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Assessment of wildlife value orientations, state agency credibility, and tolerance for mountain lions in Iowa

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Assessment of wildlife value orientations, state agency credibility, and tolerance for mountain lions in Iowa

by

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ABSTRACT

It is increasingly necessary for state agencies to incorporate the opinions of their constituents in wildlife management decision-making. Shifting demographics of Iowa's human population necessitate gathering information on stakeholders' beliefs and values toward wildlife. This project was implemented to establish baseline information regarding the distribution of WVOs held by Iowa's citizenry, identify areas of dissonance between the public and agency staff, and elucidate issues of state agency credibility. The goal is to provide information that will be helpful in implementation and operationalization of the Iowa Wildlife Action Plan (IWAP). The public was surveyed through a statewide self-administered mail questionnaire (n = 5,400) and an online questionnaire was used to solicit responses from employees of the Iowa Department of Natural Resources' Conservation and Recreation Division (n = 611). We classified individuals into one of four wildlife value orientations (WVOs) based on their beliefs and attitudes towards wildlife: Utilitarian, Mutualistic, Pluralistic, and Distanced. We found significant differences between state agency staff and the public in the distribution of WVOs and we demonstrated that the public believes the IDNR to be more credible than was predicted by the IDNR employees. We demonstrated the utility of the gathered information by applying our knowledge of the public's WVOs to understand preferred responses to possible conflicts associated with the presence of a potentially recolonizing large predator in Iowa, supporting our assertion that understanding how citizens think of and value wildlife can help state agencies make better informed decisions as to preferred and acceptable management of wildlife.

CHAPTER I. GENERAL INTRODUCTION

Wildlife is an important aspect of American history and plays a prominent role in the lives of many Americans. The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation has been conducted for over 55 years, monitoring changes in how people interact with wildlife (U.S. Census Bureau, 2012). According to the 2011 survey, >90 million U.S. residents 16 years and older participated in some form of wildlife recreation; however, the proportion of Americans participating in wildlife recreation has declined significantly over the last 20 years. In 1991, the same survey reported 108.7 million individuals 16 and over participated in some form of wildlife-related recreation (U.S. Census Bureau, 1991).

Though information regarding participation in wildlife-related recreation is important, previous research has shown that broad generalizations of stakeholders, such as farmers and hunters, may not adequately identify the breadth of variation in attitudes toward management decisions within these groups (Fritzell et al., 1995; Lischka et al., 2008). Teel et al. (2005) have used the cognitive hierarchy model (Figure 1) and wildlife value orientations (WVOs) (Figure 2) to investigate this decline in wildlife-related recreation as it relates to societal level shifts that may be occurring. By establishing baseline information regarding WVOs in 19 western states, they have created a platform from which longitudinal and geographic comparisons can be made (Teel & Manfredo, 2009). The research presented in this manuscript represents the first effort to collect this information in Iowa.

How do Iowans value wildlife? How do their value orientations influence their participation in wildlife-related recreation in the state or the sources of information they use to find out information about wildlife in Iowa? What do Iowans consider as wildlife? How do Iowans feel about a potentially recolonizing large predator, the mountain lion? How credible is the Iowa Department of Natural Resources in the eyes of stakeholders? How do stakeholders differ from the Iowa Department of Natural Resources (IDNR) staff and what are the implications of those differences? These are some of the questions we sought to answer. Multiple techniques were employed to collect data that would allow us to answer these questions. These included interviews (Appendix F) with the public to inform survey design by identification of salient issues and local vernacular, a statewide mail-back survey of 5,400 Iowans conducted in the summer of 2012, and an online survey of the IDNR's Conservation and Recreation Division employees, conducted in the fall of 2012.

The purpose of this research was to understand all stakeholders in Iowa in terms of their WVOs and to add new perspective on the application of this knowledge. This information is intended to help wildlife managers implement and operationalize the Iowa Wildlife Action Plan by identifying how stakeholders may differ from the IDNR staff and suggesting insights as to the implications of those differences. We also supply needed information for determining appropriate management responses to a potentially recolonizing large predator, the mountain lion.

Thesis Organization

The three chapters, each of which will be submitted for publication in appropriate scientific journals, form the bulk of this thesis. In addition, there is a general introduction and a general summary chapter that provide a roadmap to, and a synthesis of, the three middle chapters. Manuscript authors each contributed to the design of the survey tool, data analyses, or writing of one or more papers.

