ABSTRACT

FREW, KRISTIN NICOLE. Valuation of Wildlife Species in North Carolina. (Under the direction of Markus Peterson).

The coincident decline in monetary conservation resources and the increase in numbers of threatened species makes valuation of wildlife species important and mandates prioritization when allocating the limited resources available for conservation. Conservation experts often have made such prioritization decisions but pressure to include public priorities in decision making has mounted over recent decades. Estimating how the public values species, species groups, and species attributes has become an important way to meet this need. Valuation of species or their attributes can be coordinated in many ways. Monetary worth (e.g., market and non-market value) and general appreciation and high opinion of a species provide two general types of measures. The lack of research exploring the perspectives of children on species values and prioritization represents a major gap in research on the value of biodiversity.

Despite the importance of biodiversity's bequest value, children's preferences for species attributes have never been considered. We began addressing this need with a survey of 3rd and 5th grade students–typically 8-10 years old–in North Carolina, USA (n = 440) to determine how children prioritized conservation of species with different attributes. We asked children to rank five species attributes, allocate money to species with each attribute, and choose between each species attribute and endemism. We found children prioritized species important in nature and species with declining numbers over species with other attributes, whereas previous research suggests adults prioritize endemic species over most other types. Our results suggest children prioritize biodiversity conservation differently from adults, and in ways that may be more conducive to biodiversity conservation in cases where

endemism is not directly related to species endangerment. We recommend the perspectives of children be more fully considered within biodiversity conservation both because they have reasonable priorities and because many people attempt to save biodiversity for them in the first place.

In addition to public preferences and values influencing management decisions, wildlife can have a positive monetary effect on rural economies by injecting new dollars in local businesses, supporting the tax base, and creating increased demands for locally available land, labor, and capital. We estimated the market and non-market value of tundra swans (*Cygnus columbianus*) in North Carolina with IMPLAN and the contingent valuation method, and we compared tundra swan values among hunters, birders, and residents. We found birders and hunters had higher mean willingness to pay (WTP) with $35.2/birder/year and $30.53/hunter/year than residents with a mean WTP of $16.27/resident/year. Tundra swan hunters spent an average of $408.34/hunter/year and generated a value added of $306,156 – $920,161/year for the state economy. Birders spent $171.25/birder/year and generated a value added of $14 million – $32.7 million/year for the state economy. Our results also suggest high WTP for tundra swans by birders and hunters could be attributed to conservation-oriented attitudes. Low leakage rates also may suggest unique hunting and viewing opportunities can capture higher economic value for rural areas. The coalescence of market and non-market values provides a more comprehensive estimate of the value of wildlife and facilitates more effective management decisions. Therefore, we recommend that market and non-market values be considered to minimize tradeoffs between development and wildlife recreation.

Valuation of Wildlife Species in North Carolina

by
Kristin Nicole Frew

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DEDICATION

To my parents, Cindy and Steven, for supporting me from the very beginning, and my brother, Michael, for showing me how to work hard towards a Master's degree and inspiring me to try myself. To my boyfriend, Mason, for helping me stuff thousands of envelopes, chase down people to survey, and being a constant companion through this whole experience.

BIOGRAPHY

Kristin Nicole Frew was born on June 3, 1991 in Bridgeton, Missouri to parents Cindy and Steven Frew. She has one older brother, Michael Frew, and a new sister, Anna Frew, as of May 2015. Kristin lived in Bridgeton, Missouri until the age of 8 when her family moved to Flowood, Mississippi. She received her undergraduate degree in Fisheries and Wildlife Conservation from Mississippi State University, where she graduated magna cum laude in 2013. Throughout her undergraduate career, she worked as a wildlife technician in Mississippi and Utah. She also worked as an environmental educator in Georgia after graduating from Mississippi State. In January of 2014, she began her Masters degree in Fisheries, Wildlife, and Conservation Biology at North Carolina State University. She completed two projects, the first evaluating children's preferences of wildlife species attributes in North Carolina, and the second assessing the economic value of tundra swans in eastern North Carolina. She is looking forward to a career focused on her love of wildlife and education.

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TABLE OF CONTENTS

LIST OF TABLES

Are We Working to Save the Species Our Children Want to Protect? Evaluating Species Attribute Preferences among Children

Market and Non-Market Valuation of North Carolina's Tundra Swans (*Cygnus columbianus*) for Hunters, Birders, and the Public

LIST OF FIGURES

Market and Non-Market Valuation of North Carolina's Tundra Swans (*Cygnus columbianus*) for Hunters, Birders, and the Public

CHAPTER 1

Are We Working to Save the Species Our Children Want to Protect? Evaluating Species Attribute Preferences among Children

ABSTRACT

The coincident decline in conservation resources and increase in numbers of threatened species makes prioritizing species increasingly important, and prioritizing based on attributes versus named species may be the most efficient approach. Despite the importance of biodiversity's bequest value, children's preferences for species attributes have never been considered. We surveyed 3rd and 5th grade students–typically 8-10 years old–in North Carolina, USA (n = 440) to determine how children prioritize conservation of species with different attributes. We asked students to rank five species attributes, allocate money to species with each attribute, and choose between each species attribute and endemism. Children prioritized species important in nature and species with declining numbers over species with other attributes, whereas previous research suggests adults prioritize endemic species over most other types. Our results suggest children prioritize biodiversity conservation differently from adults, and in ways that may be more conducive to biodiversity conservation in cases where endemism is not directly related to species endangerment. We suggest the perspectives of children be more fully considered within biodiversity conservation both because they have reasonable priorities and because many people attempt to save biodiversity for them in the first place.

INTRODUCTION

Limited and often declining resources for biodiversity conservation (Mace et al. 2007, Butchart et al. 2010) and growing biodiversity conservation needs (Pereira et al. 2010, Cardinale et al. 2012, Hooper et al. 2012) make prioritizing species increasingly important. Human actions have increased extinction rates up to 1000 times their background levels (Pimm et al. 1995), and this catastrophe is projected to grow in the face of rapid anthropogenic climate and land cover change (Foley et al. 2005, Leadley et al. 2010, Bellard et al. 2014). Stable or declining conservation budgets (Iwamura et al. 2010, Waldron et al. 2013) mean difficult trade-offs regarding which species are protected will be necessary. Many government and non-governmental conservation organizations prioritize species based on their chances of becoming extinct (e.g. U.S.A's Endangered Species Act 1973; IUCN Red List 2015); however, some scientists suggest that other attributes need to be considered when deciding conservation priority. Experts have used criteria including endemism, economic value, ecological significance, charisma, and evolutionary distinctiveness to determine the conservation priority of species (Avise 2005, Isaac et al. 2007, Sodhi et al. 2010, Curnick et al. 2015). Recent scholarship also highlights the importance of species with large impacts on ecological and evolutionary processes (Possingham et al. 2002, Isaac et al. 2007, Arponen 2012).

Understanding public perspectives on prioritizing species is critical both because saving species often requires human intervention, and because public preference should influence conservation in nominally democratic contexts (Czech et al. 1998). Public preferences dictate where money will be allocated, which species will receive protection, and the overall success of conservation plans (Norton 1986, Martín-López et al. 2007, Martín-López et al. 2009). Efforts to evaluate public prioritization of biodiversity conservation have

focused on willingness to pay for conserving a species or suite of species (e.g., Loomis & White 1996, Martín-López et al. 2007). These studies, however, tend to be species specific and do not provide general principles for prioritizing species. Eliciting public preference for species conservation can be problematic when using named species because public preference for iconic species tends to overestimate species value (Jacobsen et al. 2007). Further, specific species may be viewed in widely differing ways among stakeholders. For example, the tiger (*Panthera tigris*) is a popular flagship species in developed countries, but those whose lives and livelihood are threatened because of tigers have a different view (Leader Williams and Dublin 2000). Researchers have responded to this need by developing and testing the importance of several relatively objective and general species attributes (e.g., Knegtering et al. 2002, Montgomery 2002, Meuser et al. 2009). Being rare and endemic are often two most important species attributes (Veríssimo et al. 2009, Morse-Jones et al. 2012, Takahashi et al. 2012). The role of body size and appearance are also relevant attributes for flagship species but importance varies among studies (Takahashi et al. 2012, Veríssimo et al. 2014). Another study ranked attributes of endemic species being clearly the most important followed by species with declining numbers and species with economic importance (Meuser et al. 2009).

This research trajectory focusing on multiple species attributes is important but conspicuously omits the perspectives of children. The idea that biodiversity conservation is in part about a bequest to our children and future generations is axiomatic to the conservation biology field and was repeatedly voiced in seminal works (Weiss 1990, Meine et al. 2006). Further, the future success of conservation efforts depends on creating the next generation of conservationists. Experiences in childhood can set lasting trajectories in areas such as

academic performance (Gelman and Brenneman 2004), life success (Gorey 2001), and pro-environmental behavior (Chawla 1999), and understanding the opinions of children may shed light on how to foster lifelong biodiversity stewardship. Further, children's viewpoints may shape conservation behaviors of their parents now. Numerous studies have documented how children influence their parents in areas such as purchasing behavior (e.g., children convincing parents to buy breakfast cereals; Flurry & Burns 2005), information technology (e.g., children teaching parents in computer skills; Hampshire 2000), and pro-environmental behavior (e.g., children encouraging recycling among parents; Legault & Pelletier 2000), which suggests that children's' conservation priorities may influence those of their parents. For all these reasons, the perspectives of children on prioritizing biodiversity conservation are fundamentally important.

We began addressing this need with a study similar to Meuser et al. (2009), but focused on how children between 3rd and 5th grade prioritized species attributes. We hypothesized that species with declining numbers and ecologically important species would be ranked highest among children. Although previous studies among adults found endemism to be an important, if not the most important, attribute (Meuser et al. 2009, Veríssimo et al. 2009, Morse-Jones et al. 2012), that relationship may emerge from adults having a nativist response to animals similar to xenophobia towards other humans (Brown & Sax 2004), which may lead to favoratism for all types of native animals, including endemic species. Although gender represents a relatively strong and persistent driver of how adults prioritize and perceive wildlife (Kellert and Berry 1987, Czech et al. 2001), we predicted the relationship would be weaker among children because gender identities are still forming (Serbin et al. 1993, Martin and Ruble 2004, 2009). We treated ethnicity, socioeconomic

status (SES), and education as exploratory variables because there was little or no theory suggesting potential relationships between these variables and how children prioritized species for conservation.

METHODS

Sampling

Our study targeted 3rd and 5th grade students–typically 8-10 years old–in North Carolina because they represented the youngest age groups with cognitive abilities that allow them to think abstractly and form interests and concerns related to environmental issues (Gelman and Brenneman 2004). We obtained a stratified random sample of elementary school children across North Carolina. To obtain a random sample, we selected 60 schools from a list of all public middle and elementary schools in North Carolina. Within the 60 schools, we compiled a list of all 3rd and 5th grade teachers. From the list of all 3rd and 5th grade teachers, we randomly selected 118 teachers for participation in our study. Of the 118 teachers contacted, 36 responded (30.5% response rate) and 21 consented to participate (58.3% compliance rate). Data collection occurred in March 2014 and resulted in 16 classroom visits and 440 student surveys (all students who attended class chose to participate). We surveyed 16 classrooms rather than all 21 that consented to participate due to scheduling conflicts. Gender was balanced (53% female) and most students were in 3rd grade (79%). The most prevalent ethnicity was White (46%) followed by African American (21%), Native American (11%), Hispanic (10%), Other (10%), and Asian (2%). School-level data available from the National Center for Education statistics revealed that average percentage of students eligible for free and reduced lunch at the schools associated with our sample was 66.4% (SD = 17.5) (US Department of Education 2012). The North Carolina

State University institutional review board (IRB # 3793) approved this study and all participants were provided study information and consented to the study (i.e., informed consent).

Questionnaire Design

In order to elicit species preferences among children, we constructed a questionnaire asking students to rank species attributes, allocate money to species with each attribute, and choose between each species attribute and endemism. These questions were adapted for children from a similar survey by Meuser et al. (2009). We chose this approach both to facilitate comparisons, and because other methods (e.g., choice experiments) were less suited to minimizing classroom time interrupted by the study and minimizing cognitive difficulty for the young age group in our study (Hanley et al. 2001). The first question asked students to rank the importance of five species attributes that might dictate allocation of resources for conservation: wild animals whose numbers are going down fast (species with declining numbers), wild animals that are important in nature (species important in nature), the wild animals that live nowhere else but North Carolina (endemic species), wild animals people like to watch (species people watch), and wild animals people like to eat (species people eat). The second question asked students to allocate a specific amount of money ($10) among the same species attributes. This constant-sum question provided a ranking of attributes and a measure of the extent of children's preferences for these attributes. The third question asked students to choose between endemic species and four other species attributes. The other factors were: species with declining numbers, species important in nature, species people watch, and species people eat. For each pair, students identified the attribute they thought should be a higher priority for species protection.

The final instrument was based on pretesting of both 3rd and 5th grade students. First, we administered the draft instrument to two classes of 5th graders (n = 32). We asked students to circle questions that were difficult to understand and make notes on how to make improvements. After making adjustments to the wording of several items, we administered a second draft version of the survey to an additional two classes of 3rd grade students (n = 37) and asked for written feedback. Additionally, we completed cognitive interviews (Desimone and Le Floch 2004) with 12 students to gather general feedback and identify versions of questions that were easier to understand.

Analysis

For the questions asking students to rank species attributes and allocate money to species with each attribute, we compared answers across students with Wilcoxon signed-ranks tests (Meuser et al. 2009). For the question asking students to choose between each species attribute and endemism, we tested for differences in the pairwise comparisons with binomial tests. For each question, we also explored whether students' preferences differed by grade level, gender, ethnicity, locale, and SES with Mann-Whitney U tests. For SES, we split the sample based on the median percentage of students eligible for free and reduced lunch at the schools associated with this sample (65.6%). Students attending schools below the median were placed in the high SES group, and students attending schools at or above the median were placed in the low SES group. We also used school-level locale data to split the sample into urban versus rural students. Those attending schools in areas classified as rural or towns were placed in the rural group and those in suburbs or cities were placed in the urban group. School-level SES and local data was available through the National Center for Education Statistics (US Department of Education 2012).

