eta squared values >0.01 are negligible, 0.01 to 0.05 are small, 0.06 to 0.13 are medium, and > 0.14 are considered large.

Barrier Type	Variable	F-value	P	η_p^2
Rules and Regulations	Activity	298.86	<0.01	0.02
	Location	46.56	<0.01	0.00
Waterfowl Identification	Activity	798.25	<0.01	0.09
	Location	36.83	<0.01	0.00
Cost	Activity	100.21	<0.01	0.01
	Location	31.63	<0.01	0.01
Waterfowl Hunting Skills	Activity	611.17	<0.01	0.11
	Location	12.74	<0.01	0.00
Land Access	Activity	67.86	<0.01	0.01
	Location	33.90	<0.01	0.01
Other Hunters	Activity	102.31	<0.01	0.02
	Location	23.87	<0.01	0.00
Travel	Activity	44.63	<0.01	0.02
	Location	31.38	<0.01	0.01
No Hunters	Activity	239.51	<0.01	0.09
	Location	7.99	<0.01	0.00
Waterfowl Population Views	Activity	18.21	<0.01	0.00
	Location	16.09	<0.01	0.00
Views	Activity	23.95	<0.01	0.01
	Location	2.95	<0.01	0.00

Table 2-6

Barrier type means \pm SD for each barrier type (i.e., Land access, Views) across different stated activity participation groups. Rows indicate the barrier types and columns indicate the stated activity participation type. Superscripts next to mean values indicate similarities within the respective row across the stated activity participation types. Superscripts only represent the barrier types including: (1) no hunters, (2) waterfowl identification, and (3) waterfowl hunting skills, which all had an effect size value > 0.05 (Table 2-5).

Barrier Types	Mean \pm SD						
	Waterfowl hunters			Non-waterfowl hunters			
	Avid	Sporadic	Dissociated	Angler	Big Game	Combination user	Small Game
Rules and Regulations	0.66 \pm 1.00	0.92 \pm 1.14	1.02 \pm 1.19	0.93 \pm 1.22	1.02 \pm 1.26	1.02 \pm 1.22	0.98 \pm 1.12
Waterfowl Identification	0.57 \pm 0.88 ^e	0.98 \pm 1.10 ^d	1.05 \pm 1.14 ^{cd}	1.28 \pm 1.41 ^b	1.21 \pm 1.30 ^{bc}	1.48 \pm 1.36 ^a	1.09 \pm 1.16 ^{bcd}
Cost	1.12 \pm 1.15	1.39 \pm 1.25	1.40 \pm 1.29	1.33 \pm 1.38	1.30 \pm 1.33	1.49 \pm 1.36	1.39 \pm 1.28
Waterfowl Hunting Skills	0.52 \pm 0.88 ^c	0.94 \pm 1.09 ^b	0.92 \pm 1.10 ^b	1.50 \pm 1.49 ^a	1.06 \pm 1.23 ^b	1.45 \pm 1.33 ^a	1.41 \pm 1.25 ^a
Land Access	2.00 \pm 1.40	2.17 \pm 1.36	2.07 \pm 1.41	1.48 \pm 1.48	1.79 \pm 1.46	1.90 \pm 1.46	1.91 \pm 1.41
Other Hunters	2.10 \pm 1.29	2.00 \pm 1.29	1.91 \pm 1.33	1.34 \pm 1.42	1.65 \pm 1.45	1.67 \pm 1.38	1.50 \pm 1.32
Travel	1.64 \pm 1.20	1.79 \pm 1.22	1.82 \pm 1.30	1.13 \pm 1.30	1.50 \pm 1.33	1.48 \pm 1.30	1.57 \pm 1.24

Table 2-6 continued

Barrier Types	Waterfowl hunters			Non-waterfowl hunters			
	Avid	Sporadic	Dissociated	Angler	Big Game	Combination user	Small Game
No Hunters	0.68 ± 1.06 ^d	1.12 ± 1.29 ^c	1.38 ± 1.39 ^{bc}	1.41 ± 1.53 ^b	1.28 ± 1.39 ^{bc}	1.66 ± 1.51 ^a	1.44 ± 1.41 ^{bc}
Waterfowl Populations	1.22 ± 1.17	1.41 ± 1.21	1.32 ± 1.22	1.16 ± 1.34	1.26 ± 1.34	1.38 ± 1.31	1.21 ± 1.21
Views	0.22 ± 0.62	0.25 ± 0.66	0.26 ± 0.72	0.52 ± 1.07	0.49 ± 0.99	0.31 ± 0.81	0.28 ± 0.64

Table 2-7

Individual barrier means from all the barrier types (Table 2-6). Rows indicate the individual barriers preceded by barrier factors in bold. Columns indicate the stated activity participation type along with the F-values and partial eta squared (e.g., effect size) values. Asterix next to F-value indicates p-value < 0.05. Superscripts next to mean values indicate similarities within the respective row across the stated activity participation types. Superscripts only represent the individual barriers that had an effect size value > 0.05. Effect sizes were largest within the waterfowl hunting skills barriers. Avid waterfowl hunters were generally not similar to any other group and rated the individual barriers the lowest among barriers with superscripts. Anglers and combination users were generally similar and rated the individuals barriers the greatest among barriers with superscripts. There was variation within the similarities between the sporadic, dissociated, big game and small game users. Partial eta squared values >0.01 are negligible, 0.01 to 0.05 are small, 0.06 to 0.13 are medium, and > 0.14 are considered large.

Barrier	Mean Values							F-value	η_p^2
	Waterfowl hunters			Non-waterfowl hunters					
	Avid	Sporadic	Dissociated	Angler	Big Game	Combination user	Small Game		
Rules and Regulations									
Fear of not complying	0.78±1.09	1.13±1.28	1.25±1.33	1.14±1.39	1.16±1.32	1.25±1.36	1.08 1.17	37.02*	0.03
Finding information	0.51±0.89	0.68±0.96	0.72±1.00	0.76±1.12	0.79±1.14	0.74±1.06	0.73 1.00	14.67*	0.01

Table 2-7 continued

Barrier	Mean±SD							F-value	η_p^2
	Waterfowl hunters			Non-waterfowl hunters					
	Avid	Sporadic	Dissociated	Angler	Big Game	Combination user	Small Game		
Know zone season dates	0.63±0.98	0.87±1.11	0.95±1.15	0.96±1.24	1.03±1.24	0.94±1.19	0.95 1.05	23.36*	0.02
Knowing season dates	0.45±0.84	0.66±1.01	0.72±1.06	0.81±1.15	0.84±1.16	0.77±1.10	0.81 1.02	28.22*	0.02
Knowing zones	0.80±1.05	1.09±1.18	1.24±1.21	1.20±1.34	1.22±1.29	1.30±1.26	1.29 1.18	43.29*	0.03
Number of permits	0.75±1.07	1.04±1.19	1.17±1.24	0.96±1.22	0.98±1.23	1.09±1.22	0.96 1.09	25.18*	0.02
Rule changes	0.83±1.04	1.06±1.13	1.17±1.21	0.90±1.14	1.13±1.33	1.07±1.20	1.05 1.09	16.96*	0.01
Species bag limits	0.76±1.02	1.09±1.15	1.14±1.19	0.89±1.23	1.11±1.30	1.18±1.29	1.08 1.22	32.24*	0.02
Understanding rules	0.60±0.94	0.88±1.10	0.96±1.15	0.96±1.22	1.01±1.25	1.05±1.23	1.00 1.05	39.15*	0.03
Use of non-toxic shot	0.65±1.08	0.83±1.15	1.03±1.27	0.69±1.10	1.00±1.30	0.84±1.16	0.91 1.19	15.77*	0.00
What kind of permit	0.45±0.85	0.77±1.08	0.89±1.11	0.92±1.21	0.99±1.29	1.00±1.21	0.88 1.14	61.33*	0.04
Waterfowl Identification									
Finding ID resources	0.88±0.80	1.24±0.96	1.13±0.98	1.03±1.29	1.04±1.22	1.11±1.19	1.02±1.10	16.29*	0.01
ID female ducks	0.89±0.89	0.86±1.16	0.93±1.10	1.26±1.46	0.94±1.28	0.96±1.38	0.76±1.24	6.47*	0.00
ID flying waterfowl	0.86±1.00 ^c	1.43±1.23 ^b	1.35±1.17 ^b	1.46±1.43 ^b	1.38±1.38 ^b	1.77±1.41 ^a	1.20±1.24 ^{bc}	117.52*	0.08
ID male vs. females	0.50±0.83 ^c	1.02±1.14 ^b	0.92±1.10 ^b	1.34±1.45 ^a	1.23±1.33 ^{ab}	1.52±1.37 ^a	1.09±1.22 ^{ab}	170.92*	0.12

Table 2-7 continued

Barrier	Mean±SD							F-value	η_p^2
	Waterfowl hunters			Non-waterfowl hunters					
	Avid	Sporadic	Dissociated	Angler	Big Game	Combination user	Small Game		
ID requirement	0.65±0.93 ^c	1.19±1.15 ^b	1.07±1.12 ^b	1.22±1.37 ^b	1.28±1.33 ^{ab}	1.52±1.36 ^a	1.27±1.24 ^{ab}	118.70*	0.08
ID waterfowl in hand	0.38±0.70 ^d	0.85±1.04 ^c	0.76±1.00 ^{bc}	1.30±1.41 ^a	1.13±1.24 ^{ab}	1.40±1.34 ^a	1.01±1.18 ^{abc}	205.20*	0.14
Costs									
Cost of blinds	1.22±1.19	1.60±1.27	1.63±1.31	1.45±1.47	1.48±1.39	1.80±1.35	1.79±1.40	45.29*	0.03
Decoy costs	1.34±1.22	1.74±1.27	1.71±1.31	1.42±1.42	1.53±1.36	1.88±1.38	1.63±1.31	39.60*	0.03
Other equipment costs	1.25±1.13	1.53±1.21	1.56±1.27	1.49±1.37	1.52±1.37	1.70±1.35	1.60±1.27	29.28*	0.02
Permit costs	0.88±1.08	1.13±1.21	1.24±1.22	1.03±1.21	1.04±1.23	1.11±1.21	1.02±1.03	16.49*	0.01
Shotgun cost	0.89±1.06	0.93±1.11	0.86±1.14	1.26±1.39	0.94±1.20	0.96±1.24	0.76±1.02	6.47*	0.00
Waterfowl Hunting Skills									
How to scout	0.47±0.82 ^d	0.89±1.09 ^c	0.85±1.02 ^c	1.56±1.53 ^a	1.01±1.23 ^{bc}	1.42±1.33 ^{ab}	1.42±1.30 ^{ab}	174.10*	0.12
Using calls	0.82±1.07 ^b	1.17±1.21 ^a	1.30±1.20 ^a	1.48±1.48 ^a	1.14±1.28 ^{ab}	1.59±1.36 ^a	1.59±1.31 ^a	85.17*	0.06
Using decoys	0.52±0.84 ^c	0.95±1.05 ^b	0.99±1.07 ^b	1.49±1.47 ^a	1.15±1.22 ^{ab}	1.50±1.33 ^a	1.31±1.22 ^{ab}	175.60*	0.12
What equipment to use	0.27±0.65 ^d	0.67±0.97 ^c	0.62±0.93 ^c	1.48±1.51 ^a	0.93±1.18 ^{bc}	1.28±1.28 ^a	1.20±1.25 ^{ab}	239.90*	0.16
Land Access									
Amount of public land	2.01±1.36	2.13±1.30	2.01±1.37	1.23±1.35	1.75±1.43	1.74±1.39	1.74±1.36	29.68*	0.02