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FIGURES

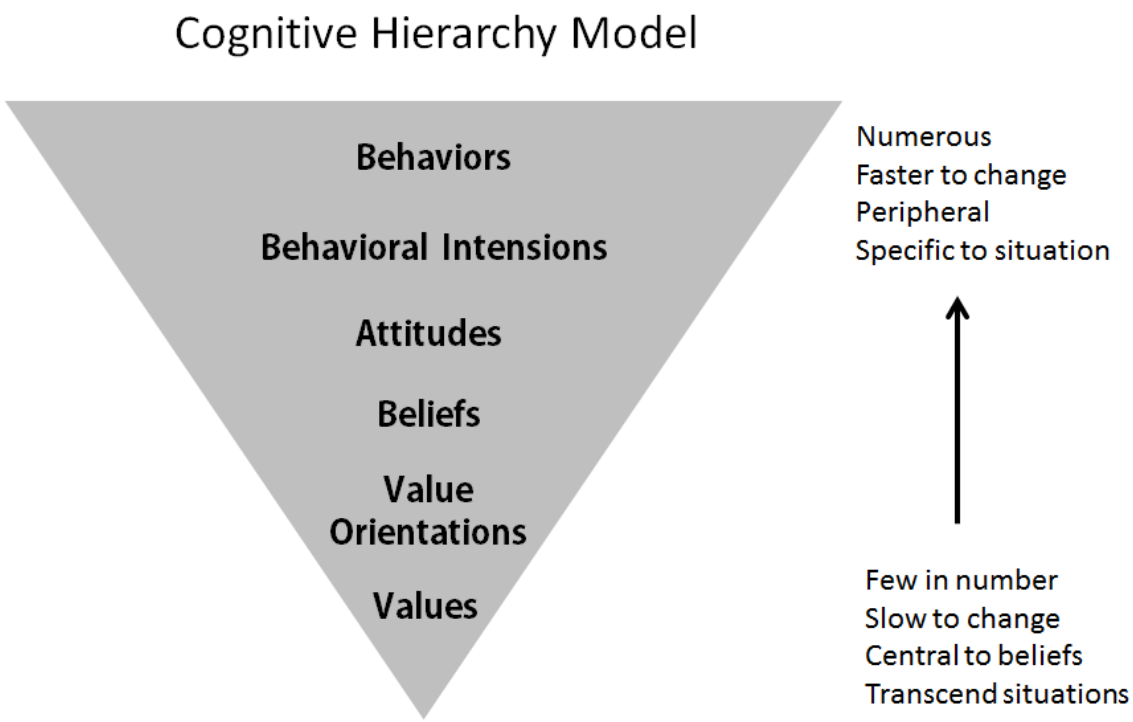

Figure 1. The cognitive hierarchy model of human behavior, from Vaske and Donnelly (1999).

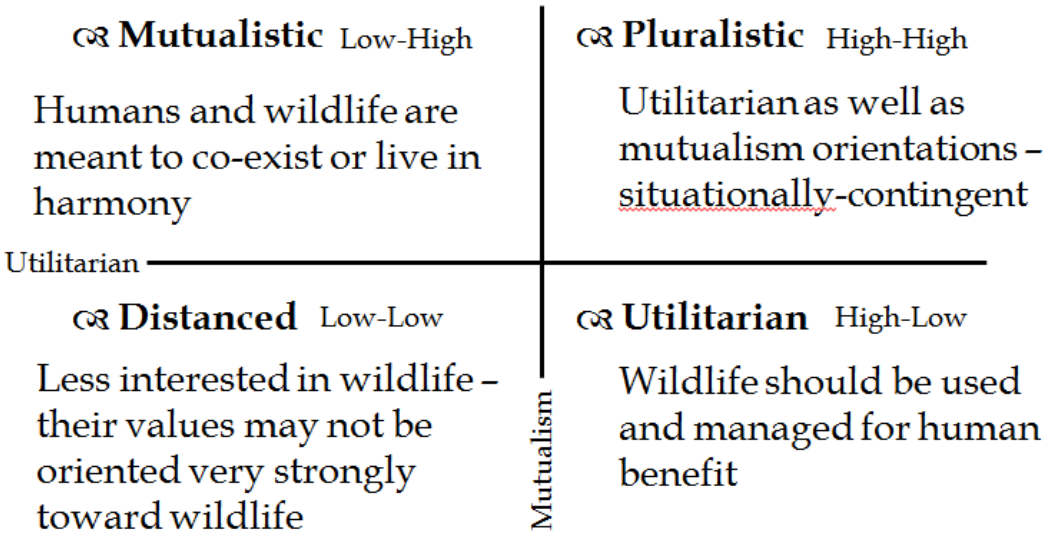

Figure 2. Characteristics of Wildlife Value Orientations (Teel et al. 2005).