RESULTS

When asked to rank species attributes and allocate money to species with each attribute, children ranked species with declining numbers as most important relative to the other species attributes (Tables 1). Species with declining numbers was ranked higher and allocated more money for all species attributes other than species important in nature. When asked to choose between each species attribute and endemism, children chose species important in nature over endemic species the most (Table 1). Species with declining numbers was a close second preference over endemic species.

We did not detect gender based differences in ranking of species attributes, allocation of money to species with each attribute, or choices between each species attribute and endemism. When examining education level, we found children in the 3rd grade (n = 347) and 5th grade (n = 93) ranked species attributes in the same order but with different preference strengths. The 5th graders ranked species with declining numbers and species important in nature significantly higher than 3rd graders (Table 2). The 3rd graders ranked endemic species higher than 5th graders. The 5th graders allocated more money to species with declining numbers than 3rd graders, but 3rd graders allocated more money to endemic species than 5th graders. For the question asking students to choose between each species attribute and endemism, 3rd graders chose species people watch over endemic species more often than 5th graders. We also found that 5th graders chose species people eat over endemic species more than 3rd graders (Table 2). Third graders demonstrated higher variance in their ranking of endemic species (SD = 1.46 vs. 1.23), species people eat (SD = 1.51 vs. 1.34), and species important in nature (SD = 1.41 vs. 1.31).

We did not detect a difference in the overall ranking of species attributes or the allocation of money to species with each attribute between White (n = 196) and non-White children (n = 229). However, when individual attributes are examined, we found White children ranked species with declining numbers higher than non-White children (Table 3). For the allocation of money to species with each attribute, White children also allocated more money to species with declining numbers than non-White children. Non-White children allocated more money to conserving species people watch than White children. For the question asking students to choose between each species attribute and endemism, White children chose species with declining numbers over endemic species more often than non-White children (Table 3). Patterns in overall ranking and allocation of money between students attending schools in the low SES (n = 273) and high SES (n = 172) groups, largely mirrored those evident when comparing White and non-White students (Table 3). This is reasonable since ethnicity was strongly related to SES in the study area (Macartney et al. 2013). Children from the high SES group (likely higher percentages of non-White students) placed more importance on species with declining numbers and less importance on species people watch than did the low SES group (Table 3). Children at high SES schools also allocated more money to species with declining numbers and less money to species people watch than children at low SES schools did. When asked to compare each attribute to endemism, students in the high SES group chose species with declining numbers and species people eat more often and species people watch less often than the students at the low SES school did (Table 3).

DISCUSSION

Our findings suggest endemism was not the most important species attribute among children as previous research suggests it is among adults. Previous research with adults found endemic species to be either most important (Meuser et al. 2009) or second most important among attributes considered (Veríssimo et al. 2009), but children in our study ranked endemic species as fourth most important, well behind species with declining numbers, species important in nature, and species people eat. Since we addressed local endemism in this study, versus endemism in the abstract which exists beyond a nation or place border (Morse-Jones et al. 2012), this could be related to children having less prejudice against "alien species" than adults. It has commonly been theorized that implicit racial prejudice develops via exposure to detrimental socializing agents in early childhood (Devine 1989, Sinclair et al. 2005). According to Brown & Sax (2004), adults may have a deep natural response, similar to xenophobia towards other humans, in their view of alien plants and animals. Children may be less influenced by this nativist thinking because they have yet to develop prejudices against people, animals, or plants that are seen as foreign (Brown and Sax 2004). It is possible for social desirability to play a role in our findings due to using endemism as a constant attribute in the last question. However, this seems unlikely since our study used three measures to test species attribute preferences and they yielded the same results despite the last question being the only one vulnerable to social desirability bias.

Children in our study prioritized species attributes in much the same way a conservation biologist would. Although conservation biologists have not reached consensus about which species attributes are most important (Wilson et al. 2011), species with declining or threatened populations and those with large ecological or evolutionary roles typically top the list of attributes (Carter et al. 2000, Forest et al. 2007, Isaac et al. 2007,

Redding et al. 2010). These attributes are the same ones children in this study valued above all others. Being endemic, fun to watch, or edible may generate some value, but if species with these attributes face no threats to future population viability and do not play a critical role in ecosystem function, why dedicate resources to protecting them? Because the perspectives of children often influence their parents, in arenas ranging from purchasing behavior (Flurry and Burns 2005, Walia Sharma and Dasgupta 2009) to pro-environmental behavior (Easterling et al. 1995, Ballantyne et al. 1998, 2001, Duvall and Zint 2007, Damerell et al. 2013), the conservation biology minded perspectives of children may be leveraged in efforts to influence the perspectives of adults who may prioritize less critical species attributes. Conversely, some of the greatest wildlife conservation challenges require eradication of non-native species such as feral cats (Ash et al. 2003; Robertson 2008; Loss et al. 2013), and typical arguments about non-native or invasive status may not resonate as well among children as among adults.

Unlike studies among adults (Meuser et al. 2009, Veríssimo et al. 2009), which found gender effects on species preferences, we did not find any correlations between gender and prioritization of any species attributes. Although there are many gender development theories rooted in diverse biological and social schema, it is widely accepted that gender identity is a dynamic process which is far from complete among elementary school age children (Bussey and Bandura 1999). Thus, our lack of findings regarding gender differences in species attribute preferences may reflect gender socialization being less complete among children than adults. Social cognitive theory combines psychological and sociostructural determinants to explain gender development as a product of familial and social influences regularly encountered (Bussey and Bandura 1999). These relationships drive gender identity

development as early as two years old and plateaus when a person is in their 20s; however, gender is a dynamic process that can continue to develop throughout life (Martin and Ruble 2009, Leman and Tenenbaum 2011). This suggests future research may detect gender effects on species attribute preferences in young adults as they gain societal experiences. Indeed some studies among older students (ages 10 to 20) have found gender effects with girls being more oriented towards pets (Bjerke et al. 1998), and more fearful of animals, particularly threatening species (Prokop and Tunnicliffe 2010, Prokop and Fančovičová 2013). Future research should explore when gender identity begins to impact species and species attribute preferences.

Differences in grade level, ethnicity, and SES did not correspond to different rank orders for species attribute rankings but were related to different average ranks for some attributes. Our finding that 5th grade students prioritized species with declining numbers more than 3rd graders suggests two more years of schooling may result in increased knowledge regarding the environment and how organisms are interconnected (Kellert 1984, Larson et al. 2010). This may correspond to species prioritization growing closer to a conservation biology ideal. Alternatively, 3rd graders demonstrated more variance in their answers, which could be a result of not being able to read as well as the 5th graders and having a less clear understanding of the questions. If this is the case, better reading comprehension may produce results very similar to those found for 5th grade students. Our results vary from the results of Meuser et al. (2009), who found that endemic species was preferred more by those with higher education among adults.

The relationships between ethnicity and species attribute preferences may be explained by previously established differences in orientations towards wildlife among

different ethnic groups. Kellert (1984) found that non-White children were more utilitarian than White children. Although more recent research among children is limited, extensive research suggests the same pattern persists among adults (Brown 2003). If such utilitarian wildlife orientations identified among non-White adults exist among children, that may explain why we found non-White children consider edibility and watch-ability as more important species attributes than White children. These findings should be interpreted with caution, however, as ethnicity serves as a surrogate for other variables such as income, education, and the incidence of single parent households (Collins 2004, Duncan and Magnusun 2005). The fact that our SES results mirrored those for ethnicity support the assertion that ethnicity may serve a surrogate for SES in this case study. Recent research suggests nature based education may improve environmental literacy more among minority than non-minority students in the U.S. (Stevenson et al. 2013), so future research exploring the degree to which similar experiences shape the balance between use focused and conservation focused attributes for species conservation would be valuable.

Differences among students attending schools of differing SES levels with respects to species attribute preferences may parallel studies linking affluence with pro-environmental attitudes and behaviors among adults (Van Liere and Dunlap 1980, Scott and Willits 1994, Chen et al. 2013). This line of research suggests that individuals become more concerned with the environment after they are able to attend to aesthetic needs, which increases with affluence (Inglehart 1995). Our results suggest that children of low SES background may have more utilitarian wildlife interests (e.g., having a stronger preference for species people watch) and those of a higher SES background may be interested in biodiversity conservation for its own sake (e.g., a stronger preference for species with declining numbers). Although

our measure of SES was at a school-level, these results warrant future research, as this is the first study we are aware of that has investigated how SES impacts wildlife perceptions among children.

Additional research on how children prioritize species attributes would benefit from consideration of several variables including geographic locations of homes (Miller 2005), significant life experiences in nature (Stevenson et al. 2014), and adult role models (Monroe 2003), which appear to shape the way children orient themselves towards nature and potentially biodiversity. Similarly, unique geographic contexts such as islands may elicit unique species attribute rankings among children (e.g., higher ranking for endemic species) and should be considered. Future research with older children may benefit from choice experiment methodology because it allows for more realistic tradeoffs (Hanley et al. 2001, Veríssimo et al. 2009, Di Minin et al. 2013). Qualitative research would provide insight into why children think various species attributes are more important than others. In order to combat declining global biodiversity, public awareness about the need to preserve biological diversity is crucial. Species attributes preferences among children may provide the foundation for a bridge between public preferences for prioritizing conservation biology efforts and the priorities for conservation biology.

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Table 1. Responses to three species attribute preference tasks among 3rd and 5th grade students.

Task 1: Rank each kind of wild animal from 1 (should be protected first) to 5 (should be protected last). Each z-score is associated with a comparison to endemic species (H_0 = no difference in rank of species attributes; n = 296).

Wildlife Attributes	*Mean Ranks*	*Z*
Wild animals whose numbers are going down fast	2.05	10.21*
Wild animals that are important in nature	2.39	8.45*
Wild animals that people like to eat	3.17	3.79*
Wild animals that live nowhere else but North Carolina	3.57	
Wild animals that people like to watch	3.81	-2.14

Task 2: Allocate a total of $10 to protection of the five species types. Each z-score is associated with a comparison to endemic species (H_0 = no difference in rank of species attributes; n = 333).

Wildlife Attributes	*Mean Allocation (USD$)*	*Z*
Wild animals whose numbers are going down fast	2.99	-9.83*
Wild animals that are important in nature	2.25	-6.01*
Wild animals that people like to eat	1.78	-1.91
Wild animals that live nowhere else but North Carolina	1.65	
Wild animals that people like to watch	1.43	3.982*

Task 3: Percentage of cases for which each species attribute was chosen over endemism. Each z-score is associated with a comparison to endemic species (H_0 = no difference in rank of species attributes; n = 424).

Wildlife Attributes	*% Preferred Over Endemic*	*Z*
Wild animals that are important in nature	91.23%	29.91*
Wild animals whose numbers are going down fast	86.16%	21.41*
Wild animals that people like to eat	51.42%	0.58
Wild animals that people like to watch	46.79%	-1.32

**significant with $\alpha<0.0125$ corrected for false discovery rate* (Benjamini and Hochberg 1995).

Table 2. Responses to three species attribute preference tasks according to grade level.

Task 1: Rank each kind of wild animal from 1 (should be protected first) to 5 (should be protected last). Each z-score is associated with a comparison to endemic species (H_0 = no difference in rank of species attributes; n = 293).

Wildlife Attributes	*Mean Ranks*		*Z*
	3rd Grade	*5th Grade*	
Wild animals whose numbers are going down fast	2.37	1.93	2.98*
Wild animals that are important in nature	2.80	2.22	3.31*
Wild animals that people like to eat	2.96	3.24	-1.52
Wild animals that live nowhere else but North Carolina	3.22	3.73	-2.57*
Wild animals that people like to watch	3.60	3.89	-1.94

Task 2: Allocate a total of $10 to protection of the five species types. Each z-score is associated with a comparison to endemic species (H_0 = no difference in rank of species attributes; n = 333).

Wildlife Attributes	*Mean Allocation (USD$)*		*Z*
	3rd Grade	*5th Grade*	
Wild animals whose numbers are going down fast	2.57	3.13	-2.93*
Wild animals that are important in nature	2.31	2.23	-0.15
Wild animals that people like to eat	1.84	1.77	0.14
Wild animals that live nowhere else but North Carolina	1.94	1.53	2.64*
Wild animals that people like to watch	1.46	1.42	0.66

Task 3: Percentage of cases for which each species attribute was chosen over endemism. Each z-score is associated with a comparison to endemic species (H_0 = no difference in rank of species attributes; n = 420).

Wildlife Attributes	*% Preferred Over Endemic*		*Z*
	3rd Grade	*5th Grade*	
Wild animals that are important in nature	0.88	0.93	-1.4
Wild animals whose numbers are going down fast	0.78	0.89	-3.03*
Wild animals that people like to eat	0.42	0.51	-2.42*
Wild animals that people like to watch	0.59	0.47	3.132*

**significant with $\alpha<0.0125$ corrected for false discovery rate* (Benjamini and Hochberg 1995).

Table 3. Responses to three species attribute preference tasks according to ethnicity and SES.

Task 1: Rank each kind of wild animal from 1 (should be protected first) to 5 (should be protected last). Each z-score is associated with a comparison to endemic species (H_0 = no difference in rank of species attributes; n = 293).

Wildlife Attributes	*Mean Ranks*			
	White	*Non-White*	*Low SES*	*High SES*
Wild animals whose numbers are going down fast	1.72*	2.32*	1.44*	0.81*
Wild animals that are important in nature	2.29	2.48	1.49	1.33
Wild animals that people like to eat	3.27	3.08	2.18	2.16
Wild animals that live nowhere else but North Carolina	3.66	3.50	2.39	2.69
Wild animals that people like to watch	4.07*	3.60*	2.52*	2.99*

Task 2: Allocate a total of $10 to protection of the five species types. Each z-score is associated with a comparison to endemic species (H_0 = no difference in rank of species attributes; n = 335).

Wildlife Attributes	*Mean Allocation (USD$)*			
	White	*Non-White*	*Low SES*	*High SES*
Wild animals whose numbers are going down fast	3.18*	2.83*	2.59*	3.20*
Wild animals that are important in nature	2.24	2.26	2.42	2.16
Wild animals that people like to eat	1.76	1.79	1.78	1.78
Wild animals that live nowhere else but North Carolina	1.61	1.63	1.72	1.62
Wild animals that people like to watch	1.29*	1.57*	1.61*	1.34*

Task 3: Percentage of cases for which each species attribute was chosen over endemism. Each z-score is associated with a comparison to endemic species (H_0 = no difference in rank of species attributes; n = 424).