Table 2-7 continued

Barrier	Mean±SD							F-value	η_p^2
	Waterfowl hunters			Non-waterfowl hunters					
	Avid	Sporadic	Dissociated	Angler	Big Game	Combination user	Small Game		
Asking for permission	2.18±1.37	2.30±1.32	2.18±1.40	1.55±1.50	1.94±1.52	2.00±1.48	1.98±1.41	17.58*	0.01
Knowing public land location	1.25±1.22	1.48±1.27	1.52±1.33	1.39±1.44	1.51±1.40	1.58±1.38	1.66±1.36	15.45*	0.01
Obtaining permission	2.37±1.37	2.53±1.32	2.36±1.40	1.50±1.50	1.87±1.43	2.06±1.48	2.00±1.50	37.89*	0.03
Who to ask for permission	2.20±1.40	2.43±1.35	2.28±1.41	1.75±1.58	1.89±1.53	2.11±1.50	2.24±1.44	14.16*	0.01
				Other Hunters					
Crowding	2.44±1.33	2.34±1.32	2.29±1.32	1.45±1.47	1.94±1.47	1.99±1.43	1.80±1.42	43.52*	0.03
Encounters	1.81±1.19	1.75±1.21	1.65±1.26	1.26±1.37	1.50±1.36	1.44±1.29	1.30±1.28	26.73*	0.02
Interference	2.05±1.28	1.91±1.27	1.80±1.33	1.29±1.41	1.50±1.49	1.59±1.35	1.44±1.28	37.96*	0.03
				Travel					
Travel distance	1.64±1.20	1.81±1.23	1.83±1.29	1.12±1.30	1.50±1.35	1.48±1.31	1.54±1.26	22.80*	0.02
Travel time	1.64±1.19	1.78±1.21	1.82±1.30	1.14±1.30	1.50±1.32	1.47±1.29	1.60±1.27	21.86*	0.02
				No Hunters					
Lack of family who hunt	0.65±1.07 ^d	1.34±1.41 ^c	1.09±1.30 ^{bc}	1.43±1.55 ^{ab}	1.33±1.44 ^{bc}	1.67±1.54 ^a	1.36±1.42 ^{abc}	127.80*	0.09

Table 2-7 continued

Barrier	Mean±SD							F-value	η_p^2
	Waterfowl hunters			Non-waterfowl hunters					
	Avid	Sporadic	Dissociated	Angler	Big Game	Combination user	Small Game		
Lack of friends who hunt	0.72±1.06 ^c	1.41±1.38 ^b	1.15±1.27 ^b	1.39±1.52 ^b	1.24±1.35 ^b	1.64±1.48 ^a	1.44±1.42 ^{ab}	111.50*	0.08
Waterfowl Populations									
Low population numbers	1.01±1.09	1.16±1.13	1.09±1.12	1.14±1.34	1.27±1.38	1.24±1.28	1.05±1.21	8.91*	0.00
Number of waterfowl I see	1.27±1.17	1.41±1.16	1.28±1.16	1.18±1.32	1.09±1.29	1.28±1.23	1.09±1.17	3.87*	0.00
Timing of Migration	1.39±1.22	1.68±1.26	1.60±1.32	1.17±1.39	1.43±1.33	1.61±1.37	1.40±1.27	14.77*	0.01
Views									
Community Views	0.24±0.64	0.25±0.66	0.24±0.69	0.46±1.01	0.45±0.91	0.27±0.73	0.21±0.58	7.02*	0.00
Important person views	0.21±0.60	0.25±0.66	0.28±0.74	0.58±1.14	0.52±1.07	0.35±0.88	0.36±0.70	19.36*	0.01

FIGURES

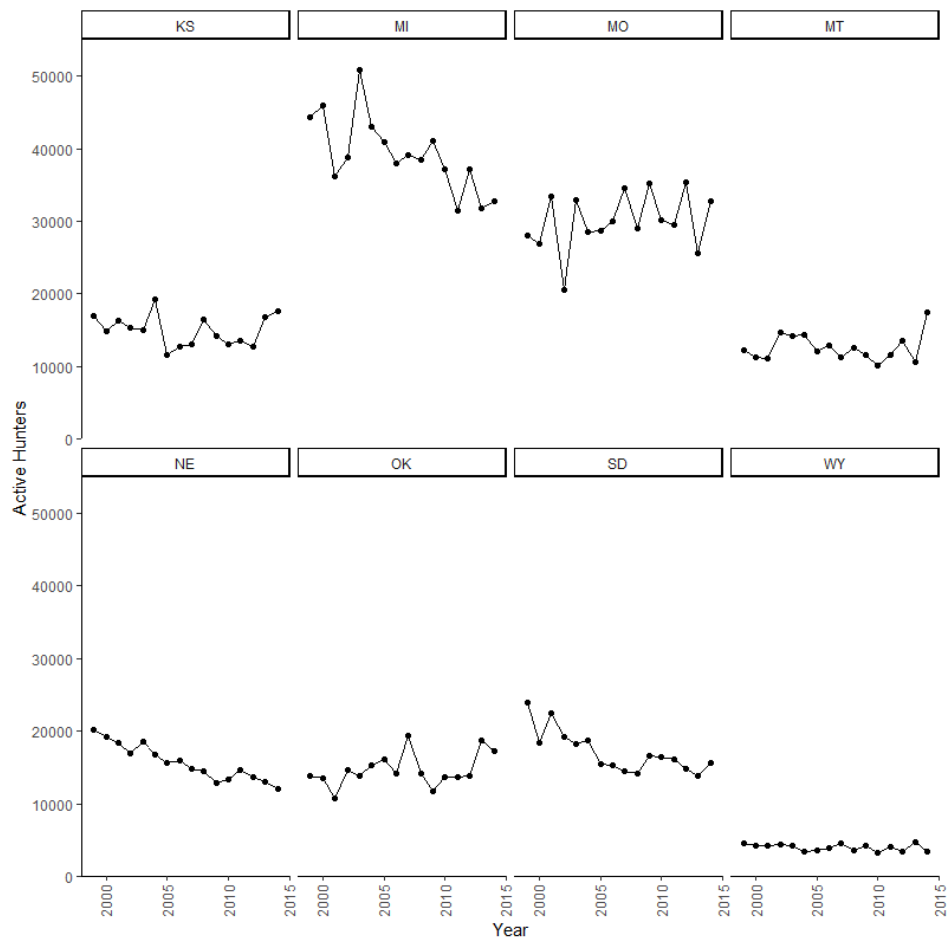


Figure 2-1:

Variation in waterfowl hunting participation across states within the study area between 1999 and 2014. Data was acquired from the Central and Mississippi flyway reports (Fronczak, 2016; Kruse, 2015). Some states are showing increasing (Missouri, Montana, Oklahoma), decreasing (Michigan, Nebraska, South Dakota), and stable (Kansas, Wyoming) participation rates. Each dot represents a specific year all, each connected by a line. The Y-axis represents the total number of active participants and the X-axis represents the year.

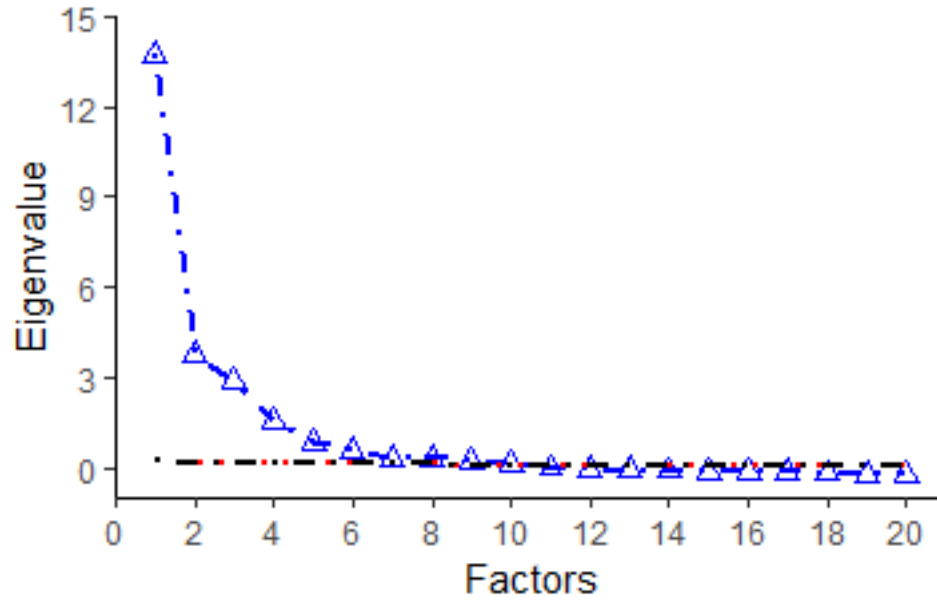


Figure 2-2

Parallel analysis scree plot from the barrier exploratory factor analysis. Blue line with a triangle is the factor analysis actual data, the red dot line is the simulated data, and the black dash and dot line is the resampled data. The y-axis represents the eigenvalues and the x-axis represents the number of factors. There are ten factors in the “Factor Analysis” parallel analysis lie above the corresponding simulated data line suggesting a ten factor solution.

CHAPTER 3: HOW TO INCREASE WATERFOWL HUNTING PARTICIPATION? AN ANALYSIS OF MULTIPLE SCENARIOS

INTRODUCTION

The motivations for individuals participating in hunting and fishing are diverse, just like the hunter and anglers themselves (Arlinghaus, Bork, & Fladung, 2008; Watkins, Poudyal, Caplenor, Buehler, & Applegate, 2018). The strength of the influence of factors that motivate hunters and anglers varies across activity type. In an assessment of motivations among hunters and anglers in the central United States, consumption related motivations were of high importance to big game hunters and less important to anglers, small game, and waterfowl hunters (Chapter 1). Although there is some variation among motivations between those that participate in hunting and fishing activities, there are also strong commonalities (More 1973, Enck et al. 1993, Gigliotti 2000, Finn and Loomis 2001, Schroeder et al. 2006a, Beardmore et al. 2011, Chapter 1). Motivation factors that include nature (e.g., spending time outdoors) or social (e.g., spending time with companions) are frequently rated as the most important motivations for individuals participating in hunting and fishing activities. While nature related motivations were of high importance to all activity types, the strength of that importance varied. For example, big game and waterfowl hunters rated nature motivations stronger than anglers and small game hunters (Chapter 1). Further, social related motivations were of high importance to waterfowl hunters and less important to anglers, big game, and small game hunters. In addition, there are commonalities among why individuals participate across states. For example, big game hunters are similarly motivated whether they hunt in Nebraska,

Montana, or Oklahoma (Chapter 1). As such, motivations to hunt and fish appear to be fairly generalizable across hunting and fishing activities and locations.

Similar to motivations, the strength of the influence of factors that prevent individuals from participating varies across hunting and fishing activities. In an assessment of barriers to waterfowl hunting among hunters and anglers in the central United States, the barriers consisting of: lack of family and friends who hunt, waterfowl identification (e.g., identifying flying waterfowl, identifying female ducks), and waterfowl hunting skills (e.g., using duck and goose calls and decoys) varied among hunters and anglers (Chapter 2). Individuals who participated in waterfowl hunting considered the barriers less limiting compared to non-waterfowl hunters, who generally considered the barriers more limiting. Although there is variation in waterfowl hunting barriers between those who participate in hunting and fishing, there were similarities among them (Enck et al. 1993, Schroeder et al. 2012, Chapter 2). Barriers that included land access (e.g., amount of public land, private land access) and other hunters (e.g., encounters or interference with other hunters) were strongly rated across all hunters and anglers. In addition, there are commonalities among barriers specific to waterfowl hunting across states. For example, barriers that included the social views of others, the number of waterfowl observed, travel distance to hunting areas, and complex rules and regulations were similar regardless of where an individual lives (Chapter 2). As such, broad barriers toward waterfowl hunting such as land access, appear to be fairly universal among hunters and anglers and locations within the central United States.

With similarities among motivations and barriers to waterfowl hunting, it begs the question, why are more individuals not participating in waterfowl hunting? Recent

information indicates that waterfowl hunting participation continues to decline at the national level (Bureau of the Census & United States Fish and Wildlife Service, 2018). While there has been a decline in waterfowl hunters nationally, there has been variation in the trends of waterfowl hunting participation among states (Fronczak, 2016; Kruse, 2015) (Figure 2-1). The variation among states in waterfowl hunting participation illustrates a perplexing dilemma to waterfowl managers. If hunters and anglers are largely motivated to participate in hunting and fishing activities similarly and they generally perceive barriers similarly, why do we continue to observe variable trends in waterfowl participation?

MENTORING

Recently, state agencies and non-governmental organizations (NGOs) such as Pheasants Forever have created programs and opportunities to recruit new hunters (D.J. Case and Associates, 2009). Programs such as youth mentor hunts, becoming an outdoors woman, and youth outdoor skills camps have been implemented to add a social component to hunting and build a mentor/mentee relationship (Ryan & Shaw, 2011). While a majority of efforts have been placed on promoting youth into hunting, evidence suggests these programs are attracting individuals who would already be introduced to hunting through family or friends (Ryan & Shaw, 2011). Wentz and Seng (2000) suggested education that teaches an individual to become a hunter instead of going hunting is more vital to an individual's acceptance of hunting. Identifying as a hunter suggests that an individual perceives themselves as part of a unique culture, which requires support of individuals with established hunter identities (Ryan & Shaw, 2011). Additionally, education that promotes an individual to become a hunter requires current

hunters to take on the role of mentoring new hunters. To be successful in recruiting new hunters, the mentor and mentee need to participate in multiple activities to allow the mentee the ability to build a network of other hunters to remain engaged in the hunting culture (D.J. Case and Associates, 2009).