CHAPTER II. IOWA'S WILDLIFE VALUE ORIENTATIONS

A paper to be submitted to the *Wildlife Society Bulletin*

Andrew L. Stephenson[1], Rebecca A. Christoffel[1], and Peter A. Fritzell, Jr.[2]

ABSTRACT

Understanding how citizens think of and value wildlife can help state agencies make better informed decisions as to preferred and acceptable management of wildlife. It is increasingly important for management agencies to understand the full scope of stakeholders as new non-traditional funding sources for wildlife management are identified and implemented. Using a standard mail survey design we surveyed 5,400 individuals in Iowa's nine United States Department of Agriculture (USDA) regions. We classified individuals into one of four wildlife value orientations (WVOs) based on their beliefs and attitudes towards wildlife. We investigated possible explanatory variables for these WVOs, including gender, history of residence (urban, rural, etc.), and pet ownership to better understand how WVOs are formed and may change over time and space. Respondents identified their most commonly used sources for learning about Iowa's wildlife and related issues and provided information that allowed us to measure their preferences for the restoration of some of Iowa's species of greatest conservation need. This information will help the IDNR develop management strategies that better reflect their desires of Iowans and create effective communication techniques for the diverse populace. This research serves as the first statewide effort in classifying Iowa's

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stakeholders in terms of WVOs. From our results we will suggest how wildlife value orientations of various segments of Iowa's human population can be effectively incorporated into successful implementation of Iowa's Wildlife Action Plan (IWAP).

Key words: wildlife, value orientations, Iowa, human dimensions, attitudes, values

INTRODUCTION

Iowa is a state centered on farming, with > 31 million acres in agriculture. Only 1% of Iowa's approximately 35,760,000 acres is publicly owned and < 2% of the landscape is in permanently protected wildlife habitat and managed for conservation (Zohrer, 2005). Because of the relatively small amount of public land in Iowa, understanding the values of landowners and farm operators is crucial to successful implementation of wildlife management practices throughout the state. Reliance on private land owners for habitat management coupled with a dependency on consumptive users of wildlife - hunters and anglers - for conservation funding, has resulted in much of the human dimensions research in Iowa focusing on specific stakeholder groups in the forms of the Iowa Farm and Rural Life Poll (Arbuckle, Lasley, & Ferrell, 2012), Waterfowl Hunter Survey Report (Iowa Department of Natural Resources, 2011), and Iowa Angler Survey (Responsive Management, 2008).

However, Iowa has an increasingly urban population, with 64% of the human population reported as urban in 2010 (U.S. Census Bureau, 2013), up 3% from 2000 (U.S. Census Bureau, 2001). Thus, it is important to understand that the majority of stakeholders in Iowa do not live on vast tracts of land nor hunt or fish, only 8% hunt and 15% fish (U.S. Department of the Interior et al., 2008), but that their opinions do have

implications for conservation in the state. Minnis (1998), suggests that more stakeholders are becoming involved in wildlife policy through ballot initiatives. In 2010, Iowa voters passed the Iowa Water and Land Legacy (IWLL) Amendment, which will appropriate a portion, 3/8 of one cent, of the next sales tax increase to create the Natural Resources & Outdoor Recreation Fund (Iowa Water & Land Legacy, 2010). When this act is funded it will make all stakeholders complicit in protecting Iowa's natural resources.