Wildlife Attributes	*% Preferred Over Endemism*			
	White	*Non-White*	*Low SES*	*High SES*
Wild animals that are important in nature	0.93	0.89	0.89	0.92
Wild animals whose numbers are going down fast	0.96*	0.78*	0.74*	0.93*
Wild animals that people like to eat	0.55	0.48	0.54*	0.43*
Wild animals that people like to watch	0.45	0.48	0.42*	0.57*

**significant with $\alpha<0.0125$ corrected for false discovery rate* (Benjamini and Hochberg 1995).

CHAPTER 2

Market and Non-Market Valuation of North Carolina's Tundra Swans (*Cygnus columbianus*) for Hunters, Birders, and the Public

ABSTRACT

Wildlife-related tourism represents an important and growing sector for many rural economies and may be inadequately considered during regional planning. Providing robust estimates of wildlife value can help address this challenge. In this paper, we contribute to previous work estimating the value of wildlife in hunting and bird watching contexts with a case study that evaluated both simultaneously. Specifically, we used both market and non-market valuation methods to estimate the value of tundra swans in North Carolina and compared tundra swan values among hunters, birders, and the general public. Birders and hunters had higher mean willingness to pay (WTP), with $35.2/birder/year and $30.53/hunter/year, than residents with a mean WTP of $16.27/resident/year. When controlling for income and importance of tundra swan conservation, mean WTP was $33.54/birder/year, $31.2/hunter/year, and $20.47/resident/year. We used the Impact Analysis for Planning (IMPLAN) system software to estimate market values for tundra swans. Tundra swan hunters spent an average of $408.34/hunter/year and generated a value added of $306,156 – $920,161/year for the state economy. Birders spent an average of $171.25/birder/year and generated a value added of $14 million – $42.9 million/year for the state economy. High WTP for tundra swans by birders and hunters could be attributed to conservation-oriented attitudes. Low leakage rates also suggest unique hunting and viewing opportunities can capture higher economic value for rural areas. The coalescence of market

and non-market values provides a more comprehensive estimate of the value of wildlife and facilitates more effective management decisions. Therefore, we recommend that market and non-market values be considered to minimize tradeoffs between development and wildlife recreation.

INTRODUCTION

Wildlife-related tourism represents an important and growing sector for many rural economies. Wildlife and nature-based tourism can have a positive effect on rural economies by injecting new dollars in local businesses, supporting the tax base, and creating increased demands for locally available land, labor, and capital (Sims et al. 2004). Tourism has proven to be a powerful component for economic growth by transferring capital, income, and employment from industrial, urban and developed areas to more rural regions (Lane 1994, Reynolds and Braithwaite 2001). Rural tourism in the United States is largely composed of domestic tourism (Gartner 2004, Aremberri 2005). Most international visitors do not move far from urban areas (Gartner and Lime 2000); thus, international tourism is much less economically important to a developed nation's economy when compared with domestic tourism (Aremberri 2005). Because over half of all trips, 100 miles or more, originate and end in the same state (U.S. Department of Transportation 2002), distance and ease of travel are important factors for rural tourists (Oh and Schuett 2010). Unique recreational opportunities also attract tourists and provide rural communities with a competitive advantage in the development of productive tourism businesses (English and Bowker 1996). Further, wildlife tourism can increase rural support for wildlife management and conservation by demonstrating the value of wildlife resources (Ashley and Roe 1998).

Wildlife tourism should be considered in regional planning efforts to avoid damage to rural economies and decisions that do not produce optimal outcomes for stakeholders. Development such as housing, infrastructure, and renewable energy projects can alter the landscape and affect the viability of wildlife for tourism and recreation. For example, wind energy developments can have negative impacts on wildlife populations by altering habitat, altering behavior or displacing species, and causing direct mortality from collisions (Kunz et al. 2007, Kuvlesky et al. 2007). Because most outdoor recreation activities take place in natural settings (Knight and Gutzwiller 1995), habitat loss or population decline in a rural area dependent on wildlife for tourism may have significant impacts on the local economy. The local traditions of a rural area may also be affected by regional planning. Hunting is generally considered a family tradition and serves as an important way of life for many rural communities (Hayslette et al. 2001, Stedman and Heberlein 2001). Hence, regional planning that does not consider impacts on wildlife may affect the viability of hunting and affect socio-cultural values of locals.

Integrating wildlife conservation into regional planning is complex and multifaceted; however, economic impact analyses and cost-benefit analyses are two commonly used approaches. Economic impact analyses (EIA) quantify the extent to which an activity impacts an economy and how related expenditures benefit services and other businesses (Grado et al. 2011). EIA use input-output analyses to assess the market value of wildlife. Market values of wildlife can be assessed by garnering expenditures from a hunting, fishing, or wildlife watching trip from participants (Loden et al. 2004, Grado et al. 2011). These expenses can be used in an input-output analysis to determine total economic impacts, which include direct impacts coming from expenditures made to businesses, indirect impacts

coming from supporting business expenditures, and induced impacts coming from expenditures derived from employees of direct and indirect businesses (Grado et al. 2011). Wildlife are difficult to consider in these assessments because valuation of wildlife is typically more complex than the valuation of goods traditionally bought and sold in markets. The value of wildlife species consists of market and non-market values, which makes it difficult to consider the true costs associated with land-use decisions. The non-market value of wildlife includes use value (e.g., viewing a species), option value (e.g., maintaining a species for genetic information that may be used in the future), existence value (e.g., satisfaction from knowing a species exists), and bequest value (e.g., knowledge that conserving a species today leaves it for future generations) (Loomis and White 1996). Cost-benefit analyses (CBA) determine net benefits by indicating which of the money flows in EIA are a cost and which are a benefit (Taks et al. 2011). CBA uses willingness to pay (WTP) valuation techniques to identify benefits. A common method used to assess non-market values is the contingent valuation method, which is a WTP valuation technique that uses surveys to reveal individuals' preferences for environmental goods, such as species conservation (Arrow et al. 1993, Jakobsson and Dragun 2001, Dalrymple et al. 2012).

We conducted a study focused on documenting the market and non-market value of tundra swans in eastern North Carolina. The region offers a compelling study because it provides wintering habitat for an average of 70,000 tundra swans, roughly 68% of the entire Eastern Population (Kruse 2015), and the first wind energy development project in the southeastern United States was announced for construction in eastern North Carolina in 2015 (NCEast Alliance 2015). We tested one hypothesis related to the valuation of tundra swans: (1) people who receive use value from an environmental good, such as tundra swan hunting

or viewing, will have a higher willingness to pay (WTP) than people who receive only non-use value, while controlling for income and importance of tundra swan conservation. We also examined respondent income and importance of tundra swan conservation as checks on the validity of our findings. Income should be positively related to WTP because of previous research (Chen and Jim 2010), and economic theory predicts that WTP for any good or service (holding all else equal) should be positively related to income. Importance of tundra swan conservation should be positively related to WTP because the more important something is to someone, the more they are willing to pay (Loomis and White 1996, Dalrymple et al. 2012). We will also evaluate the relationship between gender and WTP as well as age and WTP. Finally, because tourism impacts on rural economies are often diluted by leakage of economic benefits back to more wealthy regions, we evaluated how much of the market value associated with tundra swans was retained in eastern North Carolina and the state as a whole.

METHODS

We conducted three surveys, one with tundra swan hunters, one with birders at Mattamuskeet and Pea Island National Wildlife Refuges (NWR), and one with residents of North Carolina. We administered an online survey through Qualtrics to 3,000 randomly selected tundra swan hunters during February-March 2015 (n = 1,485). We obtained our sample of hunters from the North Carolina Wildlife Resources Commission's tundra swan hunting permit database and had a 50% response rate. We administered an in-person survey of birders in January 2015 (n = 350). We used an intercept survey method to obtain our sample of birders (Davis et al. 2012). We gave the questionnaire to every person we saw enter either refuge and had the respondent complete and return it to us while we waited. At

Mattamuskeet NWR, we drove the main road of the refuge and surveyed every person we saw. We spent 10 days at Mattamuskeet NWR and collected 240 surveys. At Pea Island NWR, we surveyed every person that stopped at one of the primary pull-offs along NC Highway 12. We spent 8 days at Pea Island NWR and collected 110 surveys. We obtained a compliance rate of 97% for both refuges. We administered a mail survey to a sample of 3,000 randomly selected North Carolina residents during February-March 2015 (n = 455). The resident sample was purchased from Survey Sampling International (Shelton, CT) and achieved approximately 76% coverage of North Carolina households using landline phone records, drivers' license records, and deed records (F. Markowitz, Survey Sampling International, personal communication). Mail survey administration followed Dillman's Tailored Design Method (Dillman 2007), adapted to more closely follow survey administration methods traditionally used by the North Carolina Wildlife Resources Commission. There were 4 mailings that included the first survey packet, second survey packet, reminder postcard, and a final survey packet. Each survey packet included a cover letter that explained the survey, a survey booklet, and a paid return postage envelope. After adjusting for undeliverable addresses, we obtained a 16% response rate for North Carolina residents.

We used pretests and cognitive interviews to identify and correct problems with question comprehension, wording, and skip patterns as well as to finalize bid structures for the contingent valuation questions. We pretested the online hunter questionnaire with a sample of 200 tundra swan hunters and obtained a 45% response rate (n = 90). At the end of the pre-test, we asked respondents to indicate any problems they encountered and suggest improvements. The tourist questionnaire was pretested in two stages at Mattamuskeet

National Wildlife Refuge. In February 2014, we interviewed 12 birders to collect a list of typical expenses, and in October 2014, we administered the questionnaire to 15 birders at Mattamuskeet National Wildlife Refuge using a cognitive interview format (Desimone and Le Floch 2004). The format involved asking respondents to comment on the current questionnaire and suggest how we could make improvements. The resident questionnaire was pretested via mail with 200 (n = 12) randomly chosen respondents.

The three questionnaires used in these surveys were modeled after recent wildlife valuation studies (Grado et al. 2011, Dalrymple et al. 2012). They shared several common elements: a question asking the importance of tundra swan conservation, a contingent behavior question asking respondents to rate the likelihood they would take a trip to eastern North Carolina if tundra swans stopped migrating to North Carolina, a contingent valuation question using dichotomous choice with a follow-up bid to determine respondent WTP for tundra swan conservation, and demographic questions assessing gender, age, education, and income. The contingent valuation question presented a hypothetical scenario that a non-governmental organization was planning on implementing a new program for tundra swan habitat improvement in eastern North Carolina. The respondent was asked if they would be willing to donate a certain amount of money to support this program. We presented respondents with different bid amounts to obtain a range of WTP. The bid for the follow-up question depended on the respondent's answer to the initial question. If the respondent said yes to the initial bid, the follow-up bid would be higher. If the respondent said no to the initial bid, the follow-up bid would be lower (Appendix). The hunter and birder questionnaires shared questions asking where the respondent lived, how many people and cars were present on their trip, and an expenditure table that requested the amount they spent

for specific items (e.g., gas, food, ammunition, etc.) and the county in which they purchased the items. The birder and resident questionnaires also shared a question asking how many times the respondent had seen a tundra swan, a question asking how much they liked or disliked tundra swans, and a demographic question assessing ethnicity. The birder questionnaire had a question asking if tundra swans influenced the likelihood of the respondent taking a trip, and a follow up question asking how much of an influence on a scale of 0-10, where 0 = no influence and 10 = heavy influence. The hunter questionnaire also had a question asking how many days they spent on their most recent trip, and a follow up question asking of those days, how many were spent actively hunting tundra swans.

To assess hunter and birder expenditures, we separated respondents' expenses by county to determine how much money was spent in eastern North Carolina. We defined eastern North Carolina as the 16 counties which provide nearly all (99.4%) of the tundra swan harvest in the state: Hyde, Washington, Currituck, Tyrrell, Beaufort, Pasquotank, Carteret, Pamlico, Chowan, Dare, Halifax, Perquimans, Edgecombe, Bertie, Camden, and Northampton (J. C. Fuller, North Carolina Wildlife Resources Commission, unpublished data). Few tundra swans are known to winter outside of this area in North Carolina. To determine what percent of expenditures were due to tundra swans, we used several questions to obtain an upper and lower bound estimate of expenditures. For the upper bound estimate, we used two separate questions for hunters and birders. For hunters, we calculated the fraction of days they spent actively hunting tundra swans. We then multiplied these percentages by each hunter's expenditures to determine an upper bound (liberal) estimate of the expenditures due to tundra swans. For birders, we used the question asking if tundra swans influenced the likelihood of the them taking a trip, and the follow up question asking

how much of an influence on a scale of 0-10, where 0 = no influence and 10 = heavy influence. The scale was converted to percentages (0 = 0%, 1 = 10%, 2 = 20%, etc.). We then multiplied these percentages by each birder's expenditures to determine an upper bound (liberal) estimate of the expenditures due to tundra swans. For the lower bound estimate, we used the contingent behavior question asking respondents to rate the likelihood they would take a trip to eastern North Carolina if tundra swans stopped migrating to North Carolina. This question was on a scale of least likely (0), no change (5), to most likely (10). We flipped and converted this scale to percentages in order to estimate the amount of expenditures due to tundra swans. Because the options 5–10 meant the respondent would go on the trip regardless of tundra swans (thus, not valuing tundra swans), these options resulted in 0 percent. The options resulted in the following: 0 = 100%, 1 = 80%, 2 = 60%, 3 = 40%, 4 = 20%, and 5-10 = 0%. We then multiplied these percentages by each hunter's and birder's expenditures to determine a lower bound (conservative) estimate of the expenditures due to tundra swans.