RANKING

Promoting participation in physical activities, such as hunting and fishing, is likely to be more productive if the needs and interests of the targeted groups are addressed (Green & Kreuter, 1990). Knowledge of the specific activity being promoted and potential barriers that may prevent participation in the activity is important prior to developing different scenarios to address lack of participation (Booth, Bauman, Owne, & Gore, 1997). One way to understand the needs and interests of individuals is through stated preferences assessments. Stated preference approaches capture what an individual preferences that could not be made from direct observations (Hendee, Gale, & Catton, 1971). While stated preferences have been used extensively in the marketing literature (Batsell & Louviere, 1991), they have increasingly been used in leisure sciences and natural resource management literature. Lyon and Vaske (2010) used stated preferences to predict hunting participation in states with chronic wasting disease (CWD). They used six hypothetical scenarios depicting increased CWD levels and human death to identify what would influence a deer hunters change in hunting behavior. Bullock et al. (1998) analyzed Scotland deer hunters using stated preferences to understand potential alternative hunting packages to benefit both the hunters and the environment. They found hunters would prefer to have one chance a day to harvest a deer that is light (i.e., less than

8-points), hunters do not want other activity options combined with the hunt, and that they want the hunt to take place in the high open mountains. We used a stated preference approach and partial rankings to identify potential scenarios that would increase waterfowl participation among waterfowl and non-waterfowl hunters in the central United States. There were three primary objectives of this study: (1) understand how each scenario (Table 3-1) would decrease, increase, or neither increase or decrease participation in waterfowl hunting among waterfowl hunters (i.e., avid, sporadic, and dissociated) and non-waterfowl hunters and anglers (i.e., anglers, big and small game hunters, and combination users); (2) identify which scenario would rank highest between waterfowl hunters (i.e., avid, sporadic, and dissociated) and non-waterfowl hunters and anglers (i.e., anglers, big and small game hunters, and combination users); and (3) identify who a non-waterfowl hunter would be willing to accept as a waterfowl hunting mentor.

HYPOTHESES

H₁: Results from the 2018 National Duck Hunter survey (Slagle & Dietsch, 2018a, 2018b) found that current duck hunters want a high quality hunt.

Therefore, we hypothesize the scenario that will provide areas for a high-quality hunt to be highly ranked among current waterfowl hunters.

H₂: Waterfowl identification can be difficult for non-participants and even among current waterfowl hunters. The perceived barriers involving waterfowl identification among the non-waterfowl hunters were rated stronger than current

waterfowl hunters (Chapter 2). Therefore, we hypothesize the scenarios aimed at relaxing the waterfowl identification requirement with a smaller bag limit will be ranked highly among non-waterfowl hunters and ranked low among current waterfowl hunters.

METHODS

STUDY SYSTEM

This study consisted of hunters and anglers across eight states in the Central and Mississippi Flyways (Chapter 1, Figure 1-1). States within each flyway were approached to determine interest in participating in a multi-state survey to better understand constituent motivations and what may limit or prevent the hunters and anglers from participating in waterfowl hunting. States that wished to participate in the study were required to have electronic license systems (ELS) that contained email addresses, license and stamp types, permit year, and birth year. License type and purchase year was needed to develop purchase histories and birth year was needed to comply with the University of Nebraska Institution Review Board (IRB) age requirements. Participating states and the University of Nebraska signed data sharing agreements with each individual state to ensure data security and appropriate use of data. All protocols and survey instruments were approved by the University of Nebraska-Lincoln Institutional Review Board (IRB Approval #: 20160215880 EX).

We developed six *a priori* groups based on license, permit, and stamp purchase histories between 2012 – 2016 for each state (Chapter 1, Table 1-1). The *a priori* groups

consisted of anglers (i.e., only purchased a fishing license between 2012 and 2016), big game hunters only (i.e., only purchased a big game license between 2012 and 2016), combination users (i.e., purchased a combination of licenses between 2012 and 2016), small game hunters only (i.e., only purchased a small game hunting license between 2012 and 2016) and waterfowl hunters (i.e., purchased the required combination of licenses and state stamps between 2012 and 2016). Waterfowl hunters were then broken down into two different classifications based on frequency they purchased the correct combination of licenses and stamps. Federal waterfowl stamps were not considered in breakdown because this information did not exist in state ELS. Avid waterfowl hunters (i.e., purchased the appropriate licenses and stamps four or more times between 2012-2016) and sporadic waterfowl hunters (i.e., purchased the appropriate licenses and stamps one to three times between 2012-2016).

DATA COLLECTION

SURVEY

A stratified random sample of up to 2,000 individuals were drawn from the six *a priori* groups in each state. Some groups did not allow us to draw 2,000 individuals; in those cases, we drew the entire sample (Chapter 1, Table 1-2). A total of 88,613 individuals were selected to be included in the survey. Hunters and anglers were sent an email invitation (Appendix B) to an online survey (Appendix C) created with Qualtrics. The survey link was active between May to June 2018 and again from August – September 2018. The survey was opened during the two periods to maximize the number of respondents to the survey. Email reminders (Appendix D) sent on Mondays and

Wednesdays mornings at 6:00 am central time to all non-respondents starting one week after initial invitation. A total of four reminders were sent between May and June 2018 and three reminders were sent between August and September 2018.

SCENARIOS

A series of questions asked whether the respondent would increase, decrease, or neither increase nor decrease their participation in waterfowl hunting based on ten scenarios. Scenarios included items such as easing restrictions on waterfowl identification regulations, providing better areas for a quality hunt, and reducing license costs for new or inexperienced hunters (Table 3-1). The respondent was asked to rank their top three preferences (i.e., incomplete rank) among the ten scenarios, that if implemented, would increase participation in waterfowl hunting. Scenarios were developed with input from waterfowl managers in the Central and Mississippi flyway. Each scenario was selected based on the ability to potentially be implemented by state agencies or was suggested by waterfowl program managers in each participating state. Each respondent was provided the scenarios in a random order to prevent being influenced by the scenario order (i.e., primacy and recency effects).

MENTORING

A series of questions asked whether or not a non-waterfowl hunter would be likely to accept a mentor for waterfowl hunting. The respondent was asked, "If you were to go waterfowl hunting for the first time, how likely would you be willing to hunt with a

mentor who is a ...” There were five different mentors provided: family, friend, co-worker, agency personnel, or a stranger. The respondent would then select how likely they would be willing to hunt with each mentor type from not at all likely (1) to very likely (5). If an individual selected they were not likely to accept one of the five mentors, they were asked a follow up question to understand why they did not want to accept the mentor. The question was “If you are not willing to have a person as a mentor, why?” and the respondent was could choose among the following: feeling uncomfortable, would rather focus on other activities, do not want to be seen failing, do not feel I need a mentor, or other. If other was selected, the respondent could provide an answer.

DEFINING ACTIVITY GROUPS

While we sampled from the six *a priori* groups, we based analyses on individual’s stated activity participation rather than a revealed preference (i.e., license sales). We focused on stated activity participation because our data was limited to 2012 and 2016 (i.e., respondents could have participated prior to this window) and resident permits (i.e., could participate in other activities another state). In addition, purchasing a permit does not guarantee how much or if they participated in the activity. By allowing an individual to state what they have participated in and how frequently, allows for a more accurate representation of individuals participation patterns (Hendee et al., 1971). Further, this approach allowed us to distinguish individuals who used to participate in waterfowl hunting but no longer do (i.e., dissociated waterfowl hunter), which was an important component to distinguishing real and perceived barriers to waterfowl hunting.

Each respondent was asked “What activities have you ever participated in?” and they could choose multiple options such as big game hunting, fishing, non-waterfowl migratory bird hunting, small and upland game hunting, and waterfowl hunting. The activities selected determined the groups that individuals were assigned to. For example, individuals who selected only small game hunting were placed in a small game hunter group, whereas individuals who selected fishing and big game hunting was placed in the combination group. Additionally, if an individual selected waterfowl hunting, they were considered a waterfowl hunter despite any additional activities they may have participated in. Each respondent was then asked, “Between 2012-2016, how many years did you purchase the required licenses, permits, or stamps?” for all the activities they had specified to the previous question. We used this question to categorize the individual into one of three types of waterfowl hunters: (1) avid waterfowl hunters participated 4 or more years; (2) sporadic waterfowl hunters participated 1-3 years; or (3) dissociated waterfowl hunters participated 0 years during 2012-2016. Individuals who selected non-waterfowl migratory bird hunting were grouped into a small and upland game hunting group.

DATA ANALYSIS

To compare demographics between the respondents of the survey and the non-respondents, we evaluated relative non-response bias in age using methods described by Callegaro et al. (2015). Non-response bias is the difference between the expected value estimate based on respondents and the true value for population characteristics (e.g., average age). Relative non-response bias is the proportion of the population characteristic of interest that the bias represents (Callegaro et al. 2015). Relative non-response bias is

calculated by calculating the difference in mean of the value of interest from respondents and from non-respondents. The difference is multiplied by proportion of non-respondents relative to respondents and then the value of interest is divided by the mean of the entire sample population. Standard relative non-response benchmarks are between 5% and 10% (Callegaro et al. 2015).

We used descriptive statistics to understand the demographics of the individuals. We first took all respondents who selected a stated activity participation type and linked their unique identification (ID) number to the electronic license database to have their age. We then took the survey responses for gender and ethnicity and linked the responses by the unique ID number. We filtered out all individuals who did not complete the gender and ethnicity section. Then we grouped the data by state and stated activity participation type. We then calculated the mean age and standard deviation for across all states and stated activity participation type. Next, we summarized and totaled all respondents gender and ethnicity choices across all states and preferred activity type and divided by the total number of respondents by state and stated activity participation type.

To compare the respondents stated activity participation based on their *a priori* grouping we used a chi-squared analysis. We first filtered out all individuals who did not select a stated activity participation. Then we used the respondents unique ID number and linked their stated activity participation with the sampling frame, which contained the respondents *a priori* group. We then grouped all the respondents based off their *a priori* groupings and summarized the total number of respondents from each *a priori* group based on their selected stated activity participation.

We used descriptive statistics to understand how the ten scenarios would influence participation (i.e., increase, decrease, neither) in waterfowl hunting. We first removed all individuals did not respond to at least one question (N = 7,915). We then gathered all the data and grouped by the scenario, stated activity (i.e., avid, big game hunter), and the response (i.e., increase, decrease participation). We then summarized the total counts for each response given the activity and scenario.

To quantify the ranking data, we first removed all individuals who did not select at minimum one top choice. Further, if they selected more than three options we only considered their top three (N = 5,958). We then took each individual and placed a “NA”, “1”, “2”, or “3” in the column and row that corresponded with the scenario they ranked (e.g., 1,2,3) or did not rank (e.g., NA). A matrix was created with the row names consisting of the unique identifiers and the column names consisting of the different scenarios using R (R Core Team, 2018) for each activity type (i.e., avid, sporadic, angler), separately. We estimated the median rankings of the scenarios for each activity using the FASTcons function in ConsRank package (D’Ambrosio, Amodio, & Mazzeo, 2017). The ConsRank package provides algorithms to calculate median or consensus rankings with weak and partial ranking data (Amodio, D’Ambrosio, & Siciliano, 2016). Further, the FASTcons algorithm always returns at least one solution in the ranking (Amodio et al. 2016). However, it is possible that be multiple solutions among the ranks could be found. If more than one solution was found, we presented all solutions for the scenario.

We used descriptive statistics to understand who a non-waterfowl hunter would be willing to accept as a mentor for waterfowl hunting and if not willing, the reason why.

We filtered out all individuals who did not complete the mentor section ($N = 2,646$). Next, we grouped by the type of mentor, and the response (i.e., likely, very likely). We calculated the total respondents for each mentor type, then we calculated the total for each response given the mentor type and calculated the percentage of respondents who selected each response. We did the same thing for each respondent who selected they were not willing to accept a mentor ($N = 1,708$).

RESULTS

SURVEY RESULTS

Of the 88,613 survey invitations emailed to participants, 7,797 emails bounced (i.e., the recipient did not receive the invitation) and a total of 17,120 individuals responded to the survey, resulting in an adjusted response rate of 21%. Of the 17,120 that responded to the survey, 5,958 agreed to participate in the survey and completed all the relevant questions to assess future waterfowl hunting opportunities section.