This work represents the first effort to collect information regarding attitudes and beliefs about wildlife in Iowa from all stakeholders and to classify Iowans by their values orientations toward wildlife. Different classification systems have been used to describe stakeholders by their wildlife values (Kellert, 1980; Purdy & Decker, 1989; Fulton et al., 1996); however we used the method recently applied in 19 Western states by Teel et al. (2005). This will allow for comparisons between Iowa and some neighboring states. We scored individuals on four basic belief dimensions: hunting beliefs, appropriate use beliefs, caring beliefs, and social acceptability beliefs. Scores on items concerning hunting beliefs and appropriate use beliefs are averaged to create a Utilitarian wildlife value orientation (WVO) score, while caring beliefs and social acceptability beliefs are similarly used to calculate a Mutualism WVO score. Individuals are then categorized into one of four WVOs by their scores on the Mutualism and Utilitarian axes (high-high = Pluralistic, high-low = Mutualistic, low-high = Pluralistic, and low-low = Distanced) (Figure 2). Mutualists believe that humans and wildlife are capable of coexisting and that wildlife deserves rights and care. Utilitarians hold a view that wildlife are here for the benefit of humans and should be managed as such. Pluralistic individuals score high on both the Mutualism and Utilitarian WVOs and the values that manifest are situationally-

contingent. Distanced individuals score low on both orientations and are believed to have less of a connection with wildlife and less interest in wildlife issues than others. Teel et al. (2005) found that states with higher levels of urbanization had lower percentages of individuals with traditional wildlife values. Because Iowa is in transition toward a more urban based population it presents an ideal area to apply this theory. Gaining baseline information now about stakeholder WVOs will allow for future monitoring of how urbanization may affect WVOs in Iowa.

Previous human dimensions research featuring WVOs has compared segments of the population on their interactions with wildlife (Bryan, 1980; Fulton, Manfredo, & Lipscomb, 1996), differences in effectiveness of communication strategies (Bright, Manfredo, & Fulton, 2000), and differences in attitudes toward various wildlife issues. Our analysis incorporates these components, but primarily serves to investigate how classifying stakeholders by their WVOs can be used to help implement and operationalize a state wildlife action plan. This research will help to operationalize the Iowa Wildlife Action Plan (IWAP) by identifying distributions of stakeholder groups within the state and by informing a system that could be used to identify areas with high social acceptability for habitat restoration for Species of Greatest Conservation Need (SGCN) (Zohrer, 2005). Three objectives of this study were:

1) to identify the distribution of WVOs within Iowa;
2) to determine how individuals classified by mutualistic, pluralistic, distanced, and utilitarian WVOs differ in their definitions of wildlife, participation in wildlife-related activities, the information sources they use for learning about Iowa's wildlife and

related issues, a variety of sociodemographic characteristics, and their preferences for the restoration of some of Iowa's SGCN; and

3) to discuss how information about WVOs in Iowa can be used to help implement and operationalize the IWAP.

METHODS

Sampling and mailing procedures

All work was conducted with IRB Approval from Iowa State University IRB #12-232.

We surveyed 5,625 Iowa residents (18 years or older) drawn from a random directory-listed and supplemented sample purchased from Survey Sampling International, SSI®. This sampling method included phone numbers for most addresses which facilitated telephone non-response follow-up (*n*=150). Of the purchased addresses, 225 were identified as unusable during the initial postcard mailing, yielding an effective sampling size of 5,400. Details of sampling methodology used are included in Appendix A. We followed Dillman et al.'s (2009) tailored design method, specifically employing 4 separate mailings (Table 1): an initial contact postcard (Appendix B), 1st mailing of the survey booklet with cover letter (Appendix C), a reminder postcard (Appendix D), and a 2nd mailing of the survey booklet (Appendix E) with cover letter. Surveys were formatted in booklet style with 8½ x 5½ inch dimensions and were accompanied by a signed cover letter printed on Iowa State University letterhead. We applied $0.45 stamps to all surveys which were to be sealed with the provided mailing seal upon return; $0.65 stamps were used for delivery. To assure survey quality, we tested the questionnaire in an undergraduate classroom (*n*= 31), solicited expert review, and conducted a single mailing sample survey (*n*=100). To address concerns of potential gender-bias that have been

reported for natural resource-focused surveys, we asked for the "adult (≥18 years) residing in the household who will next celebrate a birthday" to complete the survey (Dillman et al., 2009). Though the "birthday method" is not without faults and can still result in gender-bias due to respondents ignoring the request or overriding influence of topic saliency (Jacobson et al. 2007), Dillman et al. (2009) still identify this as one of the best respondent selection methods for self-administered mail-back surveys.