For the economic impact analysis of tundra swans in eastern North Carolina, we used the Impact Analysis for Planning (IMPLAN) model to determine direct, indirect, and induced impacts in North Carolina. Direct impacts are sales, salaries, wages, and jobs created by initial purchases that are retained in the economy. Secondary impacts are composed of indirect and induced impacts. Indirect impacts are created through purchases made by directly-impacted businesses or individuals within supporting businesses in the economy. Induced impacts are purchases by employees associated with direct and indirect impact sectors (Loden et al. 2004). We used the 2013 data for North Carolina counties in our hunter and birder IMPLAN models. Overall expenditures for each item listed on the expenditure

table were calculated for birders and hunters and placed within its corresponding economic sector. We also calculated the Social Accounting Matrix (SAM) multiplier, which is the total impact (i.e., direct, indirect, induced impacts) divided by the direct impacts (MIG, Inc. 2004). This relationship accounts for social security and income tax leakage, institution savings, and commuting and serves as a barometer of the region's ability to keep dollars that are spent in the economy. Leakages are local expenditures leaving the region to purchase goods or services elsewhere (Martin 1987). Leakages were calculated as the difference between total sales and local value added (Loomis and Walsh 1997).

We used regression models to predict mean WTP. Age was included in WTP models as a continuous variable, and gender also was included in the models (0 = F, 1 = M). We included education in our models as a binary variable (0 = less than college degree, 1 = college degree or higher) because college is the divider for education level. We also included the importance of tundra swan conservation as a binary variable (0 = of little importance or not at all important; 1 = very important, important, or moderately important) because tundra swan conservation is either important or not important. Ethnicity was included in the birder and resident models as a binary variable (0 = white, 1 = nonwhite) due to small sample size of nonwhites. Respondents identified their annual household income as 1 of 10 categories (1 $\leq$ \$40,000 to 10 $\geq$ \$200,000). Each respondent's income was coded as the midpoint of their self-selected income category and reported in units of \$1,000 (e.g., respondents who selected the \$60,000 to \$79,999 income bracket were coded as 69.9995). We then calculated the mean midpoint income and subtracted it from each respondent's midpoint income to obtain respondent income relative to the mean income (e.g., 69.9995 - 63.707 = 6.2925), which was included in final models.

We used SAS 9.4 (SAS Institute, Inc., Cary, NC) to fit models of WTP for tundra swan conservation. Given that our goal was to conduct inference on expected (mean) WTP, we used a normal distribution to model WTP. Because our survey was based on a dichotomous choice with a follow-up bid method, we obtained interval censored data for each respondent. Instead of observing the exact response from the individual, based on the initial and follow-up bid amounts, we were able to determine an interval for their WTP. For example, if a respondent said yes to an initial bid of $50 but no to a follow-up bid of $75, WTP was known to lie in the interval between $50 and $75. We considered alternative distributions, such as lognormal, for the WTP due to concerns of potential skewness. However, the relevant quantities under the skewness assumption is the median or other quantiles. Given the nature of the question of interest, the mean is a more relevant quantity leading to the use of a symmetric distribution. We used the LIFEREG procedure in SAS to fit interval-censored regression models. If an individual responded "no" to both bids, we knew the response of interest was smaller than the follow-up bid amount but was assumed to be no smaller than 0. If an individual responded "yes" to both bids, we had right-censored data with an unknown upper bound. We used the backward selection method to find the best models at each level of variable inclusions. Due to economic theory stating that income should be positively related to WTP, holding all else equal, we included income as a constant variable in each model. We then used the Akaike Information Criterion (AIC) to compare models (Burnham and Anderson 2002). We selected the best model for each group based on the candidate models with $\Delta AIC < 2$. We also created a model controlling for income and importance of tundra swan conservation in relation to WTP.

We calculated overall non-market value for tundra swans in North Carolina by multiplying the population number of residents, hunters, and birders by their respective WTP estimates. For tundra swan hunters, we graphed the number of new tundra swan permit applicants for the past 9 years, and fit a line to the data. We then used this equation to estimate the total number of tundra swan hunters in the last 25 years. For birders, we used visitor data from five of the most high profile tundra swan viewing refuges in eastern North Carolina: Mattamuskeet NWR, Pea Island NWR, Mackay Island NWR, Alligator River NWR, and Pocosin Lakes NWR. We assumed that visitors at Mattamuskeet and Pea Island NWR were representative of visitors at all of these sites due to high compliance rate and because the sample aligned with previous research suggesting birders are older males with high levels of education and income (Kerlinger and Brett 1995, Kerlinger et al. 1997). We obtained visitor numbers from November to February, when tundra swans are present, and calculated a conservative population number of tundra swan birders. We assumed that anyone who visited these sites outside of November to February, when tundra swans are present, were not attracted by tundra swans. We also assumed that all visitors to refuges during November to February were attracted by tundra swans. For residents we used census data on the number of residents over 18.

We compared age, gender, ethnicity, education, and income for our resident sample to North Carolina census population data (U.S. Census Bureau 2013*a*, *b*, *c*). We found age, gender, ethnicity, education, and income were different between the sample and population ($p < 0.05$), with the sample being mostly older, white males with high levels of education and income. To obtain a valid estimate of WTP for the population of residents in North Carolina, we weighted age, gender, ethnicity, education, and income for our sample data based on

target population characteristics. We assessed nonresponse bias to the resident survey using results from a follow-up survey of nonrespondents. We randomly selected 200 residents from those who did not respond to our first survey for participation in the nonresponse survey. We called each person three times, once during the day, once during the evening, and once over the weekend. We spoke with 57 people and 32 agreed to complete the follow-up survey, which resulted in a 56% compliance rate. We used t-tests to compare respondent and non-respondent data and found no significant difference in how much the respondent liked or disliked tundra swans (t = -0.1921, p > 0.85) or rated importance of tundra swan conservation (t = -0.5529, p > 0.59).

RESULTS

Hunters were predominately male (97%), and their mean age was 44 (*SD* = 14.03). The mean level of education was a college degree ($\bar{x}$ = 4.09; *SD* = 1.36), and the median income was $90,000. Most tundra swan hunters (87%) lived in North Carolina and 13% lived out of state. Birders were mostly white (97%) and male (56%), and their mean age was 54 (*SD* = 15.21). Education level of birders was high with 36% with a college degree and 32% with a Master's or Doctoral/Professional degree. The mean education level was a college degree ($\bar{x}$ = 4.48; *SD* = 1.5), and median income was $90,000. Most birders (84%) lived in North Carolina, 15% lived out of state, and 1% lived in another country. Residents were mostly white (90%) and male (68%), and their mean age was 60 years old (*SD* = 13.83). The mean education level was a college degree ($\bar{x}$ = 4.13; *SD* = 1.6), and median income was $70,000.

When asked how many times they have seen a tundra swan in their life, birders reported seeing tundra swans more than residents ($\bar{x}$ = 2.92 vs. 1.28; t = -16.33; p < 0.0001).

Almost half of North Carolina residents (49%) stated they have never seen a tundra swan. When asked how much they like or dislike tundra swans, birders reported liking tundra swans more than residents ($\bar{x}$ = 4.73 vs. 3.91; t = -16.33; $p < 0.0001$), who demonstrated indifferent views towards tundra swans (Fig 1). When asked how important conservation of tundra swans is to them, birders thought tundra swan conservation was the most important, followed by hunters, and then residents ($\bar{x}$ = 3.60 vs. 3.32 vs. 2.67; F = 116.78; $p < 0.0001$, with Tukey test indicating each variable was statistically different). We asked residents if they would like to travel to view tundra swans in eastern North Carolina, and 38% said yes. When asked why they want to travel to view tundra swans, 76% said they want to see tundra swans, 51% said they want to visit eastern North Carolina, and 25% said the cost is not too expensive.

Evidence supported multiple candidate models predicting WTP for each of our stakeholder groups (Table 1). The best-fit model for hunters included 3 variables: income, importance of tundra swan conservation, and age. Significant coefficients in the hunter model indicated that WTP increased by $0.04 when income increased by $1,000 and WTP increased by $21 when tundra swan conservation was important (Table 2). The best-fit model for birders included 2 variables: income and importance of tundra swan conservation. Neither of these variables were significant predictors of WTP (Table 2). The best-fit model for residents included 3 variables: income, importance of tundra swan conservation, and ethnicity. Significant coefficients in the resident model indicated that WTP increased by $0.80 when income increased by $1,000 and WTP increased by $11.09 when tundra swan conservation was important (Table 2).

Birders and hunters had higher mean WTP than residents (Fig 2). Based on Tukey's multiple comparison test, birders and hunters were not statistically different from each other, but both differed from residents. Income and importance of tundra swan conservation were significant factors affecting mean WTP (Table 3). When controlling for income and importance of tundra swan conservation for hunters, birders, and residents in the multivariate model, mean WTP decreased for birders and increased for hunters and residents (Fig 2). When multiplied by the population, hunters exhibit a mean WTP of $859,816/year, birders have a mean WTP of $20,587,997/year, and residents have a mean WTP of $161,788,294/year. Overall, the total WTP for tundra swan conservation among hunters, birders, and residents is $183,236,108/year.

Gross statewide expenditures spent by the population of tundra swan hunters was $2.04 million/year or $408.34/hunter/year. Gross expenditures made in eastern North Carolina by the population of tundra swan hunters was $1.7 million or $340.22/hunter/year. The gross amount of tundra swan related expenditures made by tundra swan hunters throughout the state was estimated to be $416,013 – $1.3 million. The gross amount of tundra swan related expenditures made by tundra swan hunters in eastern North Carolina was estimated to be $337,940 – $1.2 million. Upper and lower bound estimates of tundra swan related expenditures for hunters were run through a state and an eastern North Carolina model in IMPLAN (Table 4). The SAM multiplier for the total value added to the state was 1.85 and 1.50 in eastern North Carolina. For every $1 spent on tundra swan hunting, an additional $0.85 was generated in economic impact return throughout North Carolina and $0.50 in eastern North Carolina. The state government receives an additional $120,520/year from tundra swan hunting licenses and permits. The federal government also receives

$90,390/year from duck stamps purchased by tundra swan hunters. The statewide leakage rate for hunters was 26 – 28% and the leakage rate in eastern North Carolina was 38 – 40%.

Gross statewide expenditures spent by the population of birders was $90.2 million/year or $171.25/birder/year. Gross expenditures made in eastern North Carolina by the population of birders was $83.2 million or $157.94/birder/year. The gross amount of tundra swan related expenditures made by birders throughout the state was estimated to be $16.2 million – $47.2 million. The gross amount of tundra swan related expenditures made by birders in eastern North Carolina was estimated to be $15.7 million – $46.9 million. Upper and lower bound estimates of tundra swan related expenditures for birders were run through a state and an eastern North Carolina model in IMPLAN (Table 5). The SAM multiplier for the total value added to the state was 1.81 and 1.46 in eastern North Carolina. For every $1 spent on tundra swan tourism, an additional $0.81 was generated in economic impact return throughout North Carolina and $0.46 in eastern North Carolina. The statewide leakage rate for birders was 10 – 13% and the leakage rate in eastern North Carolina was 28 – 30%.

DISCUSSION

Our finding that birders and hunters have a higher WTP than residents may be explained by conservation-oriented attitudes of wildlife recreationists. Cooper et al. (2015) found that individuals who regularly go birdwatching or hunting are more likely to engage in conservation behaviors than those who do not participate in those activities. Similarly, previous studies have revealed experience with nature is fundamental in influencing pro-environmental behavior (Scannell and Gifford 2010, Larson et al. 2011, Stevenson et al. 2013). Willingness to pay for species conservation is also strongly determined by people's

attitudes towards the species (Martín-López et al. 2008). Attitudes are based on affect, people's emotional responses towards an animal, and utility, people's perceptions of an animal's instrumental value (Serpell 2004). Affect for birders and hunters may include aesthetics of the species, positive past experiences, or cultural factors. Utility for birders and hunters may include the use of a species for photography or a harvested animal for food (Serpell 2004). The higher value and WTP for tundra swans by hunters and birders also suggests that people are willing to pay more for services from which they perceive a direct benefit (Dalrymple et al. 2012).

Our finding that nearly half of residents are indifferent towards tundra swans and their conservation highlights the growing disconnect of people with nature. Previous studies suggest wildlife knowledge and value increases with increased participation in viewing, physical, and consumptive activities (Vaske and Donnelly 2007, Hinds and Sparks 2008). Tundra swans are a charismatic and unique species to North Carolina, yet almost half of North Carolina residents have never seen a tundra swan. If increasing WTP and conservation awareness is a goal, it's important to identify who in the public is indifferent or interested in the species of interest. Conservation initiatives can be tailored towards the interested public, while education can focus on the indifferent public to increase their knowledge and support.

Economic multipliers, which assess monetary contributions to the economy based on changes in tundra swan viewing or hunting demand, explain the state's and eastern North Carolina's ability to absorb and use tundra swan related expenditures. Multiplier size can be related to the size of the region of interest. As geographic size increases, value added increases and less expenditures leak outside the region (Loomis and Walsh 1997). This explains why the state multiplier is larger than the eastern North Carolina multiplier.

Multipliers are also influenced by the commercial and industrial makeup of an area (Grado et al. 2001, Loden et al. 2004), which causes recreation expenditure multipliers to range from 1.5 to 2.7 in the United States (Loomis and Walsh 1997). Our multipliers are on the low end of this range, indicating that both economies are capturing some tundra swan related expenditures, but there is room for some forms of additional business development to create or capture expenditure activity.

Low leakage rates associated with our study suggest unique hunting and viewing opportunities can capture high economic value for local, rural communities. Leakage rates for nature-based tourism can be high (e.g., over 78% at Bwindi Impenetrable National Park, Uganda; Sandbrook 2010), which can be attributed to accommodation and service providers owned by nonlocal actors (Akama and Kieti 2007). There is sparse literature describing nature-based leakage rates in the United States, which is an important contribution for this paper. Lower leakage rates of our study compared to leakage rates in international contexts, such as Bwindi Impenetrable National Park, may be a result of few international tourists. Because rural tourism in the United States is comprised mainly of domestic tourism (Gartner 2004, Aremberri 2005), expenditures are easier for the economy to capture. The lower leakage rates of our study may also be attributed to items, such as lodging and food, being purchased from local businesses. However, we did not include long-term durable goods (e.g., ATVs, binoculars, cameras) in our study (Grado et al. 2007), and a large majority of the money generated from these items would leak out of the local economy. The difference between our local and state leakage rates can be explained by scale. As geographic size increases, value added increases, and there is less leakage. Leakages in larger regions are generally reduced due to a more diverse economy capable of absorbing impacts of direct

purchases (Martin 1987). Low leakage rates associated with our study may reflect the use of local expertise and a significant local consumer base. Wildlife hunting and viewing services benefit from the use of local experience. If hunters and birders pay locals for guide services, that money is captured by the local economy, which equates to less leakage, and it benefits local communities. There is also a significant local consumer base for tundra swan hunting and viewing in North Carolina. Most tundra swan hunters and birders are residents of North Carolina, so purchases are more likely to be retained by the economy than if birders and hunters were from outside of the state.