RELATIVE NON-RESPONSE BIAS

The average age (\pm SD) of the survey respondents ranged between 40 ± 13 years and 54 ± 16 years. Respondent age was greater than the average age of the non-respondents, and the sample population (Chapter 1, Table 1-3). There were two exceptions to this in Montana. In Montana, the average age of big game hunters was the same (45 ± 14 years) across the survey respondents, non-respondents, and sample population. The average age of Montana small game hunters of the survey respondents

(47 ± 12 years) was less than that of the non-respondents (48 ± 14 years) but the same as the sample population (47 ± 14 years). Relative non-response bias varied across the groups and states. For example, avid waterfowl hunters ranged from (2 to 14%), sporadic waterfowl hunters ranged from (2 to 13%), anglers ranged from (4 to 16%), big game hunters ranged from (0 to 14%), combination users ranged from (2 to 18%), and small game hunters ranged from (-2 to 15%) (Chapter 1, Table 1-3).

DEMOGRAPHICS

Overall, respondents among the stated activity types in each state were predominately older, white males (Chapter 2, Table 2-2). Depending on the state, avid waterfowl hunters average age (mean \pm SD) ranged between 42 ± 13 to 51 ± 15 and the proportion of males and Caucasians ranged between 95 and 99% and 86 and 98%, respectively. The sporadic waterfowl hunters average age ranged between 41 ± 13 to 48 ± 14 and the proportion of males and Caucasians ranged between 91 and 97% and 86 and 95%, respectively. The dissociated waterfowl hunters average age ranged between 44 ± 13 to 59 ± 11 and the proportion of males and Caucasians ranged between 88 and 98% and 89 and 98%, respectively. The anglers average age ranged between 45 ± 12 to 54 ± 15 and the proportion of males and Caucasians ranged between 31 and 62% and 76 and 95%, respectively. The big game hunters average age ranged between 44 ± 12 to 49 ± 18 and the proportion of males and Caucasians ranged between 58 and 76% and 79 and 100%, respectively. The combination users average age ranged between 42 ± 12 to 49 ± 14 and the proportion of males and Caucasians ranged between 65 and 91% and 76 and

99%, respectively. Finally, the small game hunters average age ranged between 42 ± 13 to 53 ± 29 and the proportion of males and Caucasians ranged between 33 and 96% and 80 and 100%, respectively.

STATED ACTIVITY PREFERENCES

In general, the *a priori* groupings reflected the stated activities of the individuals (Chapter 2, Table 2-3). For example, 80% of avid waterfowl hunters were defined as an avid waterfowl hunter based on their stated activity participation. For sporadic waterfowl hunters, anglers, and combination users most ($> 39\%$) were defined similarly based on their stated activity participation. Big game and small game hunters were defined as combination users more often (52% and 38%, respectively) than their *a priori* selected category.

SCENARIO PARTICIPATION INFLUENCES

Of the scenarios provided, all respondents, regardless of activity type, were likely to increase participation or not change their current participation of waterfowl hunting (Table 3-2). Avid waterfowl hunters had a greater likelihood than other activities to decrease participation (36%) if any scenarios suggesting a decreased bag limit with no waterfowl identification were implemented.

RANKING SCENARIOS

Results from the consensus ranking provided at least one solution for every activity type and in some instances, there were two solutions (i.e., dissociated waterfowl hunters and anglers) or three solutions (i.e., big game hunters). Results from ranking the scenarios indicated “someone to take me hunting” and “an area that provides a high-quality hunt” were ranked in the top three across all activity types (Table 3-3). Current waterfowl hunters (avid and sporadic) and small game hunters rated an area that provides a quality hunt as their number one choice. Whereas, their second choice was someone to hunt and no identification of species with a smaller bag limit, respectively. Dissociated waterfowl hunters, anglers, big game hunters, and combination users ranked someone to take me hunting as their top choice. Additionally, big game hunters had more than one solution, therefore had an additional top choice, which was a special permit with no identification requirement. The second choice for dissociated waterfowl hunters and combination users was an area that provides a quality hunt, whereas anglers second choice was areas for new or inexperienced hunters. Big game hunters had more than one solution, therefore their second choice was either cheaper licenses for new waterfowl hunters for, someone to take me hunting, or special permit with no ID requirement. There was variability in the hunter and angler activity types for the third choice, which contained cheaper licenses for new hunters (sporadic waterfowl and big game hunters), information on where to hunt (avid waterfowl hunters), information for new and inexperienced hunters (anglers), no identification with a smaller bag limit (dissociated waterfowl hunters), someone to take me hunting (i.e., small game hunters), areas for new

or inexperienced hunters (combination users), and an area that provides a high quality hunt (anglers and big game hunters).

MENTORSHIP

Non-waterfowl hunters were more likely to accept a family member (70%), friend (76%), and co-worker (44%) as a mentor compared to that of an agency personnel (27%) or stranger (10%) (Figure 3-1). Of the reasons why a non-waterfowl hunter would not accept a mentor, the most prominent responses were “I would feel uncomfortable”, “I would rather focus on other activities”, or “other” (Figure 3-2). “I would feel uncomfortable” was the most selected response for a stranger (37%). “I would rather focus on other activities” was the most selected response for agency personnel (26%) and friend (34%). “Other” was the most selected choice for family (55%) and co-worker (43%).

DISCUSSION

We examined multiple scenarios aimed at increasing waterfowl hunting participation across multiple activity types. All scenarios helped negotiate a barrier observed among non-waterfowl hunters (Chapter 2). However, two scenarios would decrease participation in waterfowl hunting among one-third of avid waterfowl hunters. These were: (1) a special permit that allowed no requirements for duck species identification but a smaller daily bag limit (i.e., shoot 3-4 ducks) and shorter season dates and (2) no requirements for duck species identification but a smaller daily bag limit (i.e.,

shoot 3-4 ducks). This result is consistent with research suggesting that waterfowl hunters consider the current bag limit as “just right” (Schroeder, Fulton, Lawrence, & Cordts, 2014, 2017) and would not want to see a lower bag limit. Further, an adjustment to the current bag limit (i.e., more liberal or more restrictive) may cause an initial drop in participation from current waterfowl hunters, but over time waterfowl hunters will accept the new bag limit and consider it “just right” (Schroeder et al., 2014). Given the results, allowing for a special permit that allows for no waterfowl identification and a smaller bag limit, may be beneficial to increase participation among non-hunters. The addition of a special permit allows for current waterfowl hunters to continue to hunt with a liberal bag limit while providing new waterfowl hunters the ability to participate with fewer restrictions. Additionally, if more special permits are purchased, agencies will have the evidence needed to implement a no identification but small bag limit rule throughout the country.

Our results indicate that someone to hunt with and an area that provides a high-quality waterfowl hunt were ranked high across all hunting and fishing activity types. Current waterfowl hunters (avid and sporadic) and small game hunters ranked a high-quality waterfowl hunt as their top scenario. This results is consistent with the 2018 National Survey of Waterfowl Hunters, which suggests that current waterfowl hunters desire quality hunting opportunities (Slagle & Dietsch, 2018b, 2018a). Several states (Colorado, Missouri, California) offer a potential for higher quality areas to hunt waterfowl. At these sites, however, individuals are required to use a reservation system to gain access to the areas and only on certain days. For example in Colorado, a hunter can make a reservation no earlier than 14 days before they intend to hunt but are only allowed

to hunt on Sundays and federally mandated holidays that fall on a Monday (Colorado Parks and Wildlife, 2018). As such, the perception of the lack of public land available and inability to access private lands being barriers (Chapter 2), the implementation of high-quality areas with the use of a reservation system may increase perceptions of land access being a barrier. However, these high quality areas could be made reserved for current waterfowl hunters who take an individual who has never waterfowl hunted. Waterfowl hunters in the Central (38%) and Mississippi (42%) flyways took a new individuals waterfowl hunting and of those individuals a majority was an adult friend 56% and 49%, respectively (Slagle & Dietsch, 2018b, 2018a). Therefore, providing areas for high-quality waterfowl hunts may increase the amount of new hunters taken by current waterfowl hunters.

Someone to hunt with was the number one choice among anglers, big game hunters, combination users, and dissociated waterfowl hunters. This result is interesting considering all hunters and anglers did not view the lack of family or friends who hunt waterfowl as a limiting barrier (Chapter 2). Yet, individuals may be able to negotiate a barrier toward a leisure activity such as waterfowl hunting based on motivations they have (Schroeder et al., 2012; White, 2008). Therefore, if individuals are highly motivated by social components, which are found in waterfowl hunting (Chapter 1), they will likely be able to negotiate other perceived barriers. Given that waterfowl hunters in the central United States viewed hunting with friends and family highly (Chapter 1), this suggests individuals are more likely to participate in waterfowl hunting if asked by a current waterfowl hunter. This implies that any perceived barrier a non-waterfowl hunter may

see, being asked by a current hunter will alleviate all barriers a non-waterfowl hunter may perceive.

Our results suggest that a non-waterfowl hunter is more willing to accept a mentor for waterfowl hunting if they have a direct social connection with them (i.e., family, friend, co-worker). Additionally, an individual selecting a friend as a mentor was more likely (76%) than a family member (70%). Further, this suggests that while family is an important aspect of recruiting and retaining new hunters (Responsive Management and National Shooting Sports Foundation 2017), having a friend take you hunting may likely be more successful. This supports the notion that building a mentor and mentee relationship requires a community-style approach may be the most successful (D.J. Case and Associates, 2009; Ryan & Shaw, 2011). The community style approach should involve participation in multiple activities with the mentee and introducing the mentee to other hunters to build continuity and a social network with other hunters. Further, continued engagement with the mentee is important to the growth of the mentee as a hunter. The respondents in this study were generally older, and while youth mentor hunts are being offered through state agencies and NGOs, and may not be afforded the effort to engage them. For example, programs introducing hunting to college aged students or older individuals may be more effective, as these individuals tend to have more disposable income and the freedom to participate in leisure activities (Responsive Management & National Shooting Sports Foundation, 2017). Further, if these individuals do decide to have a family and children, they are more likely to pass it down to their children, which is the easiest way to recruit new hunters (D.J. Case and Associates, 2009; Responsive Management & National Shooting Sports Foundation, 2017).

MANAGEMENT IMPLICATIONS

When developing or implementing scenarios aimed at increasing waterfowl hunting participation, state and federal agencies and NGOs should include quantifiable objectives (USFWS et al. 2012, CAHSS 2016). In doing so, scenarios will be well-thought out, be easily implements, able to provide measurable changes in overall participation, and most importantly be evaluated to ensure they are effective. As such, the scenarios should take into account the wants and needs of both the current waterfowl hunters and the potentially new waterfowl hunters. This allows for the ability to prevent conflict among current and new waterfowl hunters by implementing a scenario that benefits both current and new hunters. With the use of surveys being implemented across state and provincial fish and wildlife agencies (Kuehn, Luzadis, and Brincka 2013; Laborde et al. 2014; Quartuch et al. 2016), an additional question gauging preferences or opinions on a scenario will allow for agencies to continually meet the needs of their constituents.

Building a network or community of individuals who are willing to mentor new waterfowl hunters is complicated but important to increase waterfowl hunting participation. Given that non-waterfowl hunters prefer a mentor who they know, building a relationship both inside and outside of the actual hunt is vital. However, are current waterfowl hunters willing to mentor new hunters, if not, what is preventing them from doing so and how can agencies recruit mentors for a mentor program. Understanding that current waterfowl hunters desire high-quality hunting areas above anything else may allow for agencies to use that to gain mentors. As such, incentivizing current waterfowl

hunters by providing areas with the potential for a high-quality hunt but have it be required to bring a new hunter along. Another approach would be to offer discounted licenses (i.e., free state duck stamp) to current waterfowl hunters willing to actively participate in mentoring new hunters throughout the year. That is a similar approach the Delta Waterfowl mentor recognition program offers but instead of a discounted license, there is a chance to win free waterfowl hunting gear for both the mentor and mentee (Delta Waterfowl, 2019). Finally, developing focus groups and open-ended survey questions asking current waterfowl hunters what they would want or need to become a mentor may provide valuable insight in the future. Regardless of how, mentors are needed and if we continue to lose hunters, non-hunters will lose a direct connection to a hunter and further exacerbate the decline in hunting participation.

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TABLES

Table 3-1

Scenarios with input from waterfowl managers from each state included in the study that was suggested in the survey to understand participation (i.e., increase, decrease, neither) trends if implemented. Scenarios are aimed at alleviating different barriers ranging from cost (i.e., ability to rent equipment, cheaper licenses), identification (i.e., classes to teach waterfowl ID, no waterfowl ID but smaller bag limit, a special permit with no waterfowl ID but smaller bag limit), land access (i.e., special areas for new hunters and high quality hunts), lack of family and friends who hunt waterfowl (i.e., someone to take me hunting), and waterfowl hunting skills (i.e., information for what new hunters need and more information on where to hunt).