To sample regional differences within the state and to enhance use of the resulting data in implementation of the IWAP, we divided the state into its nine United States Department of Agriculture (USDA) regions (Figure 1), upon which other important management activities function within the state (Iowa Department of Natural Resources (IDNR), 2006; USDA-Natural Resources Conservation Service (NRCS), 2012; IDNR, 2012). We further stratified our sampling within each region by urban, respondents whose address fell within a 5 mile radius of a population center greater than 20,000, and rural populations. Allocation for total rural and urban samples is relative to state records for population distribution of urban (61%) and rural (39%) individuals according to the 2000 Decennial Census (U.S. Census Bureau, 2001). Due to the uneven distribution of urban centers across Iowa, we used a square root proportional allocation (Vaske, 2008) for the urban strata to ensure representation from most of the state, though two regions were not sampled for urban individuals because they did not contain a population center greater than 20,000. To assure representation from each region, we used an equal allocation method (n=244) for rural respondents throughout the state (Table 2).

Measurement

We classified individuals based on their beliefs and attitudes toward wildlife into one of four WVOs: Utilitarian, Pluralist, Mutualist, and Distanced (Figure 2). Classification of WVOs was conducted according to Teel and Manfredo (2009); however, we employed a reduced set of items, 14 questions, from those reported by Teel and Manfredo and confirmed the reliability of the items at the belief dimension level (Table 3). We investigated possible explanatory variables for WVOs including, income, income generated from farming, youth residence, current residence, gender, and pet ownership with fixed response items.

We used dichotomous (yes = 1 or no = 0) scales to query respondents on their interactions with wildlife, perceived acceptable uses of wildlife, animal types that fall under their definition of wildlife, and commonly used information sources for learning about Iowa's wildlife and related issues.

Analysis

We used three measurements to determine if non-respondents differed from our respondents. First, we compared respondents' demographics and participation in wildlife recreation to state-level demographic and wildlife-related recreation information for Iowa from the 2010 Decennial Census (US Census Bureau, 2013) and the 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation – Iowa (U.S. Department of the Interior, 2008). Next, we conducted a comparison of first mailing respondents to those who responded after the second mailing. This approach assumes that late respondents are more representative of non-respondents because of the increased

effort needed to elicit a response (Tyndall et al., 2011; Miller & Smith, 1983). Finally, we used a telephone non-response follow-up (*n*=150) survey to detect differences between non-respondents and respondents.

To classify respondents by WVO, we used the methodology outlined in Teel and Manfredo (2009). We classified only those individuals that responded to all 14 scale items and compared the WVO groups on their participation in wildlife-related recreation and socio-demographic characteristics with one-way analyses of variance (ANOVA) and chi-square tests. Chi-square tests were used to compare WVO groups by their frequency of information seeking and their use of information sources for learning about Iowa's wildlife and related issues and preferences for restoration of SGCN. We used ANOVA and Tamhane's post hoc tests to determine differences in levels of participation in wildlife-related recreation, acceptable uses of wildlife, and types of animals considered as wildlife.

We calculated effect size using Cramer's V for two categorical variables and Eta for a categorical and an interval-level variable (Vaske, 2008). Following suggestions from Gliner et al. (2001), we reported effect sizes for those relationships that were not significantly different to aid in future meta-analysis of this type of data. We used effect size criteria outlined in Rea and Parker (1992) and used by Teel et al. (2005) to determine strength of association with Cramer's V, where: 0.00 to under 0.10 = "negligible association," 0.10 to under 0.20 = "weak association," 0.20 to under 0.40 = "moderate association," 0.40 to under 0.60 = "relatively strong association," 0.60 to under 0.80 = "strong association," and 0.80 to 1.00 = "very strong association." We used Eta effect size criteria outlined by Cohen (1988) and used by Teel et al. (2005) where: 0.10 to under

0.234 = “small effect”, 0.234 to under 0.371= “medium effect”, and 0.371 and above = “large effect.”

We used Levene’s test of homogeneity to determine if post hoc tests should be conducted under the assumption of equal or unequal variance. The test for homogeneity returned significant results for all variables tested, indicating that a test assuming unequal variance should be used. We selected to use Tamhane’s test, which is often conservative, to compare responses of the different WVOs on dichotomous variables that were indicated to have significant differences by ANOVA testing.