MANAGEMENT IMPLICATIONS

Established market and non-market values of wildlife species allows decision makers to understand tradeoffs inherent to development attributes that impact wildlife. Economic measures are useful to wildlife managers in setting regulations, evaluating past and future management practices, identifying wildlife values for multiple-use resource planning, and providing assessments for how decisions will affect communities (Grado et al. 2007, 2011). For example, in 2015 the first wind energy development project was announced for construction in two core wintering counties for tundra swans. This particular 208 MW wind energy development is expected to inject more than $1.1 million into the local economy each year through landowner payments and taxes (NCEast Alliance 2015). The benefits of this wind energy development should be compared with the potential costs such a development could have on tundra swans and their value for the state of North Carolina.

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FIGURES

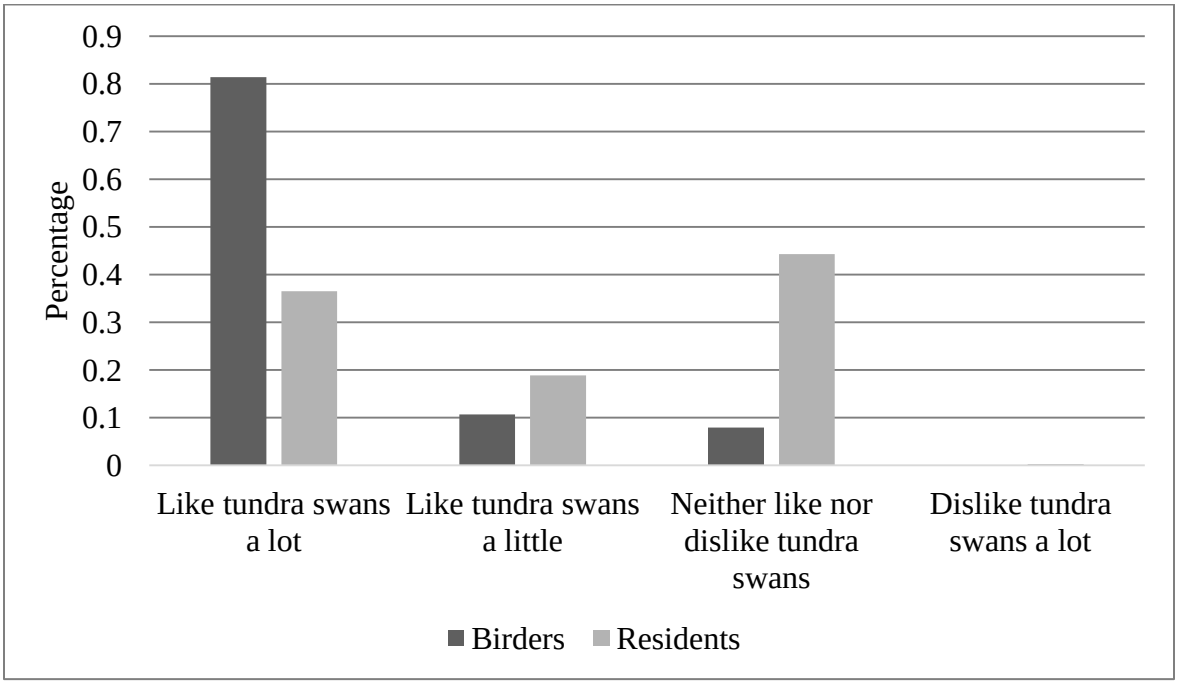


Fig 1. Birder and resident responses to the question "Which of the following best describes your opinion of tundra swans?" in North Carolina (USA), 2015.

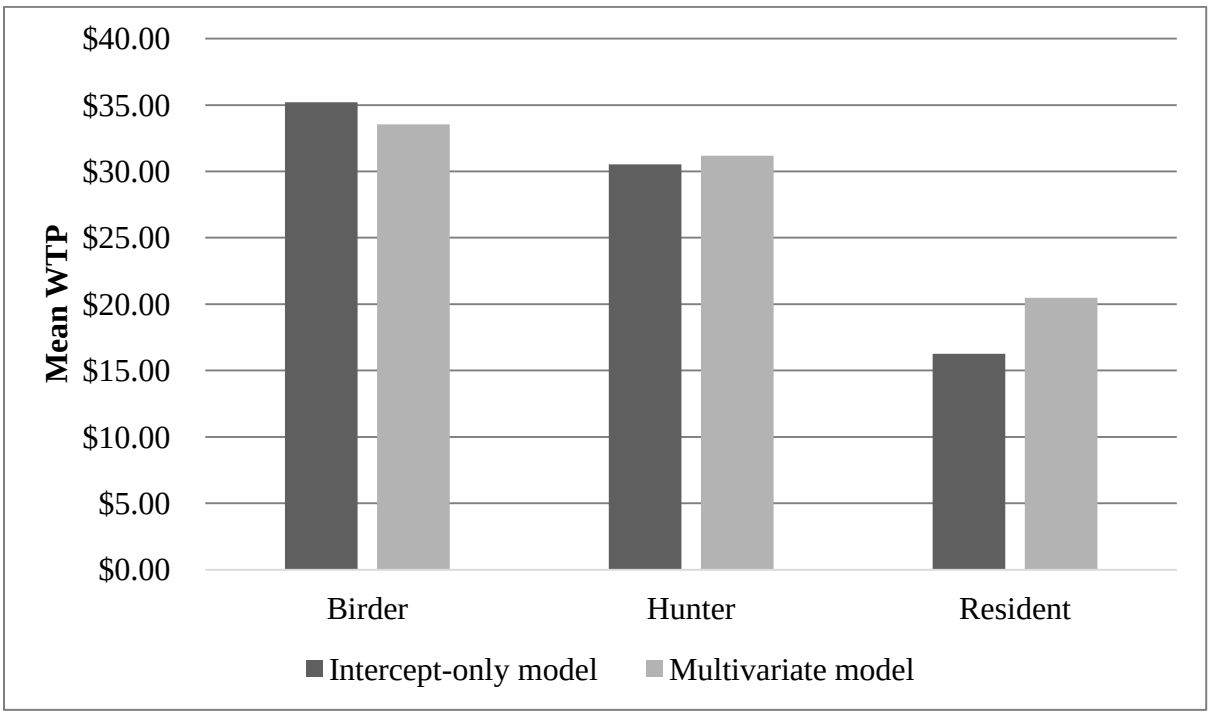


Fig 2. Mean WTP per year from the intercept-only and multivariate model of birders, hunters, and residents in North Carolina (USA), 2015.

TABLES

Table 1. Models with Delta Akaike Information Criterion (AIC) values <2, that predicted willingness to pay for tundra swan conservation by hunters, birders, and residents in North Carolina (USA), 2015.

	Candidate model	*AIC*	*DeltaAIC*	*Akaike wt*	*Evidence ratio*
Hunters	Income + importance of tundra swan conservation + age	4286.711	0.000	0.340	1.000
	Income + importance of tundra swan conservation	4286.939	0.228	0.305	0.897
	Income + importance of tundra swan conservation + age + education	4287.923	1.212	0.184	0.542
Birders	Income + importance of tundra swan conservation	754.603	0.000	1.469	1.000
	Income + importance of tundra swan conservation + seen a tundra swan	755.591	0.988	0.873	0.594
	Income + importance of tundra swan conservation + ethnicity	1104.802	0.000	0.306	1.000
Residents	Income + importance of tundra swan conservation	1104.817	0.015	0.310	1.013
	Income + Importance of tundra swan conservation + age + ethnicity	1105.695	0.893	0.191	0.623

Table 2. Best-fit models predicting willingness to pay for tundra swan conservation by hunters, birders, and residents in North Carolina (USA), 2015.

	Independent variable	***Coefficient***	***SE*[d]**
Hunters	Income[a]	0.044	0.015*
	Importance of tundra swan conservation[b]	21.487	4.933**
	Age	-0.094	0.063
Birders	Income[a]	-0.006	0.034
	Importance of tundra swan conservation[b]	12.662	21.274
Residents	Income[a]	0.082	0.018**
	Importance of tundra swan conservation[b]	11.087	2.689**
	Ethnicity[c]	4.914	3.509

[a]*Income was measured as income relative to the mean income*
[b]*Importance was measured as a binary variable, where 0 = of little importance or not at all important; 1 = very important, important, or moderately important.*
[c]*Ethnicity was measured as a binary variable, where 0 = white, 1 = nonwhite*
[d]**p < 0.01, **p < 0.001*

Table 3. Multivariate WTP model controlling for income and importance of tundra swan conservation for hunters, birders, and residents in North Carolina (USA), 2015.

Independent variable	***Coefficient***	***SE[b]***
Intercept[a]	8.249	3.06*
Hunter	8.423	1.987**
Birder	5.243	1.269**
Income	0.049	0.013**
Importance of tundra swan conservation	14.937	2.96**

[a]*Resident variable was the omitted category and is represented by the intercept*
[b]**p <0.01, **p < 0.001*

Table 4. Value added by tundra swan related expenditures of hunters within the state and eastern region of North Carolina (USA), 2015.

Hunter Value Added	State		Eastern	
	Lower estimate	**Upper estimate**	**Lower estimate**	**Upper estimate**
Direct impact	$166,003	$497,739	$138,828	$472,833
Indirect impact	$69,906	$210,665	$38,919	$128,943
Induced impact	$70,246	$211,757	$31,011	$106,089
Total impact	$306,156	$920,161	$208,758	$707,864

Table 5. Value added by tundra swan related expenditures of birders within the state and eastern region of North Carolina (USA), 2015.

Birder Value Added	State		Eastern	
	Lower estimate	Upper estimate	Lower estimate	Upper estimate
Direct impact	$7,716,124	$23,614,274	$7,514,374	$23,118,496
Indirect impact	$2,942,255	$9,038,854	$1,765,814	$5,443,650
Induced impact	$3,346,137	$0	$1,697,666	$5,237,300
Total impact	$14,004,515	$42,909,794	$10,977,854	$33,799,446

APPENDICES

Which Kinds of Wild Animals Should We Help??

All animals that <u>live in nature</u> are wild animals.

What are your 5 favorite kinds of <u>wild animals</u> in the <u>world</u>? Please put them in order with your most favorite first. (If you don't know the name of five animals, just list as many as you can)

1. _____
2. _____
3. _____
4. _____
5. _____

What are your five favorite kinds of <u>wild animals</u> that live in <u>North Carolina</u>? Remember put your most favorite first. (If you don't know the name of five animals, just list as many as you can)

1. _____
2. _____
3. _____
4. _____
5. _____

There are many things to think about when deciding which types of wild animals to protect and help first. Please put in order each kind of <u>wild animal</u> from 1 (<u>should be protected first</u>) to 5 (<u>should be protected last</u>).

_____The wild animals that live nowhere else but North Carolina

_____The wild animals that people like to eat

_____Wild animals whose numbers are going down fast

_____Wild animals that people like to watch

_____Wild animals that are important in nature

If you had <u>$10 all together</u> to spend on protecting and helping wild animals in North Carolina how would you divide your money between the following five kinds of wild animals?

$_____ The wild animals that live nowhere else but North Carolina

$_____The wild animals that people like to eat

$_____Wild animals whose numbers are going down fast

$_____Wild animals that people like to watch

$_____Wild animals that are important in nature

The dollars above should TOTAL $10

For A-D below, check the box beside the kind of wild animals that you think is the most important to protect or help. For example, if you think that animals that eat plants are more important to protect than animals that eat other animals you would answer like this:

☑ Animals that eat plants

OR

☐ Animals that eat other animals

A ☐ The wild animals that live nowhere else but North Carolina **OR** ☐ Wild animals that people like to eat	**B** ☐ Wild animals whose numbers are going down fast **OR** ☐ The wild animals that live nowhere else but North Carolina
C ☐ The wild animals that live nowhere else but North Carolina **OR** ☐ Wild animals that people like to watch	**D** ☐ Wild animals that are important in nature **OR** ☐ The wild animals that live nowhere else but North Carolina

Do you hunt? Please circle one: YES or NO

Do you fish? Please circle one: YES or NO

Do you think people should hunt? Please circle one: YES or NO

Do you think people should fish? Please circle one: YES or NO

Are you a boy or a girl? Please circle one: BOY or GIRL

What is your race or ethnicity? (please check one)

___Asian or Indian
___Black
___Hispanic or Latino
___Native American
___White
___Other

Appendix B: Hunter Survey Results

2015 Survey of Tundra Swan Hunters

This survey is a cooperative project between the North Carolina Wildlife Resources Commission (NCWRC) and North Carolina State University (NCSU). The purpose of this survey is to learn about the economic value of tundra swans in North Carolina and to get your opinions on conservation of the species. All responses to this survey will remain confidential. This survey is voluntary, and you can decline to complete the survey at any time.

Please note: If you hunted swans this year, this survey does not replace the tundra swan harvest survey you received with your swan tag. To ensure eligibility for a tundra swan permit next year, please remember to respond to that separate harvest survey.

Q1 Where do you live?

- ❍ North Carolina (1) **87%**
- ❍ Other state (2) **13%**
- ❍ Other country (3) **0%**

Mean	1.1299663
Std Dev	0.3363797
Std Err Mean	0.008729
Upper 95% Mean	1.1470889
Lower 95% Mean	1.1128438
N	1485

Q2 How important is conservation of tundra swans in North Carolina to you?

❍ Very important (2)	**N=730**	**50%**
❍ Important (3)	**N=497**	**34%**
❍ Moderately important (4)	**N=183**	**12.5%**
❍ Of little importance (5)	**N=33**	**2.3%**
❍ Not at all important (6)	**N=7**	**0.5%**
❍ Not sure (7)	**N=10**	**0.7%**

Mean	3.3172414
Std Dev	0.8148336
Std Err Mean	0.0213986
Upper 95% Mean	3.3592169
Lower 95% Mean	3.2752659
N	1450

Q3 Within the last 5 years, how many times have you applied for a tundra swan hunting permit in North Carolina?