Scenarios
Ability to rent equipment
Cheaper licenses for new hunters
Classes or materials to teach waterfowl ID
Information for what new/inexperienced hunters need
More information on where to hunt
No ID but smaller bag limit
Someone to take me hunting
Special areas for new/inexperienced waterfowl hunters
Special areas to allow for quality hunt
Special permit to allow for no ID but fewer bag limit

Table 3-2

Totals for increase, decrease, or neither increase nor decrease participation in waterfowl hunting for ten different scenarios among avid, sporadic, and dissociated waterfowl hunters, anglers, big and small game hunters, and combination users (all states combined). Columns indicate participation trends and rows indicate stated activity participation type preceded by the scenario in bold. Percentages are in parentheses and add up to 100% within rows. Very few individuals would decrease participation and a majority of individuals would increase or maintain the same level of participation.

Activity Type	Totals		
	Decrease Participation	Increase Participation	Neither increase nor decrease participation
Ability to rent equipment			
Avid waterfowl hunter	142 (5%)	546 (19%)	2157 (76%)
Sporadic waterfowl hunter	48 (3%)	461 (32%)	924 (65%)
Dissociated waterfowl hunter	26 (3%)	241 (27%)	633 (70%)
Angler	6 (2%)	84 (26%)	228 (72%)
Big game hunter	6 (5%)	30 (25%)	84 (70%)
Combination user	52 (3%)	698 (35%)	1254 (63%)
Small game hunter	2 (2%)	30 (37%)	50 (61%)
Cheaper licenses for new hunters			
Avid waterfowl hunter	93 (3%)	677 (24%)	2071 (73%)
Sporadic waterfowl hunter	34 (2%)	483 (34%)	918 (64%)
Dissociated waterfowl hunter	16 (2%)	280 (31%)	599 (67%)
Angler	8 (3%)	67 (21%)	242 (76%)
Big game hunter	6 (5%)	36 (31%)	76 (64%)
Combination user	44 (2%)	636 (32%)	1321 (66%)
Small game hunter	3 (4%)	23 (28%)	57 (68%)
Classes or materials to teach waterfowl ID			
Avid waterfowl hunter	79 (3%)	479 (17%)	2286 (80%)
Sporadic waterfowl hunter	31 (2%)	408 (29%)	994 (69%)
Dissociated waterfowl hunter	15 (2%)	206 (23%)	674 (75%)
Angler	7 (2%)	93 (29%)	219 (69%)
Big game hunter	7 (6%)	34 (28%)	79 (66%)

Table 3-2 continued

Activity Type	Totals		
	Decrease Participation	Increase Participation	Neither increase nor decrease participation
Combination user	48 (2%)	676 (34%)	1274 (64%)
Small game hunter	3 (4%)	24 (29%)	56 (67%)
Information for what new/inexperienced hunters need			
Avid waterfowl hunter	68 (2%)	523 (18%)	2248 (79%)
Sporadic waterfowl hunter	32 (2%)	404 (28%)	999 (70%)
Dissociated waterfowl hunter	11 (2%)	227 (25%)	658 (73%)
Angler	6 (2%)	93 (29%)	218 (69%)
Big game hunter	4 (3%)	36 (30%)	81 (67%)
Combination user	41 (2%)	738 (37%)	1225 (61%)
Small game hunter	3 (4%)	29 (35%)	52 (61%)
More information on where to hunt			
Avid waterfowl hunter	79 (3%)	1152 (41%)	1611 (57%)
Sporadic waterfowl hunter	32 (2%)	719 (50%)	683 (48%)
Dissociated waterfowl hunter	10 (1%)	359 (40%)	529 (59%)
Angler	4 (1%)	92 (29%)	223 (70%)
Big game hunter	5 (4%)	42 (35%)	73 (61%)
Combination user	34 (2%)	781 (39%)	1187 (59%)
Small game hunter	1 (1%)	40 (48%)	42 (51%)
No ID but smaller bag limit			
Avid waterfowl hunter	663 23(%)	379 (13%)	1798 (63%)
Sporadic waterfowl hunter	143 (10%)	417 (29%)	873 (61%)
Dissociated waterfowl hunter	48 (5%)	266 (30%)	582 (65%)
Angler	18 (6%)	53 (17%)	247 (78%)
Big game hunter	12 (10%)	25 (21%)	83 (69%)
Combination user	73 (4%)	647 (32%)	1275 (64%)
Small game hunter	5 (6%)	26 (31%)	53 (63%)
Someone to take me hunting			
Avid waterfowl hunter	71 (2%)	960 34(%)	1809 (64%)
Sporadic waterfowl hunter	31 (2%)	724 (51%)	677 (47%)
Dissociated waterfowl hunter	12 (1%)	405 (45%)	479 (54%)

Table 3-2 continued

Activity Type	Totals		
	Decrease Participation	Increase Participation	Neither increase nor decrease participation
Angler	7 (2%)	140 (44%)	173 (54%)
Big game hunter	8 (7%)	54 (45%)	58 (48%)
Combination user	40 (2%)	1166 (58%)	792 (40%)
Small game hunter	3 (4%)	44 (52%)	37 (44%)
Special areas for new/inexperienced waterfowl hunters			
Avid waterfowl hunter	117 (5%)	892 (31%)	1833 (64%)
Sporadic waterfowl hunter	50 (4%)	578 (40%)	803 (56%)
Dissociated waterfowl hunter	25 (3%)	280 (31%)	592 (66%)
Angler	9 (3%)	101 (32%)	208 (65%)
Big game hunter	6 (5%)	38 (32%)	75 (63%)
Combination user	44 (2%)	837 (42%)	1119 (56%)
Small game hunter	4 (5%)	34 (41%)	45 (54%)
Special areas to allow for quality hunt			
Avid waterfowl hunter	80 (3%)	1754 (62%)	1005 (35%)
Sporadic waterfowl hunter	30 (2%)	922 (64%)	481 (34%)
Dissociated waterfowl hunter	18 (2%)	418 (47%)	463 (52%)
Angler	7 (2%)	74 (23%)	238 (75%)
Big game hunter	5 (4%)	44 (37%)	71 (59%)
Combination user	40 (2%)	826 (41%)	1130 (57%)
Small game hunter	3 (4%)	39 (47%)	41 (49%)
Special permit to allow for no ID but fewer bag limit			
Avid waterfowl hunter	764 (27%)	364 (13%)	1716 (60%)
Sporadic waterfowl hunter	182 (13%)	413 (29%)	838 (58%)
Dissociated waterfowl hunter	63 (7%)	250 (28%)	587 (65%)
Angler	23 (7%)	59 (19%)	237 (74%)
Big game hunter	11 (5%)	25 (21%)	84 (70%)
Combination user	82 (4%)	631 (32%)	1282 (64%)
Small game hunter	7 (8%)	27 (32%)	50 (60%)

Table 3-3

Consensus rankings for each scenario given the stated activity participation type (all states combined). Columns indicate the number of times a scenario was ranked with 1 being the most important and 3 being the least important, and the consensus ranking. Rows indicate the scenarios and is preceded by the activity type in bold. If more than one consensus rank solution was predicted additional rankings were provided with a comma following the prior solution. The top ranked scenarios were someone to take me hunting (i.e., anglers, big game hunters, dissociated waterfowl hunters, and combination users) and a special are that provides a high quality hunt (i.e., avid and sporadic waterfowl hunters, and small game hunters).

Rank	1	2	3	Consensus rank
Scenario	←High to low importance →			
Avid waterfowl hunter				
Ability to rent equipment	61	159	255	8
Cheaper licenses for new hunters	204	234	267	4
Classes or materials to teach waterfowl ID	38	70	133	9
Information for what new/inexperienced hunters need	24	78	120	10
More information on where to hunt	207	495	360	3
No ID but smaller bag limit	122	190	184	5
Someone to take me hunting	255	191	196	2
Special areas for new/inexperienced waterfowl hunters	109	271	291	6
Special areas to allow for quality hunt	1113	365	207	1
Special permit to allow for no ID but fewer bag limit	64	144	184	7
Sporadic waterfowl hunter				
Ability to rent equipment	53	103	153	9
Cheaper licenses for new hunters	128	111	117	3
Classes or materials to teach waterfowl ID	29	47	72	8

Table 3-3 continued

Rank	1	2	3	Consensus rank
Scenario	←High to low importance →			
Information for what new/inexperienced hunters need	17	52	72	10
More information on where to hunt	92	184	179	5
No ID but smaller bag limit	103	114	144	4
Someone to take me hunting	247	106	92	2
Special areas for new/inexperienced waterfowl hunters	59	125	108	6
Special areas to allow for quality hunt	384	216	120	1
Special permit to allow for no ID but fewer bag limit	56	110	111	7
Dissociated waterfowl hunter				
Ability to rent equipment	20	64	90	10,9
Cheaper licenses for new hunters	86	80	86	4,4
Classes or materials to teach waterfowl ID	16	18	33	9,8
Information for what new/inexperienced hunters need	12	23	42	8,10
More information on where to hunt	50	80	80	6,6
No ID but smaller bag limit	81	97	77	3,3
Someone to take me hunting	202	68	52	1,1
Special areas for new/inexperienced waterfowl hunters	36	71	61	7,7
Special areas to allow for quality hunt	152	125	108	2,2
Special permit to allow for no ID but fewer bag limit	49	78	75	5,5
Angler				
Ability to rent equipment	5	21	37	10,10
Cheaper licenses for new hunters	13	22	19	5,4
Classes or materials to teach waterfowl ID	10	35	30	7,7
Information for what new/inexperienced hunters need	15	21	24	4,3
More information on where to hunt	13	11	24	6,6
No ID but smaller bag limit	5	10	14	8,8
Someone to take me hunting	115	19	17	1,1
Special areas for new/inexperienced waterfowl hunters	28	51	31	2,2
Special areas to allow for quality hunt	9	17	9	3,5

Table 3-3 continued

Rank	1	2	3	Consensus rank
Scenario	←High to low importance →			
Special permit to allow for no ID but fewer bag limit	6	12	14	9,9
Big game hunter				
Ability to rent equipment	3	8	7	6,6,6
Cheaper licenses for new hunters	4	11	4	2,3,3
Classes or materials to teach waterfowl ID	0	7	8	10,10,10
Information for what new/inexperienced hunters need	4	7	10	7,7,7
More information on where to hunt	2	11	6	9,9,9
No ID but smaller bag limit	5	6	10	8,8,8
Someone to take me hunting	28	5	9	1,2,1
Special areas for new/inexperienced waterfowl hunters	8	4	11	4,5,5
Special areas to allow for quality hunt	11	7	3	3,4,4
Special permit to allow for no ID but fewer bag limit	8	7	5	5,1,2
Combination user				
Ability to rent equipment	59	129	225	8
Cheaper licenses for new hunters	100	163	157	6
Classes or materials to teach waterfowl ID	47	123	109	5
Information for what new/inexperienced hunters need	55	88	133	9
More information on where to hunt	54	130	143	10
No ID but smaller bag limit	151	158	160	4
Someone to take me hunting	761	164	109	1
Special areas for new/inexperienced waterfowl hunters	113	245	180	3
Special areas to allow for quality hunt	118	160	172	2
Special permit to allow for no ID but fewer bag limit	81	179	151	7
Small game hunter				
Ability to rent equipment	5	3	10	7
Cheaper licenses for new hunters	4	10	5	5
Classes or materials to teach waterfowl ID	1	2	2	9
Information for what new/inexperienced hunters need	3	3	4	8
More information on where to hunt	1	7	7	10

Table 3-3 continued

Rank	1	2	3	Consensus rank
Scenario	←High to low importance →			
No ID but smaller bag limit	6	4	6	2
Someone to take me hunting	22	4	12	3
Special areas for new/inexperienced waterfowl hunters	3	9	7	4
Special areas to allow for quality hunt	12	8	2	1
Special permit to allow for no ID but fewer bag limit	1	8	3	6