- ❍ 1 (1) **N=274** **19%**
- ❍ 2 (2) **N=289** **20%**
- ❍ 3 (3) **N=300** **20%**
- ❍ 4 (4) **N=180** **12%**
- ❍ 5 (5) **N=417** **29%**

Mean	3.1212329
Std Dev	1.4836421
Std Err Mean	0.0388287
Upper 95% Mean	3.1973989
Lower 95% Mean	3.0450669
N	1460

Q4 Within the last 5 years, how many times have you been tundra swan hunting in North Carolina?

- ❍ 0 (1) **N=226** **15.5%**
- ❍ 1 (2) **N=342** **23.4%**
- ❍ 2 (3) **N=251** **17.2%**
- ❍ 3 (4) **N=180** **12.3%**
- ❍ 4 (5) **N=145** **10%**
- ❍ 5 (6) **N=111** **8%**
- ❍ 6 (7) **N=33** **2%**
- ❍ 7 (8) **N=20** **1.4%**
- ❍ 8 (9) **N=18** **1.2%**
- ❍ 9 (10) **N=4** **0.2%**
- ❍ 10 (11) **N=20** **1.3%**
- ❍ More than 10 times (12) **N=110** **7.5%**

Mean	3.0458904
Std Dev	3.03847
Std Err Mean	0.0795204
Upper 95% Mean	3.2018769
Lower 95% Mean	2.8899039
N	1460

If 0 Is Selected, Then Skip To End of Block

Q5 Within the last 5 years, how many tundra swans have you harvested?

- ❍ 0 (1) **N=1** **<1%**
- ❍ 1 (2) **N=285** **24%**
- ❍ 2 (3) **N=422** **35%**
- ❍ 3 (4) **N=232** **19%**
- ❍ 4 (5) **N=155** **13%**
- ❍ 5 (6) **N=97** **8%**

The next few questions are about your most recent trip. To answer these questions, please try to recall your most recent trip in eastern North Carolina during which you hunted tundra swans.

Q6 During which hunting season was this most recent trip?

- I have never been tundra swan hunting (21) **N=126 8.7%**
- 2014-2015 (42) **N=475 33%**
- 2013-2014 (20) **N=368 26%**
- 2012-2013 (19) **N=216 15%**
- 2011-2012 (18) **N=86 6%**
- 2010-2011 (17) **N=62 4%**
- 2009-2010 (16) **N=32 2%**
- 2008-2009 (15) **N=17 1.2%**
- 2007-2008 (14) **N=13 1%**
- 2006-2007 (13) **N=5 0.3%**
- 2005-2006 (12) **N=2 0.1%**
- 2004-2005 (11) **N=8 0.5%**
- 2003-2004 (10) **N=2 0.1%**
- 2002-2003 (9) **N=4 0.3%**
- 2001-2002 (8) **N=3 0.2%**
- 2000-2001 (7) **N=1 0.07%**
- 1999-2000 (6) **N=3 0.2%**
- 1998-1999 (5) **N=2 0.1%**
- 1997-1998 (4) **N=0 0%**
- 1996-1997 (3) **N=1 0.07%**
- 1995-1996 (2) **N=0 0%**
- 1994-1995 (1) **N=8 0.5%**

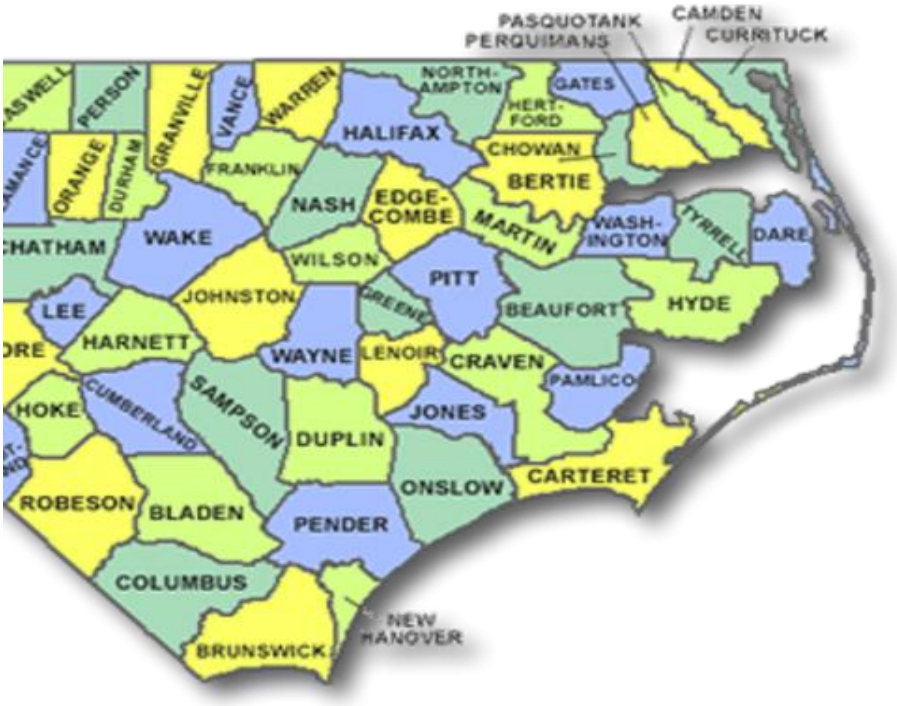
If I have never been tundra sw... Is Selected, Then Skip To End of Block

Q7 How many days did you spend on this recent trip regardless of activity? (0.5, 1, 2, etc.)

Mean	2.4734558
Std Dev	3.4526284
Std Err Mean	0.0965416
Upper 95% Mean	2.6628533
Lower 95% Mean	2.2840584
N	1279

Q8 How many days did you spend actively hunting tundra swans on this recent trip? (0.5, 1, 2, etc.)

Mean	1.5313917
Std Dev	2.4985523
Std Err Mean	0.069864
Upper 95% Mean	1.6684524
Lower 95% Mean	1.3943311
N	1279



Q9 Using the map above, please select which county you hunted tundra swans in during your most recent trip from the list below.

- ❍ Beaufort (1) **N=55 4%**
- ❍ Bertie (2) **N=19 1%**
- ❍ Brunswick (4) **N=1 <1%**
- ❍ Camden (5) **N=9 0.07%**
- ❍ Carteret (6) **N=45 3.5%**
- ❍ Chowan (7) **N=6 0.05%**
- ❍ Craven (9) **N=1 <1%**
- ❍ Currituck (11) **N=146 11%**
- ❍ Dare (12) **N=61 4.7%**
- ❍ Duplin (13) **N=1 <1%**
- ❍ Edgecombe (15) **N=8 0.6%**
- ❍ Halifax (20) **N=25 2%**
- ❍ Hertford (22) **N=3 0.2%**
- ❍ Hyde (24) **N=537 42%**
- ❍ Lenoir (27) **N=1 <1%**
- ❍ Martin (28) **N=4 0.3%**
- ❍ Nash (29) **N=1 <1%**
- ❍ Northampton (31) **N=8 0.6%**
- ❍ Onslow (32) **N=1 <1%**
- ❍ Pamlico (34) **N=71 5.5%**
- ❍ Pasquotank (35) **N=50 4%**
- ❍ Pender (36) **N=1 <1%**
- ❍ Perquimans (37) **N=10 0.8%**
- ❍ Pitt (48) **N=2 0.01%**
- ❍ Tyrrell (41) **N=108 8.4%**
- ❍ Washington (45) **N=106 8.2%**

Q10 Where did you hunt tundra swans on this recent trip? (Please check all that apply)

- ❑ National Wildlife Refuges (1) **N=68 5%**
- ❑ North Carolina Wildlife Resources Commission Game Lands (2) **N=119 9%**
- ❑ Private Land (3) **N=893 65%**
- ❑ Pamlico Sound (4) **N=109 8%**
- ❑ Currituck Sound (5) **N=130 9%**
- ❑ Other (6) **N=61 4%**

Q11 Which of the following best describes your most recent tundra swan hunting experience?

- ❍ I only hunted tundra swans (1) **N=436 34%**
- ❍ I hunted both tundra swans and other waterfowl (2) **N=839 66%**

Mean	1.6580392
Std Dev	0.4745527
Std Err Mean	0.0132901
Upper 95% Mean	1.6841122
Lower 95% Mean	1.6319663
N	1275

The following questions are based on hypothetical situations. Please read each situation carefully and indicate your opinion for each one.

Q12 Imagine that tundra swans stopped migrating to North Carolina and could no longer be seen here. Would this make you more or less likely to take a trip to or within eastern North Carolina? (Please choose one number indicating your best guess)

- ❍ 0 (0)
- ❍ 1 (1)
- ❍ 2 (2)
- ❍ 3 (3)
- ❍ 4 (4)
- ❍ 5 (5)
- ❍ 6 (6)
- ❍ 7 (7)
- ❍ 8 (8)
- ❍ 9 (9)
- ❍ 10 (10)

Mean	4.0086083
Std Dev	2.0383785
Std Err Mean	0.0545951
Upper 95% Mean	4.1157058
Lower 95% Mean	3.9015109
N	1394

Q13 Prices are always going up. Imagine the cost to take this trip doubled, would you still take this trip?

- ❍ Yes (1)
- ❍ No (2)

Mean	0.6188083
Std Dev	0.5103718
Std Err Mean	0.0136745
Upper 95% Mean	0.6456332
Lower 95% Mean	0.5919835
N	1393

If Yes Is Selected, Then Skip To Which of the following best describes...If No Is Selected, Then Skip To Which of the following best describes...

Q14 Which of the following best describes why you would be willing to pay this amount? (Please check all that apply)

- ❑ It is a small amount of money (1) **N=313 31%**
- ❑ I care about hunting tundra swans enough to pay more money (2) **N=361 35%**
- ❑ I care about the site where I hunt tundra swans enough to pay more money (3) **N=350 34%**

Q15 If the cost to take this trip tripled, would you still take this trip?

- ❍ Yes (1)
- ❍ No (2)

Mean	0.5702179
Std Dev	0.4953448
Std Err Mean	0.0172353
Upper 95% Mean	0.604048
Lower 95% Mean	0.5363878
N	826

If Yes Is Selected, Then Skip To End of BlockIf No Is Selected, Then Skip To End of Block

Q16 Which of the following best describes why you would not be willing to pay this amount? (Please check all that apply)

- ❑ It is too expensive (1) **N=278 46%**
- ❑ I do not care about hunting tundra swans enough to pay more money (2) **N=285 47%**
- ❑ I do not care about the site where I hunt tundra swans enough to pay more money (3) **N=40 7%**

Q17 If the cost to take this trip increased by half, would you still take this trip?

- ❍ Yes (1)
- ❍ No (2)

Mean	0.3669065
Std Dev	0.4823947
Std Err Mean	0.0204581
Upper 95% Mean	0.4070912
Lower 95% Mean	0.3267217
N	556

Q18 Imagine that a non-governmental organization (NGO) is planning on implementing a new program for tundra swan habitat improvement in eastern North Carolina. Would you be willing to donate $${e://Field/start} per year to support this new program to provide habitat for tundra swans?

- ❍ Yes (1)
- ❍ No (2)

Mean	0.55105
Std Dev	0.4975673
Std Err Mean	0.0133892
Upper 95% Mean	0.5773154
Lower 95% Mean	0.5247846
N	1381

If Yes Is Selected, Then Skip To Which of the following best describes...If No Is Selected, Then Skip To Which of the following best describes...

Q19 Which of the following best describes why you would be willing to donate this amount? (Please check all that apply)

- ❑ It is a small amount of money (1) **N=250 15%**
- ❑ I care about tundra swan conservation (2) **N=367 21%**
- ❑ I benefit from tundra swan conservation (3) **N=224 13%**
- ❑ I like to contribute to wildlife conservation of any kind (4) **N=348 20%**
- ❑ I want tundra swans to be around for future generations (5) **N=538 31%**

Q20 Would you be willing to donate $${e://Field/high} per year to support this new habitat program for tundra swans?

- ❍ Yes (1)
- ❍ No (2)

Mean	0.4302632
Std Dev	0.4954389
Std Err Mean	0.0179715
Upper 95% Mean	0.4655428
Lower 95% Mean	0.3949835
N	760

If Yes Is Selected, Then Skip To End of BlockIf No Is Selected, Then Skip To End of Block

Q21 Which of the following best describes why you would not be willing to donate this amount? (Please check all that apply)

- ❑ It is too expensive (1) **N=144 20%**
- ❑ I do not care about tundra swan conservation (2) **N=15 2%**
- ❑ I do not benefit from tundra swan conservation (3) **N=52 8%**
- ❑ I think the money should come from somewhere or someone else (4) **N=90 13%**
- ❑ I think there is enough habitat for tundra swans already (5) **N=404 57%**

Q22 Would you be willing to donate $${e://Field/low} per year to support this new habitat program for tundra swans?

- ❍ Yes (1)
- ❍ No (2)

Mean	0.3550489
Std Dev	0.4789183
Std Err Mean	0.0193276
Upper 95% Mean	0.3930051
Lower 95% Mean	0.3170926
N	614

Q23 How many ONE-WAY miles did you travel from your home residence to get to your destination on this trip?