FIGURES

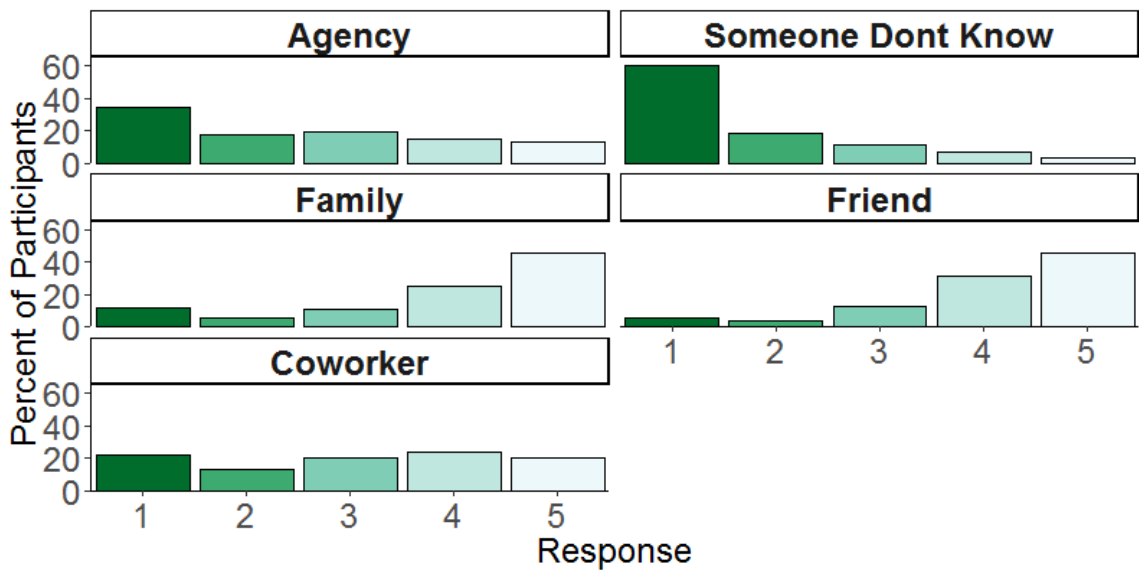


Figure 3-1

Total percentage of non-waterfowl hunters who would be willing to hunt with one of five different mentors. X-axis represents the likelihood a participant would be willing to accept a mentor with the answers consisting of: not at all likely (1), somewhat likely (2), moderately likely (3), likely (4), and very likely (5). The Y-axis is the percent of the participants. Co-worker, family, and friend had the greatest percentage of participants willing to hunt with and an agency personnel and someone I do not know were the least

likely.

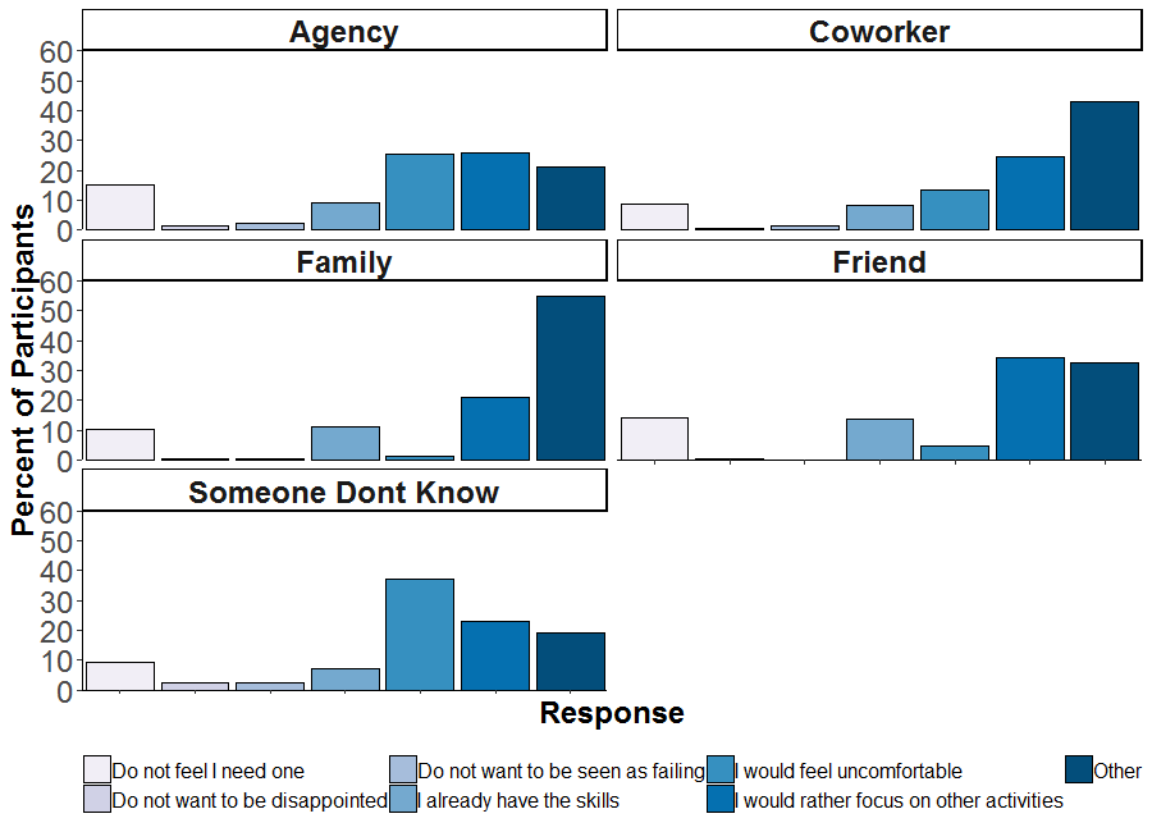




Figure 3-2

Total percentage of reasons why a non-waterfowl hunters would not be willing to hunt with one of five different mentors. X-axis represents the reasons a participant would not be willing to accept a mentor and the Y-axis is the percent of the participants. I would feel uncomfortable, rather focus on other activities, and other were one of the top reasons across the different mentor types among the non-waterfowl hunters.


APPENDICES

Appendix A. Agency name, logo, and representatives.

The combination of logos below were placed at the top of each invitation, reminder, and survey. The left two were from the University of Nebraska – Lincoln.

Agency	Logos		Representative	
Kansas Department of Wildlife, Parks, and Tourism	 FishHunt.unl.edu	 SCHOOL OF NATURAL RESOURCES	 Kansas Department of Wildlife, Parks and Tourism	Tom Bidrowski
Michigan Department of Natural Resources	 FishHunt.unl.edu	 SCHOOL OF NATURAL RESOURCES		Barbra Avers
Missouri Department of Conservation	 FishHunt.unl.edu	 SCHOOL OF NATURAL RESOURCES	 MISSOURI DEPARTMENT OF NATURAL RESOURCES	Andrew Raedeke
Montana Fish, Wildlife, & Parks	 FishHunt.unl.edu	 SCHOOL OF NATURAL RESOURCES	 <i>Montana Fish, Wildlife & Parks</i>	James Hanson

Appendix A continued

Agency	Logos		Representative
Nebraska Game and Parks Commission	 <p data-bbox="653 607 831 634">FishHunt.unl.edu</p>	 <p data-bbox="1016 542 1255 570">SCHOOL OF NATURAL RESOURCES</p>	 <p data-bbox="1730 553 1902 581">Mark Vrtiska</p>
Oklahoma Department of Wildlife Conservation	 <p data-bbox="653 813 831 841">FishHunt.unl.edu</p>	 <p data-bbox="1016 748 1255 776">SCHOOL OF NATURAL RESOURCES</p>	 <p data-bbox="1738 756 1894 784">Corey Jager</p>
South Dakota Game, Fish, & Parks	 <p data-bbox="653 1016 831 1044">FishHunt.unl.edu</p>	 <p data-bbox="1016 951 1255 979">SCHOOL OF NATURAL RESOURCES</p>	 <p data-bbox="1717 963 1915 990">Rocco Murano</p>
Wyoming Game and Fish	 <p data-bbox="653 1219 831 1247">FishHunt.unl.edu</p>	 <p data-bbox="1016 1154 1255 1182">SCHOOL OF NATURAL RESOURCES</p>	 <p data-bbox="1713 1166 1919 1193">Nathaniel Huck</p>

Appendix B. Email Invitation

DATE

Dear First Name, Last Name:

You are one of a group of sportspersons selected from those who purchased a hunting and/or fishing license between 2012 and 2016 to provide information pertaining to your activity preferences and motivations, and barriers toward waterfowl hunting. Researchers in the School of Natural Resources at The University of Nebraska—Lincoln are conducting this study in conjunction with your [INSERT STATE AGENCY] to learn about barriers toward waterfowl hunting. The results of this survey will help us better understand potential barriers toward waterfowl hunting and will assist us in our ability to provide fewer barriers to waterfowl hunting. If you are 19 years of age or older, you may participate in this research.

Even if you do not currently participate or never have participated in waterfowl hunting, we still need your opinions and perspectives.

To access this web survey through Qualtrics, please click the link below gain access. No information is shared with the Qualtrics software company.

LINK TO SURVEY

If you do not wish to participate in this survey, check “No” to the first question in the online survey and click submit. You are free to decline to participate in this study. You may also withdraw at any time without harming your relationship with the researchers of the University of Nebraska-Lincoln and your state wildlife agency. Participation in this study will require approximately 15 minutes.

There are no known direct risks or benefits to your participation. Results of research will be reported in aggregate. You may ask any questions concerning this research at any time by contacting Christopher Chizinski (email: cchizinski2@unl.edu), Matthew Hinrichs (email: mhinrichs11@unl.edu), or [INSERT STATE CONTACT INFORMATION]. If you would like to speak to someone else, please call the Research Compliance Services Office at 402-472-6965 or irb@unl.edu.

Thank you for helping us with this important study.

Sincerely,

Christopher J. Chizinski, PhD
Assistant Professor of Human Dimensions of Wildlife Management
University of Nebraska-Lincoln
(402) 472 - 8123

To opt out of further emails [CLICK HERE](#)

Appendix C. Survey

Researchers in the School of Natural Resources at The University of Nebraska – Lincoln and your state agency are interested in learning about your barriers toward waterfowl hunting. The results of this study will serve to better understand motivations and barriers toward waterfowl hunting and will assist your state wildlife agency ability to minimize barriers of waterfowl hunting.

To view Qualtrics privacy policy, enter <https://qualtrics.com/privacy-statement/> into your internet web browser. If you do not wish to participate in this survey or if you are under the age of 19, select "No" to the first question and click "Next" at the bottom of the page. Responses will be reported in aggregate with responses from all other sportspersons and no identifying information will be associated with your responses

Do you wish to participate in this survey?

Yes

No

Definitions: For the purposes of the survey the follow species have been categorized and are defined below. Please use the definitions for the duration of the survey. Thank you.

BIG GAME are considered turkey and large mammals including deer, elk, moose, bear, antelope, and bison

SMALL GAME are mammals and birds not including waterfowl that are smaller than turkeys such as rabbits, pheasants, grouse, quail, and squirrels

WATERFOWL are considered all species of ducks and geese

FISHING is considered all fishing activities including saltwater, freshwater, fly fishing, bow fishing, and spearing

NON-WATERFOWL MIGRATORY BIRDS are considered all migratory birds that are not ducks or geese such as cranes, rails, and doves

ONLY SELECTED ACTIVITIES WILL APPEAR THROUGHOUT THE SURVEY

Have you ever participated in the following?

Fishing

Waterfowl Hunting

Small Game Hunting

Non-Waterfowl Migratory Bird Hunting

Big Game Hunting

At what age did you first participate in the following?

Fishing	<input type="text"/>
Waterfowl Hunting	<input type="text"/>
Small Game Hunting	<input type="text"/>
Non-Waterfowl Migratory Bird Hunting	<input type="text"/>
Big Game Hunting	<input type="text"/>

BETWEEN 2012 - 2016, how many years did you purchase the required license, permits, or stamps to participate in the following?

	0 Years	1 Year	2-3 Years	4 + Years
Fishing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Waterfowl Hunting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Small Game Hunting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Non-Waterfowl Migratory Bird Hunting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Big Game Hunting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

BETWEEN 2012 – 2016, how many days did you typically participate each year in the following?

	0 days	1 - 5 Days	6 - 10 Days	11 - 20 Days	21 - 30 Days	31+ Days
Fishing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Waterfowl Hunting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Small Game Hunting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Non-Waterfowl Migratory Bird Hunting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Big Game Hunting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

INDIVIDUALS WHO SELECTED THEY HAD PARTICIPATED IN WATERFOWL HUNTING SEES THIS

How important is waterfowl hunting to you in comparison to other recreational activities?

- My most important
- Important but not my most important
- Moderately important
- Slightly important
- Not at all important

INDIVIDUALS WHO DID NOT SELECT THEY HAD PARTICIPATED IN WATERFOWL HUNTING SEES THIS

Given the opportunity, how likely would you be to go waterfowl hunting?