Mean	179.68499
Std Dev	197.16357
Std Err Mean	5.7914185
Upper 95% Mean	191.04784
Lower 95% Mean	168.32214
N	1159

Q24 How many people traveled with you on this trip? (Please include yourself)

Mean	3.5522002
Std Dev	2.8303487
Std Err Mean	0.0831377
Upper 95% Mean	3.7153176
Lower 95% Mean	3.3890827
N	1159

Q25 How many vehicles did your party take? (Please include yourself)

Mean	1.8084556
Std Dev	4.534599
Std Err Mean	0.1331978
Upper 95% Mean	2.0697917
Lower 95% Mean	1.5471195
N	1159

Q26 How many people in your party had a permit to hunt tundra swans? (Please include yourself)

Mean	3.2338223
Std Dev	2.6736148
Std Err Mean	0.0785339
Upper 95% Mean	3.3879069
Lower 95% Mean	3.0797376
N	1159

Q27 How many people in your party did you pay travel expenses for? (Please include yourself)

	Number of People
	Answer below (1)
Children (younger than 18) (1)	Mean 0.2841105 Std Dev 0.6205412 Std Err Mean 0.0182354 Upper 95% Mean 0.3198888 Lower 95% Mean 0.2483323 N 1158
Adults (18 or older) (2)	Mean 1.757981 Std Dev 6.6057469 Std Err Mean 0.1940351 Upper 95% Mean 2.1386807 Lower 95% Mean 1.3772814 N 1159

Q28. Please estimate all expenses for all people you paid for, including yourself, to go on this recent hunting trip using the following table:

Q28	Trip Expense ($)	County of Purchase
	Please insert dollar amount where applicable. Please leave blank if you did not incur an expense. (1)	Please write the county if it is not the county listed above (1)
Gas stop #1 (gas only) (1)		
Gas stop #2 (gas only) (2)		
Gas stop #3 (gas only) (3)		
Rental vehicle (4)		
Air fare or other travel (5)		
Other transportation (6)		
Lodging at destination (7)		
Other lodging (8)		
Restaurant/take-out meal #1 (9)		
Restaurant/take-out meal #2 (10)		
Restaurant/take-out meal #3 (11)		
Additional restaurant costs (12)		
Groceries/snacks (13)		
Other food/beverages (15)		
Ammunition/hunting supplies (16)		
Entrance fees (17)		
License and permit fees (DO NOT include swan permit or hunting license fee) (27)		
Game processing (19)		
Guide fees/outfitters (20)		
Taxidermy (21)		
Equipment rental (22)		

Entertainment (23) Heating/cooking fuel (24) Souvenirs/miscellaneous retail (25) Other shopping/services (26)		

The following questions are about you in order to help us better understand who participated in the survey.

Q29 Are you a male or female?

- Male (1) **N=1238 97.6%**
- Female (2) **N=31 2.4%**

Mean	0.0244287
Std Dev	0.1544368
Std Err Mean	0.0043353
Upper 95% Mean	0.0329338
Lower 95% Mean	0.0159235
N	1269

Q30 What year were you born?

Mean	44.532437
Std Dev	14.032162
Std Err Mean	0.3946854
Upper 95% Mean	45.306748
Lower 95% Mean	43.758126
N	1264

Q31 Which is the highest level of education you have attained?

- Some high school (1) **N=7 0.05%**
- High school degree (2) **N=116 9%**
- Some college (3) **N=273 21.5%**
- College degree (4) **N=583 46%**
- Some graduate school (5) **N=52 4%**
- Master's degree (6) **N=127 10%**
- Doctoral or Professional degree (7) **N=110 9%**

Mean	4.0867508
Std Dev	1.3591333
Std Err Mean	0.0381683
Upper 95% Mean	4.1616307
Lower 95% Mean	4.0118708
N	1268

Q32 Which of the following best describes your total household income before taxes?

- ❍ Less than $40,000 (1) **N=112 9%**
- ❍ $40,000 to $59,999 (2) **N=178 14.4%**
- ❍ $60,000 to $79,999 (3) **N=181 14.6%**
- ❍ $80,000 to $99,999 (4) **N=181 14.6%**
- ❍ $100,000 to $119,999 (5) **N=156 13%**
- ❍ $120,000 to $139,999 (6) **N=101 8%**
- ❍ $140,000 to $159,999 (7) **N=75 6%**
- ❍ $160,000 to $179,999 (8) **N=38 3%**
- ❍ $180,000 to $199,999 (9) **N=31 2.5%**
- ❍ $200,000 or more (10) **N=181 15%**

Mean	4.8938412
Std Dev	2.8548408
Std Err Mean	0.0812689
Upper 95% Mean	5.0532818
Lower 95% Mean	4.7344006
N	1234

Thank you for taking the time to complete this survey. Your help is greatly appreciated!

2015 North Carolina Economic Value of Tundra Swans Survey

The North Carolina Wildlife Resources Commission (NCWRC) and North Carolina State University (NCSU) are conducting a survey to determine the importance of tundra swan management. By completing this survey, you will help us understand public opinion and economic impacts of tundra swans. All responses to this survey will remain confidential. This survey is voluntary, and you can decline to complete the survey at any time.

Image from nationalgeographic.com

1.) Where do you live?

☐ North Carolina **N=294 84%**
- Which county? _____

☐ Other state **N=51 15%**
- Which state? _____

☐ Other country **N=3 1%**
- Which country? _____

	N	Mean	Std Dev
	348	1.1637931	0.3932565

2.) How many times in your life have you seen a tundra swan?

☐ Never	**N=25**	**7%**
☐ 1 to 5 times	**N=107**	**31%**
☐ 6 to 10 times	**N=36**	**10%**
☐ 11 to 15 times	**N=9**	**3%**
☐ 16 to 20 times	**N=10**	**3%**
☐ More than 20 times	**N=145**	**42%**
☐ Not sure	**N=15**	**4%**

Mean	2.9246988
Std Dev	1.9642711
Std Err Mean	0.1078034
Upper 95% Mean	3.136765
Lower 95% Mean	2.7126326
N	332

3.) Which of the following best describes your opinion of tundra swans?

☐ I like tundra swans a lot	**N=267**	**77.2%**
☐ I like tundra swans a little	**N=34**	**9.8%**
☐ I neither like nor dislike tundra swans	**N=26**	**7.5%**
☐ I dislike tundra swans a little	**N=1**	**0.3%**
☐ I dislike tundra swans a lot	**N=0**	**0%**
☐ I do not know	**N=18**	**5.2%**

Mean	4.7286585
Std Dev	0.6129355
Std Err Mean	0.0338437
Upper 95% Mean	4.7952374
Lower 95% Mean	4.6620797
N	328

4.) How important is conservation of tundra swans in North Carolina to you?

☐ Very important	**N=230**	**66.7%**
☐ Important	**N=72**	**20.9%**
☐ Moderately important	**N=26**	**7.5%**
☐ Of little importance	**N=2**	**0.6%**
☐ Not at all important	**N=1**	**0.3%**
☐ Not sure	**N=14**	**4%**

Mean	3.6036036
Std Dev	0.6935062
Std Err Mean	0.0380039
Upper 95% Mean	3.6783624
Lower 95% Mean	3.5288448
N	333

The following questions are about your current trip, including your visit to this location and all other travel since you left your home and before you return to your home.

5.) Which of the following best describes your current trip?

☐ Day trip (no overnight)
☐ Overnight trip to eastern North Carolina
☐ Overnight trip to multiple destinations, including eastern North Carolina

N	Mean	Std Dev
347	1.7521614	0.6857043

6.) Which of the following is closest to the primary purpose of your current trip? **(Please check one)**

☐ Bird watching/wildlife viewing	**N=250**	**72%**
☐ Fishing	**N=3**	**0.9%**
☐ Hunting	**N=43**	**12.4%**
☐ Biking/Hiking	**N=3**	**0.9%**
☐ Visiting the area nearby and decided to stop	**N=23**	**6.6%**
☐ Spending time with family (e.g., picnic)	**N=10**	**2.9%**
☐ Other	**N=15**	**4.3%**

7.) Did an interest in viewing birds influence your decision to take this trip?

☐ Yes **(Continue to Question 8)**
☐ No **(Skip to Question 13)**

N	Mean	Std Dev
347	0.8443804	0.3630178

8.) Which of the following birds are you interested in seeing at this location today? **(Please check all that apply)**

☐ Ducks	**N=276**	**78%**	****Percentages are out of total visitors (N=352)**
☐ Geese	**N=258**	**73%**	
☐ Swans	**N=275**	**78%**	
☐ Herons and egrets	**N=236**	**67%**	
☐ Songbirds	**N=192**	**55%**	
☐ Hawks and eagles	**N=235**	**67%**	

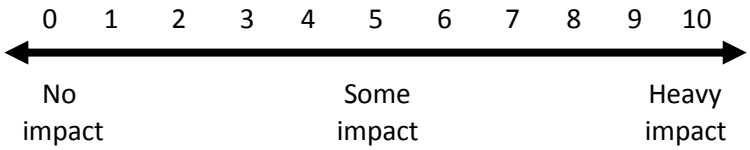
9.) Did tundra swans have any influence on the likelihood of you taking this trip?

☐ Yes **(Continue to Question 10)**

☐ No **(Skip to Question 13)**

N	Mean	Std Dev
293	0.7098976	0.4545858

10.) Ranging from 0-10, how much influence did tundra swans have on the likelihood of you taking this trip? **(Please circle one number)**



N	Mean	Std Dev
218	7.8119266	2.2281080

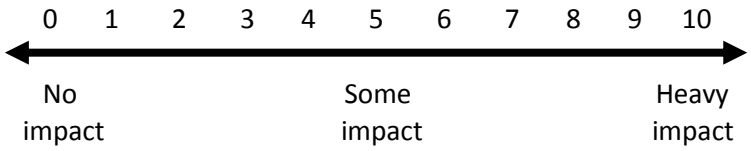
11.) Did tundra swans have any influence on the length of this trip?

☐ Yes **(Continue to Question 12)**

☐ No **(Skip to Question 13)**

N	Mean	Std Dev
217	0.4976959	0.5011507

12.) Ranging from 0-10, how much influence did tundra swans have on the length of this trip? **(Please circle one number)**



N	Mean	Std Dev
111	7.9009009	2.0491903

13.) How many people traveled with you on this trip and how many vehicles did your party take? **(Please include yourself)**

	N	Mean	Std Dev	Minimum	Maximum
Individuals	348	4.7097701	5.3245359	1.0000000	30.0000000

	N	Mean	Std Dev	Minimum	Maximum
Vehicles	325	1.8738462	2.4151194	0	26.0000000

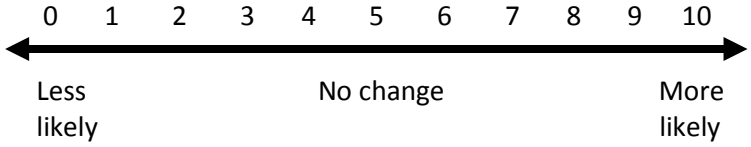
14.) Of those people, how many are you paying travel expenses for? **(Please include yourself)**

	N	Mean	Std Dev	Minimum	Maximum
Children (younger than 18)	320	0.2187500	0.6640984	0	4.0000000

	N	Mean	Std Dev	Minimum	Maximum
Adults (18 or older)	333	1.8348348	2.8485443	0	30.0000000

The following questions are based on hypothetical situations. Please read each situation carefully and indicate your opinion for each one.

15.) Imagine that tundra swans stopped migrating to North Carolina and could no longer be seen here. Would this make you more or less likely to take a trip to or within eastern North Carolina? **(Please circle one number indicating your best guess)**



N	Mean	Std Dev
346	4.1445087	1.8918395

16.) Prices are always going up. Imagine the cost to take this trip doubled, would you still take this trip?

☐ Yes **(Continue to Question 17)**

☐ No **(Skip to Question 19)**

N	Mean	Std Dev
344	0.8459302	0.3615415

<u>If you answered "Yes" to Question 16:</u>

17.) Which of the following best describes why you would be willing to pay this amount? **(Please check all that apply)**

☐ It is a small amount of money

☐ I care about viewing tundra swans enough to pay more money

☐ I care about visiting this site enough to pay more

18.) If the cost to take this trip tripled, would you still take this trip?

☐ Yes

☐ No

N	Mean	Std Dev
280	0.6214286	0.4858995

Label	N	Mean	Std Dev
Prices_smallamount	290	0.3275862	0.4701443
Prices_careaboutviewing	290	0.2965517	0.4575266
Prices_careaboutsite	290	0.6620690	0.4738226

If you answered "No" to Question 16:

19.) Which of the following best describes why you would not be willing to pay this amount? **(Please check all that apply)**

- ☐ It is too expensive
- ☐ I do not care about viewing tundra swans enough to pay more money
- ☐ I do not care about visiting this site enough to pay more

20.) If the cost to take this trip increased by half, would you still take this trip?

- ☐ Yes
- ☐ No

N	Mean	Std Dev
47	0.7021277	0.4622673

Label	N	Mean	Std Dev
Prices_tooexpensive	49	0.5102041	0.5050763
Prices_dontcareaboutviewing	49	0.3469388	0.4809288
Prices_dontcareaboutsite	49	0.2244898	0.4215698

21.) Imagine that a non-governmental organization (NGO) is planning on implementing a new program for tundra swan habitat improvement in eastern North Carolina. Would you be willing to donate $__ per year to support this new program to provide habitat for tundra swans?

☐ Yes **(Continue to Question 22)**

☐ No **(Skip to Question 24)**

N	Mean	Std Dev
339	0.6135693	0.4876510

If you answered "Yes" to Question 21:

22.) Which of the following best describes why you would be willing to donate this amount? **(Please check all that apply)**

- ☐ It is a small amount of money
- ☐ I care about tundra swan conservation
- ☐ I benefit from tundra swan conservation
- ☐ I like to contribute to wildlife conservation of any kind
- ☐ I want tundra swans to be around for future generations

23.) Would you be willing to donate $__ per year to support this new habitat program for tundra swans?

- ☐ Yes
- ☐ No

Variable	N	Mean	Std Dev
Smallamount	209	0.4784689	0.5007356
Careaboutswancons	209	0.5311005	0.5002300
Benefitfrom	209	0.2822967	0.4511976
Contributetoall	209	0.5167464	0.5009193
FutureGenerations	209	0.5167464	0.5009193

If you answered "No" to Question 21:

24.) Which of the following best describes why you would not be willing to donate this amount? **(Please check all that apply)**

- ☐ It is too expensive
- ☐ I do not care about tundra swan conservation
- ☐ I do not benefit from tundra swan conservation
- ☐ I think the money should come from somewhere or someone else
- ☐ I think there is enough habitat for tundra swans already

25.) Would you be willing to donate $__ per year to support this new habitat program for tundra swans?

- ☐ Yes
- ☐ No

Variable	N	Mean	Std Dev
Smallamount	209	0.4784689	0.5007356
Careaboutswancons	209	0.5311005	0.5002300
Benefitfrom	209	0.2822967	0.4511976
Contributetoall	209	0.5167464	0.5009193
Someoneelse	120	0.2750000	0.4483865

26.) **Please estimate all expenses for all people you paid for, including yourself, to go on this trip using the following guidelines:**

For the trip expense column, please insert the dollar amount for each item (if applicable). If you did not incur an expense for an item, leave it blank. For the county of purchase column, please write the county if it is **NOT** the same county you are currently in.