Very likely

Likely

Moderately likely

Somewhat likely

Not at all likely

Activity Preference:

The following FIVE activity sets contain different combinations of activities. Select ONE least preferred activity and ONE most preferred activity for each activity set, regardless whether you have ever participated. It is important that you complete ALL FIVE SETS.

The following is an example: If you were given the choice between four different activities, Mountain biking is your least preferred activity and Hiking is your most preferred activity.

Activity Set 1: TWO OPTIONS SHOULD BE LEFT BLANK

Least Preferred		Most Preferred
<input checked="" type="radio"/>	Mountain Biking	<input type="radio"/>
<input type="radio"/>	Running	<input type="radio"/>
<input type="radio"/>	Tennis	<input type="radio"/>
<input type="radio"/>	Hiking	<input checked="" type="radio"/>

Activity Set 1: TWO OPTIONS SHOULD BE LEFT BLANK

Least Preferred		Most Preferred
<input type="radio"/>	Non-Waterfowl Migratory Bird Hunting	<input type="radio"/>
<input type="radio"/>	Big Game Hunting	<input type="radio"/>
<input type="radio"/>	Small Game Hunting	<input type="radio"/>
<input type="radio"/>	Fishing	<input type="radio"/>

Activity Set 2: TWO OPTIONS SHOULD BE LEFT BLANK

Least Preferred

Waterfowl Hunting

Fishing

Small Game
Hunting

Big Game Hunting

Most Preferred

Activity Set 3: TWO OPTIONS SHOULD BE LEFT BLANK

Least Preferred

Fishing

Non-Waterfowl
Migratory Bird
Hunting

Waterfowl Hunting

Small Game
Hunting

Most Preferred

Activity Set 4: TWO OPTIONS SHOULD BE LEFT BLANK

Least Preferred

Waterfowl Hunting

Big Game Hunting

Fishing

Non-Waterfowl
Migratory Bird
Hunting

Most Preferred

Activity Set 5: TWO OPTIONS SHOULD BE LEFT BLANK

Least Preferred

Big Game Hunting

Non-Waterfowl
Migratory Bird
Hunting

Waterfowl Hunting

Small Game
Hunting

Most Preferred

THE ACTIVITY SELECTED HERE WILL APPEAR FOR THE FOLLOW QUESTION ONLY

If you could only participate in ONE of the following, which would you participate in?

Waterfowl Hunting

Fishing

Non-Waterfowl Migratory Bird Hunting

Small Game Hunting

Big Game Hunting

Indicate the importance for each of the following for why you participate in WATERFOWL HUNTING.

	Not at all important	Slightly important	Moderately important	Important	Very important
Being alone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Experiencing a challenge hunt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Watching my dog work/ companionship of my dog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using my equipment and skills to attract or harvest an animal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eating waterfowl meat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Viewing wildlife	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Participating in waterfowl hunting with family or friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Harvesting a trophy animal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing where my food comes from	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Harvesting my daily bag limit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Teaching someone to waterfowl hunt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Connecting with nature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Spending time outdoors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Filling my freezer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Becoming an expert waterfowl hunter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Indicate the importance for each of the following for why you participate in FISHING.

	Not at all important	Slightly important	Moderately important	Important	Very important
Being alone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Going Boating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Viewing wildlife	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Becoming an expert angler	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Connecting with nature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eating fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Harvesting my daily fish limit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Catching a trophy fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Spending time outdoors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Filling my freezer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Experiencing a challenge fight	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Participating in fishing with family or friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using my equipment and skills to catch fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing where my food comes from	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Teaching someone to fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Indicate the importance for each of the following for why you participate in NON-WATERFOWL MIGRATORY HUNTING.

	Not at all important	Slightly important	Moderately important	Important	Very important
Connecting with nature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Participating in non-waterfowl migratory bird hunting with family or friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Harvesting a trophy animal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eating non-waterfowl migratory bird hunter meat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Becoming an expert non-waterfowl migratory bird hunter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing where my food comes from	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Teaching someone to non-waterfowl migratory bird hunt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Experiencing a challenge hunt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Filling my freezer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Watching my dog work/ companionship of my dog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Spending time outdoors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Viewing wildlife	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Being alone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using my equipment and skills to attract or harvest an animal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Harvesting my daily bag limit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Indicate the importance for each of the following for why you participate in SMALL GAME HUNTING.

	Not at all important	Slightly important	Moderately important	Important	Very important
Harvesting a trophy animal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Connecting with nature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Filling my freezer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Becoming an expert small game hunter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Viewing wildlife	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eating small game meat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Teaching someone to small game hunt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using my equipment and skills to attract or harvest an animal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Spending time outdoors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing where my food comes from	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Being alone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Watching my dog work/ companionship of my dog	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Harvesting my daily bag limit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Participating in small game hunting with family or friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Experiencing a challenge hunt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Indicate the importance for each of the following for why you participate in BIG GAME HUNTING.

	Not at all important	Slightly important	Moderately important	Important	Very important
Harvesting a trophy animal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eating big game meat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Connecting with nature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Spending time outdoors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Viewing wildlife	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Processing big game	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Filling my tag	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Experiencing a challenge hunt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Being alone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using my equipment and skills to attract or harvest an animal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Becoming an expert big game hunter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Teaching someone to big game hunt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing where my food comes from	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Participating in big game hunting with family or friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Filling my freezer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

INDIVIDUALS WHO SELECTED THEY HAD PARTICIPATED IN WATERFOWL HUNTING SEES THIS

As an individual who has participated in waterfowl hunting, the following contains SIX groups of questions pertaining to potential barriers that limit YOUR ability to continue to participate in waterfowl hunting. Within each group there are a variety of possible barriers. If there are any not listed, you may list them at the end of the section in the comments box.

INDIVIDUALS WHO DID NOT SELECT THEY HAD PARTICIPATED IN WATERFOWL HUNTING SEES THIS

As an individual who has never participated in waterfowl hunting, the following contains SIX groups of questions pertaining to potential barriers that limit YOUR ability to participate in waterfowl hunting. Within each group there are a variety of possible barriers. If there are any not listed, you may list them at the end of the section in the comments box.

ACCESS barriers to waterfowl hunting:

	Not at all limiting	Slightly limiting	Moderately limiting	Limiting	Very limiting
Obtaining permission for private hunting land access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Amount/availability of public hunting land in my area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Travel time to a hunting area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Travel distance to a hunting area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Crowding on public hunting land	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Encounters with other hunters	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Asking for private hunting land access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing the location of public hunting land	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing who to ask for private hunting land access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Having the time to scout	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Interference by other hunters (i.e. setting up too close)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

COST barriers to waterfowl hunting:

	Not at all limiting	Slightly limiting	Moderately limiting	Limiting	Very limiting
The cost of travel (i.e. gas, lodging)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The cost of decoys	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The cost of other equipment (i.e. waders, duck or goose calls, shotgun shells)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The cost of a shotgun	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The cost of license/permits/stamps	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The cost of hunting blinds	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The cost to lease private land	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

RULES AND REGULATIONS barriers to waterfowl hunting:

	Not at all limiting	Slightly limiting	Moderately limiting	Limiting	Very limiting
Fear of not complying with rules and regulations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Finding information on rules and regulations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Required use of non-toxic shot	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The number of required licenses/permits and stamps	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Frequency of rules and regulations change	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Duck species-specific bag limits (i.e. Mallard or Canvasback)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing the season dates in specific areas (zones) within the state	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing when seasons open and close	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing where zone boundaries are	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Understanding rules and regulations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing what license/permits/stamps I need	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

SOCIAL barriers to waterfowl hunting:

	Not at all limiting	Slightly limiting	Moderately limiting	Limiting	Very limiting
Not having a friend that hunts waterfowl	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not having a family member that hunts waterfowl	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My community's view toward waterfowl hunting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The views about waterfowl hunting by an important person in my life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

WATERFOWL HUNTING SKILL/KNOWLEDGE barriers to waterfowl hunting:

	Not at all limiting	Slightly limiting	Moderately limiting	Limiting	Very limiting
Knowing how to use duck or goose decoys	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing how to scout	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing what equipment I need to hunt waterfowl	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The physical demands of waterfowl hunting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing how to use a duck or goose call	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing how to use a shotgun	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

WATERFOWL IDENTIFICATION AND POPULATION barriers to waterfowl hunting:

	Not at all limiting	Slightly limiting	Moderately limiting	Limiting	Very limiting
My ability to identify waterfowl in flight	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My ability to identify male versus female ducks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My ability to identify female species of duck	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The population numbers of the duck species that I am interested in where I hunt (i.e. Pintail or Scaup)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The number of waterfowl I may see	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My ability to identify waterfowl in hand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Requirement to identify waterfowl	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The timing of waterfowl migration competes with other activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Finding resources to aid in waterfowl identification	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What equipment do you think is NECESSARY to participate in waterfowl hunting? (Check all that apply)

<input type="checkbox"/> Blind	<input type="checkbox"/> Non-toxic shot-shells	<input type="checkbox"/> Waders	<input type="checkbox"/> Duck or goose call
<input type="checkbox"/> Boat with motor	<input type="checkbox"/> Shotgun	<input type="checkbox"/> GPS unit	<input type="checkbox"/> Boat without motor
<input type="checkbox"/> Dog	<input type="checkbox"/> Spinning wing decoy	<input type="checkbox"/> Camouflage clothing	<input type="checkbox"/> Stationary decoys

Comments

INDIVIDUALS WHO SELECTED THEY HAD PARTICIPATED IN WATERFOWL HUNTING SEES THE FOLLOWING MENTORSHIP QUESTIONS

The following questions are about mentorship: Mentorship is teaching and advising an individual how to be successful while hunting. For example, a mentor will show you how to use equipment, where to go hunting, and how to harvest an animal.

How likely would you be willing to mentor A NEW WATERFOWL HUNTER who is a...

	Not at all likely	Slightly likely	Moderately likely	Likely	Very likely
Family member	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Youth/child I know	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Any youth/child	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Friend	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Co-worker	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Someone I do not know	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If you are not willing to mentor a youth/child you know, why not?
(Check all that apply)

<input type="checkbox"/> Time consuming	<input type="checkbox"/> I do not have the skills
<input type="checkbox"/> Added competition	<input type="checkbox"/> I would rather focus on my own hunting
<input type="checkbox"/> More responsibility	<input type="checkbox"/> Do not want to share my limited hunting spots
<input type="checkbox"/> Do not want to disappoint	<input type="checkbox"/> I would feel uncomfortable
<input type="checkbox"/> Increased work load	<input type="checkbox"/> Other

If you are not willing to mentor a family member, why not?
(Check all that apply)

<input type="checkbox"/> Time consuming	<input type="checkbox"/> I do not have the skills
<input type="checkbox"/> Added competition	<input type="checkbox"/> I would rather focus on my own hunting
<input type="checkbox"/> More responsibility	<input type="checkbox"/> Do not want to share my limited hunting spots
<input type="checkbox"/> Do not want to disappoint	<input type="checkbox"/> I would feel uncomfortable
<input type="checkbox"/> Increased work load	<input type="checkbox"/> Other

If you are not willing to mentor a friend, why not? (Check all that apply)

<input type="checkbox"/> Time consuming	<input type="checkbox"/> I do not have the skills
<input type="checkbox"/> Added competition	<input type="checkbox"/> I would rather focus on my own hunting
<input type="checkbox"/> More responsibility	<input type="checkbox"/> Do not want to share my limited hunting spots
<input type="checkbox"/> Do not want to disappoint	<input type="checkbox"/> I would feel uncomfortable
<input type="checkbox"/> Increased work load	<input type="checkbox"/> Other

If you are not willing to mentor any youth/child, why not? (Check all that apply)

<input type="checkbox"/> Time consuming	<input type="checkbox"/> I do not have the skills
<input type="checkbox"/> Added competition	<input type="checkbox"/> I would rather focus on my own hunting
<input type="checkbox"/> More responsibility	<input type="checkbox"/> Do not want to share my limited hunting spots
<input type="checkbox"/> Do not want to disappoint	<input type="checkbox"/> I would feel uncomfortable
<input type="checkbox"/> Increased work load	<input type="checkbox"/> Other

If you are not willing to mentor someone you do not know, why not? (Check all that apply)

<input type="checkbox"/> Time consuming	<input type="checkbox"/> I do not have the skills
<input type="checkbox"/> Added competition	<input type="checkbox"/> I would rather focus on my own hunting
<input type="checkbox"/> More responsibility	<input type="checkbox"/> Do not want to share my limited hunting spots
<input type="checkbox"/> Do not want to disappoint	<input type="checkbox"/> I would feel uncomfortable
<input type="checkbox"/> Increased work load	<input type="checkbox"/> Other

If you are not willing to mentor a co-worker, why not? (Check all that apply)

<input type="checkbox"/> Time consuming	<input type="checkbox"/> I do not have the skills
<input type="checkbox"/> Added competition	<input type="checkbox"/> I would rather focus on my own hunting
<input type="checkbox"/> More responsibility	<input type="checkbox"/> Do not want to share my limited hunting spots
<input type="checkbox"/> Do not want to disappoint	<input type="checkbox"/> I would feel uncomfortable
<input type="checkbox"/> Increased work load	<input type="checkbox"/> Other

INDIVIDUALS WHO DID NOT SELECT THEY HAD PARTICIPATED IN WATERFOWL HUNTING SEES THE FOLLOWING MENTORSHIP QUESTIONS

The following questions are about mentorship: Mentorship is teaching and advising an individual how to be successful while hunting. For example, a mentor will show you how to use equipment, where to go hunting, and how to harvest an animal.