1) Transportation	**Trip Expense ($)**	**County of Purchase**
Gas stop #1 (gas only)		
Gas stop #2 (gas only)		
Gas stop #3 (gas only)		
Rental vehicle		
Airfare or other travel		
Other		
2) Lodging		
Lodging during travel to/from eastern NC		
Lodging in eastern NC		
Other		
3) Food and Beverages		
Restaurant/take-out meal #1		
Restaurant/take-out meal #2		
Restaurant/take-out meal #3		
Additional restaurant costs		
Groceries/snacks		
Other		
4) Other shopping, services		
Entrance fees		
License and permit fees		
Entertainment		
Souvenirs/miscellaneous retail		
Other		

The following questions are about other times that you have visited this location.

27.) Have you visited this location before?

- ☐ Yes **(Continue to Question 28)**
- ☐ No **(Skip to Question 29)**

N	Mean	Std Dev
340	0.7117647	0.4536087

28.) How many times per year do you visit this location?

☐	1	**N=100**	**40%**
☐	2-5	**N=93**	**36.7%**
☐	6-10	**N=28**	**11%**
☐	11-15	**N=11**	**4%**
☐	16-20	**N=2**	**0.8%**
☐	20 or more	**N=19**	**7.5%**

N	Mean	Std Dev
253	2.1264822	1.3943659

29.) How long is your typical trip when you visit this location?

☐	Day trip **(Skip to Question 31)**	**N=142**	**43%**
☐	1 night away from home	**N=46**	**14%**
☐	2-3 nights away from home	**N=109**	**33%**
☐	4-5 nights away from home	**N=16**	**5%**
☐	More than 5 nights away from home	**N=17**	**5%**

N	Mean	Std Dev
330	2.1515152	1.1829902

30.) If you stay 1 night or more, where do you typically stay?

☐	Hotel	**N=118**	**60.5%**
☐	Lodge	**N=26**	**13%**
☐	RV	**N=6**	**3%**
☐	Tent	**N=1**	**0.5%**
☐	Family or friend's house	**N=45**	**23%**

The following questions are about you in order to help us better understand who participated in the survey.

31.) Are you a male or female?

☐	Male	**N=187**	**56%**
☐	Female	**N=149**	**44%**

N	Mean	Std Dev
337	0.4436795	0.4968096

32.) What year were you born?

	N	Mean	Std Dev	Minimum	Maximum
_____	319	54.2925382	15.2078563	18.0000000	90.0000000

33.) Which of the following best describes your racial background? **(Please check one)**

☐ White	**N=325**	**97.3%**
☐ Black	**N=7**	**2.1%**
☐ Hispanic/Latino	**N=0**	**0%**
☐ Asian	**N=1**	**0.3%**
☐ Native American	**N=1**	**0.3%**

N	Mean	Std Dev
334	1.0419162	0.3071382

34.) What is the highest level of education you have attained?

☐ Some high school	**N=4**	**1%**
☐ High school degree	**N=19**	**6%**
☐ Some college	**N=61**	**19%**
☐ College degree	**N=120**	**36%**
☐ Some graduate school	**N=20**	**6%**
☐ Master's degree	**N=65**	**20%**
☐ Doctoral or Professional degree	**N=40**	**12%**

N	Mean	Std Dev
329	4.4832827	1.4981269

35.) Which of the following best describes your total household income before taxes?

☐ Less than $40,000	**N=39**	**13.2%**
☐ $40,000 to $59,999	**N=37**	**12.6%**
☐ $60,000 to $79,999	**N=55**	**18.6%**
☐ $80,000 to $99,999	**N=51**	**17.3%**
☐ $100,000 to $119,999	**N=39**	**13.2%**
☐ $120,000 to $139,999	**N=18**	**6.1%**
☐ $140,000 to $159,999	**N=19**	**6.5%**
☐ $160,000 to $179,999	**N=6**	**2%**
☐ $180,000 to $199,999	**N=7**	**2.4%**
☐ $200,000 or more	**N=24**	**8.1%**

N	Mean	Std Dev
296	95.8229426	55.8919572

Thank you for taking the time to complete this survey. Your help is greatly appreciated!

2015 North Carolina Economic Value of Tundra Swan Survey

We are interested in the opinions of all North Carolina residents, regardless of whether or not they are particularly interested in birds. You are part of a small group of North Carolina residents that have been chosen to participate in this survey. All responses to this survey will remain confidential. This survey is voluntary, and you can decline to complete the survey at any time.

Image from nationalgeographic.com

1.) How many times in your life have you seen a tundra swan?

☐ Never	**N=153**	**34%**
☐ 1 to 5 times	**N=77**	**17%**
☐ 6 to 10 times	**N=25**	**5.5%**
☐ 11 to 15 times	**N=5**	**1%**
☐ 16 to 20 times	**N=5**	**1%**
☐ More than 20 times	**N=48**	**11%**
☐ Not sure	**N=138**	**30.5%**

Mean	1.284345
Std Dev	1.7774345
Std Err Mean	0.1004665
N	313

2.) Which of the following best describes your opinion of tundra swans?

☐ I like tundra swans a lot	**N=122**	**27%**
☐ I like tundra swans a little	**N=63**	**14%**
☐ I neither like nor dislike tundra swans	**N=147**	**32.6%**
☐ I dislike tundra swans a little	**N=1**	**0.2%**
☐ I dislike tundra swans a lot	**N=1**	**0.2%**
☐ I do not know	**N=117**	**26%**

Mean	3.9101796
Std Dev	0.9158356
Std Err Mean	0.0501123
N	334

3.) How important is conservation of tundra swans in North Carolina to you?

☐ Very important	**N=101**	**22%**
☐ Important	**N=129**	**28%**
☐ Moderately important	**N=81**	**18%**
☐ Of little importance	**N=46**	**10%**
☐ Not at all important	**N=17**	**4%**
☐ Not sure	**N=80**	**18%**

Mean	2.671123
Std Dev	1.132683
Std Err Mean	0.0585696
N	374

4.) Have you traveled to or within eastern North Carolina for the primary purpose of viewing tundra swans? **(Please check one and fill in the blank if applicable)**

☐ Yes, I have traveled to or within eastern NC primarily to view tundra swans **N=20 4.4%**

- How many trips in the last 12 months? _____ **(Continue to Question 5)**

☐ No, I have never traveled to or within eastern NC primarily for the purpose of viewing tundra swans **(Skip to Question 6)**

N	Mean	Std Dev
452	0.0442478	0.2058730

5.) On your most recent trip to eastern North Carolina primarily to view tundra swans, where did you go to view tundra swans?

- ☐ National Wildlife Refuge **N=9 45%**
- ☐ North Carolina Wildlife Resources Commission Game Lands **N=5 25%**
- ☐ Private Land **N=10 50%**

6.) Would you like to travel to view tundra swans in eastern North Carolina?

- ☐ Yes **(Continue to Question 7)**
- ☐ No **(Skip to Question 8)**

N	Mean	Std Dev
447	0.3758389	0.4848814

If you answered "Yes" to Question 6:

7.) Which of the following best describes why you would like to travel to view tundra swans in eastern North Carolina? **(Please check all that apply)**

- ☐ I want to see tundra swans
- ☐ I want to visit eastern North Carolina
- ☐ The cost of taking a trip is not too expensive

Please Skip to Question 9

Variable	N	Mean	Std Dev
I_want_to_see_tundra_swans	169	0.7573964	0.4299312
I_want_to_visit_eastern_NC	169	0.5147929	0.5012664
The_cost_is_not_too_expensive	167	0.2514970	0.4351784

If you answered "No" to Question 6:

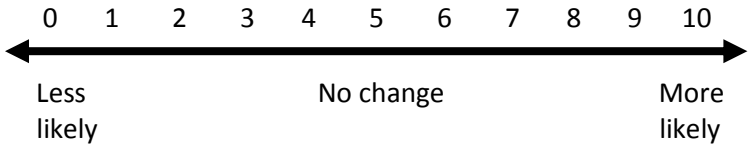
8.) Which of the following best describes why you would not like to travel to view tundra swans in eastern North Carolina? **(Please check all that apply)**

- ☐ I do not want to see tundra swans
- ☐ I do not want to visit eastern North Carolina
- ☐ The cost of taking a trip is too expensive
- ☐ I already live in eastern North Carolina

Variable	N	Mean	Std Dev
I_do_not_want_to_see_tundra_swan	255	0.3803922	0.4864380
I_do_not_want_to_visit_eastern_N	255	0.0980392	0.2979525
The_cost_is_too_expensive	255	0.2431373	0.4298209
I_already_live_in_eastern_NC	255	0.3058824	0.4616863

The following questions are based on hypothetical situations. Please read each situation carefully and indicate your opinion for each one.

9.) Imagine that tundra swans stopped migrating to North Carolina and could no longer be seen here. Would this make you more or less likely to take a trip to or within eastern North Carolina? **(Please circle one number indicating your best guess)**



Mean	4.7583893
Std Dev	1.6196011
Std Err Mean	0.0766045
Upper 95% Mean	4.9089399
Lower 95% Mean	4.6078386
N	447

10.) Imagine that a non-governmental organization (NGO) is planning on implementing a new program for tundra swan habitat improvement in eastern North Carolina. Would you be willing to donate $__ per year to support this new program to provide habitat for tundra swans?

☐ Yes **(Continue to Question 11)**

☐ No **(Skip to Question 13)**

Mean	0.2699115
Std Dev	0.4444055
Std Err Mean	0.0209031
Upper 95% Mean	0.310991
Lower 95% Mean	0.228832
N	452

If you answered "Yes" to Question 10:

11.) Which of the following best describes why you would be willing to donate this amount? **(Please check all that apply)**

- ☐ It is a small amount of money
- ☐ I care about tundra swan conservation
- ☐ I benefit from tundra swan conservation
- ☐ I like to contribute to wildlife conservation of any kind
- ☐ I want tundra swans to be around for future generations

12.) Would you be willing to donate $__ per year to support this new habitat program for tundra swans?

- ☐ Yes
- ☐ No

Please Skip to Question 15

Mean	0.3389831
Std Dev	0.4753827
Std Err Mean	0.0437625
Upper 95% Mean	0.4256524
Lower 95% Mean	0.2523137
N	118

Variable	N	Mean	St Dev
Small amount	121	0.5206612	0.5016502
Care about swan conservation	121	0.338843	0.4752845
Benefit from	121	0.1570248	0.3653369
Contribute to all	121	0.5702479	0.497099
Future generations	121	0.6363636	0.4830459

If you answered "No" to Question 10:

13.) Which of the following best describes why you would not be willing to donate this amount? **(Please check all that apply)**

- ☐ It is too expensive
- ☐ I do not care about tundra swan conservation
- ☐ I do not benefit from tundra swan conservation
- ☐ I think the money should come from somewhere or someone else
- ☐ I think there is enough habitat for tundra swans already

14.) Would you be willing to donate $__ per year to support this new habitat program for tundra swans?

- ☐ Yes
- ☐ No

Mean	0.2371795
Std Dev	0.4260365
Std Err Mean	0.0241196
Upper 95% Mean	0.2846377
Lower 95% Mean	0.1897213
N	312

Variable	N	Mean	St Dev
Too expensive	293	0.2593857	0.4390474
Don't care about swan conservation	293	0.1535836	0.361166
Don't benefit from	293	0.0955631	0.2944942
Someone else	293	0.3924915	0.4891406
Enough habitat	293	0.221843	0.4161969

The following questions will help us verify that we have heard from a representative sample of NC residents. Any information collected will not be linked to your name.

15.) Are you a male or female?

☐ Male

☐ Female

Mean	0.3244444
Std Dev	0.468688
Std Err Mean	0.0220942
Upper 95% Mean	0.3678652
Lower 95% Mean	0.2810236
N	450

16.) What year were you born?

_____

Mean	60.422705
Std Dev	13.834286
Std Err Mean	0.6799181
Upper 95% Mean	61.759237
Lower 95% Mean	59.086174
N	414

17.) Which of the following best describes your racial background? **(Please check one)**

☐ White	**N=401**	**89.5%**
☐ Black	**N=25**	**5.6%**
☐ Hispanic/Latino	**N=3**	**0.7%**
☐ Asian	**N=4**	**0.9%**
☐ Native American	**N=9**	**2%**
☐ Other	**N=6**	**1.3%**

Mean	1.2433036
Std Dev	0.8727543
Std Err Mean	0.0412338
Upper 95% Mean	1.3243397
Lower 95% Mean	1.1622675
N	448

18.) What is the highest level of education you have attained?

☐ Some high school	**N=11**	**2.5%**
☐ High school degree	**N=59**	**13.6%**
☐ Some college	**N=91**	**21%**
☐ College degree	**N=128**	**29.4%**
☐ Some graduate school	**N=37**	**8.5%**
☐ Master's degree	**N=65**	**15%**
☐ Doctoral or Professional degree	**N=44**	**10%**

Mean	4.1310345
Std Dev	1.6003535
Std Err Mean	0.0767311
Upper 95% Mean	4.2818452
Lower 95% Mean	3.9802238
N	435

19.) Which of the following best describes your total household income before taxes?

☐ Less than $40,000	**N=87**	**22%**
☐ $40,000 to $59,999	**N=68**	**17.2%**
☐ $60,000 to $79,999	**N=61**	**15%**
☐ $80,000 to $99,999	**N=46**	**11.6%**
☐ $100,000 to $119,999	**N=36**	**9%**
☐ $120,000 to $139,999	**N=23**	**5.8%**
☐ $140,000 to $159,999	**N=21**	**5%**
☐ $160,000 to $179,999	**N=12**	**3%**
☐ $180,000 to $199,999	**N=11**	**2.8%**
☐ $200,000 or more	**N=30**	**7.6%**

Mean	3.9240506
Std Dev	2.7491215
Std Err Mean	0.1383233
Upper 95% Mean	4.1959947
Lower 95% Mean	3.6521066
N	395

Thank you for taking the time to complete this survey.
Your help is greatly appreciated!

Please return this survey in the paid postage envelope. You do not need to write your return address on the envelope.

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