If you were to go WATERFOWL hunting for the first time, how likely would you be willing to hunt with a mentor who is a...

	Not at all likely	Slightly likely	Moderately likely	Likely	Very likely
Family member	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Friend	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Co-worker	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agency personnel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Someone I do not know	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If you are not willing to accept a family member as a mentor, why not? (Check all that apply)

Do not want to be seen as failing

I would rather focus on other activities

Do not want to be disappointed

I would feel uncomfortable

Do not feel I need one

Other

I already have the skills

If you are not willing to accept a friend as a mentor, why not? (Check all that apply)

Do not want to be seen as failing

I would rather focus on other activities

Do not want to be disappointed

I would feel uncomfortable

Do not feel I need one

Other

I already have the skills

If you are not willing to accept a co-worker as a mentor, why not? (Check all that apply)

Do not want to be seen as failing

I would rather focus on other activities

Do not want to be disappointed

I would feel uncomfortable

Do not feel I need one

Other

I already have the skills

If you are not willing to accept an agency personnel as a mentor, why not? (Check all that apply)

Do not want to be seen as failing

I would rather focus on other activities

Do not want to be disappointed

I would feel uncomfortable

Do not feel I need one

Other

I already have the skills

If you are not willing to accept someone you do not know as a mentor, why not? (Check all that apply)

Do not want to be seen as failing

I would rather focus on other activities

Do not want to be disappointed

I would feel uncomfortable

Do not feel I need one

Other

I already have the skills

Future waterfowl hunting opportunities:

How would your participation change in waterfowl hunting if any of the following took place?

	Increase participation	Neither increase or decrease participation	Decrease participation
There were special areas for new or inexperienced waterfowl hunters to hunt with a mentor	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There were class(es) I could take or obtain materials that taught me how to identify waterfowl	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

There were no requirements for duck species identification but a smaller daily bag limit (i.e. shoot 3-4 ducks)

More specific information on where to go waterfowl hunting was available

There were a lower cost for licenses, permits, or stamps for new or inexperienced waterfowl hunters

There was a special permit that allowed no requirements for duck species identification but a smaller daily bag limit (i.e. shoot 3-4 ducks) and shorter season dates

Someone would take me waterfowl hunting (i.e. mentor, family, friend, co-worker, etc)

There was the ability to rent decoys, blinds, or other equipment from a state agency or other entity

There were special areas that allow for a high-quality waterfowl hunt

There was a website or materials on what a new or inexperienced hunter needs

Rank your TOP THREE of the following items to increase your participation in waterfowl hunting. Write a 1 for your top choice, 2 for your middle choice, and 3 for your third choice in the boxes below.

Ranking

There were special areas for new or inexperienced waterfowl hunters to hunt with a mentor

There was a special permit that allowed no requirements for duck species identification but a smaller daily bag limit (i.e. shoot 3-4 ducks) and shorter season dates

There was a website or materials on what a new or inexperienced hunter needs

More specific information on where to go waterfowl hunting was available

There were no requirements for duck species identification but a smaller daily bag limit (i.e. shoot 3-4 ducks)

There were a lower cost for licenses, permits, or stamps for new or inexperienced waterfowl hunters

There were special areas that allow for a high-quality waterfowl hunt

Someone would take me waterfowl hunting (i.e. mentor, family, friend, co-worker, etc)

There was the ability to rent decoys, blinds, or other equipment from a state agency or other entity

There were
class(es) I could
take or obtain
materials that
taught me how
to identify
waterfowl

Demographics:

Year you were born

Zip-code of primary residence

Sex

- Male
- Female
- I prefer not to answer

Note: Answer both questions about Hispanic origins and race. For this survey, Hispanic origins are not races.

Are you of Hispanic origin?

- No, not of Hispanic, Latino, or Spanish origin
- Yes, Mexican, Mexican American, Chicano
- Yes, Puerto Rican
- Yes, Cuban
- Yes, another Hispanic, Latino, or Spanish origin

Race (select all that apply)

<input type="checkbox"/> White	<input type="checkbox"/> Filipino	<input type="checkbox"/> Samoan
<input type="checkbox"/> Black or African American	<input type="checkbox"/> Japanese	<input type="checkbox"/> Guamanian or Chamorro
<input type="checkbox"/> American Indian or Alaska Native	<input type="checkbox"/> Korean	<input type="checkbox"/> Other Asian
<input type="checkbox"/> Asian Indian	<input type="checkbox"/> Vietnamese	<input type="checkbox"/> Other Pacific Islander
<input type="checkbox"/> Chinese	<input type="checkbox"/> Native Hawaiian	<input type="checkbox"/> Other

Highest level of education completed

Some high school
 High school/GED
 Some college
 Associates degree
 Bachelors degree
 Graduate degree
 I prefer not to answer

Total gross household income in 2016

Under \$20,000
\$20,000 - \$39,999
\$40,000 - \$59,999
\$60,000 - \$79,999
\$80,000 - \$99,999
\$100,000 or more
I prefer not to answer

Appendix D. Email Reminder

DATE

Dear First Name, Last Name:

You are one of a group of sportspersons selected from those who purchased a hunting and/or fishing license between 2012 and 2016. We recently emailed you an invitation to a web survey regarding your perspective on activity preference, motivations, and barriers toward waterfowl hunting. We have not received your completed questionnaire. If you have not finished the web survey, please do so by 06/08/2018. To access this web survey, please follow the link provided below to gain access.

LINK TO SURVEY

To view Qualtrics privacy policy please visit <https://www.qualtrics.com/privacy-statement/>. You can also withdraw at any time without harming your relationship with the researchers of the University of Nebraska-Lincoln and your state wildlife agency.

The information you and other selected sportspersons is vital in allowing management agencies to understand barriers toward waterfowl hunting. Please take 15 minutes to complete the questionnaire. You may ask questions concerning this research at any time by contacting Christopher Chizinski (email: cchizinski2@unl.edu), Matthew Hinrichs (email: mhinrichs11@unl.edu), or [INSERT STATE CONTACT]). If you would like to speak to someone else, please call the Research Compliance Services Office at 402-472-6965 or irb@unl.edu.

Thank you for helping us with this important study.

Sincerely,

Christopher J. Chizinski, PhD

Assistant Professor of Human Dimensions of Wildlife Management

University of Nebraska-Lincoln

(402) 472 - 8123

To opt out of further emails [CLICK HERE](#)

Appendix E. Analysis of barriers that includes generation as an independent variable.

METHODS

DEFINING GENERATION

To define generation, we used the distinct cut off years as described by Pew Research (Dimock 2018). We included the following generations in the analysis: silent (i.e., \leq 1945), baby boomers (i.e., 1946 – 1964), generation X (i.e., 1965 – 1980), millennials (i.e., 1981 – 1995), and generation Z (i.e., \geq 1996). To categorize each respondent within a generation, we used the respondents unique identification (ID) number and linked back to the original license database to obtain the respondents year of birth. Next, we created a generation column within our data set and depending on the respondents birth year, a corresponding generation was given to each respondent.

DATA ANALYSIS

We ran an analysis of variance (ANOVA) to test among barrier factors described by the EFA as a function of activity type, location, and generation. We calculated the effect size using partial eta squared (η_p^2) values using lsr package (Navarro 2015) in R (R Core Team 2018). Partial eta squared values test the effect size of the factor and values <0.01 are negligible, 0.01 to 0.05 are small, 0.06 to 0.13 are medium, and > 0.14 are considered large. Effect sizes were important because with a large enough sample size, a significant p-value is likely even when the differences among groups are negligible (Sullivan and Feinn 2012). We used Scheffe's test using the agricolae package (Mendiburu 2017) in R to compare between avid, sporadic, dissociated waterfowl

hunters, anglers, big game hunters, combination users, and small game hunters and barrier. Scheffé's test was chosen due the unique ability to conduct complex comparisons across multiple means (Ruxton and Beauchamp 2008). For barrier factors with effect sizes $\eta_p^2 > 0.05$, we assessed the differences among the individual barrier components in each factor to identify individually important barriers.

RESULTS

COMPARING ACTIVITY TYPE, STATE, AND GENERATION

Activity type and locations were both significant across all barrier types ($p < 0.001$). Additionally, generation was statistically across all barrier types ($p < 0.01$) with an exception for the barrier type waterfowl populations (i.e., timing of migration, number of ducks I may see; $p = 0.42$). Effect sizes for stated participation activity type were small and large effects on nine of the ten barrier factors. The waterfowl population barrier type (i.e., timing of migration, low waterfowl populations) ($\eta_p^2 = 0.00$) factor had a negligible effect size. No hunters (i.e., lack of family and friends who hunt) ($\eta_p^2 = 0.09$), waterfowl identification (i.e., identifying flying ducks) ($\eta_p^2 = 0.09$), and waterfowl hunting skills (i.e., using calls and decoys) ($\eta_p^2 = 0.14$) types had large effect size values, with the remaining factors (cost, land access, other hunters, rules and regulations, travel, and views) (η_p^2 between 0.01 and 0.01) having a small effect size. Effect sizes among locations and generation were negligible or small for all barrier factors ($\eta_p^2 \leq 0.01$). Given the relative small influence of generation and geography on barriers, all further analysis focused on just activity type with large effect sizes ($\eta_p^2 \geq 0.06$).

TABLES

Table E-1

Analysis of Variance (ANOVA) results for the barrier types and the effect of activity type, location, and generation on barrier types. Rows represent the different barrier factors and columns represent the independent variables (i.e., activity type, location, generation), F-values and partial eta squared (e.g., effect size) values. Additionally, all barrier types were significant ($p < 0.01$). Effect sizes were generally negligible across all factors for location and generation and were ranged from small to large across all type types for activity type. Partial eta squared values >0.01 are negligible, 0.01 to 0.05 are small, 0.06 to 0.13 are medium, and > 0.14 are considered large.

Barrier Type	Variable	F-value	p	η_p^2
Cost	Activity	100.21	<0.01	0.01
	Location	31.63	<0.01	0.01
	Generation	79.71	<0.01	0.00
Land Access	Activity	67.86	<0.01	0.01
	Location	33.90	<0.01	0.01
	Generation	6.62	<0.01	0.00
No Hunters	Activity	239.51	<0.01	0.09
	Location	7.99	<0.01	0.00
	Generation	5.55	<0.01	0.00
Other Hunters	Activity	102.31	<0.01	0.02
	Location	23.87	<0.01	0.00
	Generation	3.22	<0.01	0.00
Rules and Regulations	Activity	298.86	<0.01	0.02
	Location	46.56	<0.01	0.00
	Generation	14.11	<0.01	0.00
Travel	Activity	44.63	<0.01	0.02
	Location	31.38	<0.01	0.01
	Generation	4.89	<0.01	0.00

Table E-1 continued

Barrier Type	Variable	F-value	P	η_p^2
Views	Activity	23.95	<0.01	0.01
	Location	2.95	<0.01	0.00
	Generation	2.77	0.01	0.00
Waterfowl Identification	Activity	798.25	<0.01	0.09
	Location	36.83	<0.01	0.00
	Generation	5.94	<0.01	0.00
Waterfowl Hunting Skills	Activity	611.17	<0.01	0.11
	Location	12.74	<0.01	0.00
	Generation	24.95	<0.01	0.00
Waterfowl Population	Activity	18.21	<0.01	0.00
	Location	16.09	<0.01	0.00
	Generation	1.00	0.42	0.00