RESULTS

We mailed 5,400 surveys, of which 2,353 were returned completed, resulting in a 43.5% response rate overall. Although region level response rates varied from 22.4% to 59.9%, we did not detect a difference between urban and rural response rates at the state level (Table 2). We identified nine variables that revealed differences between early and late respondents, but for all variables, time of response showed negligible effect size (Table 4). Comparisons of respondent demographics to state-level demographics showed that our sample underrepresents certain racial and ethnic groups and the youngest and eldest age groups, that we received more responses from men than women and that hunters were overrepresented, likely due to topic saliency. Telephone follow-up respondents differed with a weak-moderate effect size from mail-survey respondents in age and level of agreement on 3 of the 4 attitude items (Table 5). Non-respondents were older and agreed more strongly with attitude items than mail-survey respondents, which may reflect the increased likelihood of social desirability bias in telephone surveys (Vaske, 2008). Given these findings, data were weighted by gender, age and participation

in hunting to reflect state-level data; those cases without a value for gender or age were given a weight of 1 to allow weighting by other variables. We also weighted data by population proportions for each USDA region to adjust for varied response rates from the regions and by 2011 urban-rural population distribution within the state. We obtained population estimates for weighting from the 2010 Decennial Census (U.S. Census Bureau, 2013) and the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (U.S. Department of the Interior, 2008). Before weighting the data, we confirmed reliability of the 14 items comprising the WVO scales with Cronbach's alpha values of 0.85 for the Mutualist dimension and 0.73 for the Domination dimension (Table 3).

As a state, Iowa is comprised of 31.3% Utilitarians, 31.3% Mutualists, 10.4% Pluralists, and 26.9% Distanced individuals. We found differences in distribution of WVOs across the nine USDA regions. Utilitarians comprised anywhere from 25.9% to 48.6% of respondents in Iowa's USDA regions. The three regions with the highest percentage of Utilitarians- 38.3% to 46.5% - were those that had the lowest number of urban individuals sampled: the Northwest, Southcentral, and Westcentral regions. Regions with the highest proportion of Mutualists were the Eastcentral, Southwest, Central, and Southeast, ranging 30.1% to 38.4%. Regions with the highest proportions of Pluralists were the Southeast, Northeast, and Westcentral, ranging 14.9% to 17.9%. Eight regions had $\geq$ 20% of respondents classified as Distanced; Southcentral had the least with only 12.8% (Table 6).

Results show that WVOs differed, with a moderate effect size on two socio-demographic variables, gender and pet ownership. Mutualists were more likely to be

female and pet owners, while Utilitarians and Pluralists were more likely to be male and less likely to own pets. Additionally, WVOs differed on 6 other socio-demographic variables: age (continuous) and age category (Table 7), education level, income, area raised as a youth, current residence as indicated by respondent, and assigned urban-rural location, but all resulted in weak or negligible effect sizes (Table 8) (Cohen, 1988). WVOs differed by area of residence in all aspects measured, i.e., youth residence, current residence as indicated by respondent, and assigned urban-rural location. Both youth and assigned urban-rural location showed weak levels of association and current residence as indicated by respondent had a negligible effect size (Table 8).

Comparisons of WVOs and respondent interactions with wildlife revealed differences among WVOs. Hunting showed a moderate effect size and all interactions showed at least weak effect sizes. Utilitarians and Pluralists were similar to each other and different from Mutualists on consumptive interactions, indicating greater participation in hunting and fishing. Utilitarians and Distanced respondents indicated a greater preference to not interact with wildlife than both Mutualists and Pluralists. Pluralists and Mutualists indicated greater participation in providing habitat for wildlife and feeding backyard wildlife than Utilitarians and Distanced individuals. Mutualists also showed higher levels of participation in wildlife watching or photographing than Utilitarians and Distanced respondents (Table 9). Similarly, WVOs differed in the uses of wildlife that they deem acceptable. We identified moderate effect sizes for four uses, weak for two, and negligible for two. Mutualists were the least likely to identify any use of wildlife as acceptable. Utilitarians and Pluralists were the most likely to identify a

consumptive use as acceptable, including use of wildlife for clothing, food, taxidermy, or for alternative medicines (Table 10).

Results show that WVOs differ in both their frequency of information seeking regarding Iowa's wildlife and related issues and the information sources that they use. Mutualists and Pluralists reported seeking information more frequently than Utilitarians and Distanced individuals. We found six information sources that differed in reported level of use by WVOs, though all showed weak or negligible effect sizes. The two information sources used most by all respondents were TV news and an individual's own observations and experiences. Mutualists and Pluralists reported higher levels of use than Utilitarians and Distanced individuals in these information sources as well as wildlife shows, videos or DVDs, magazines, programs at zoos, state parks, etc., and brochures or pamphlets about wildlife. Social media was the least used information source by all WVOs.

Definitions of wildlife differed among WVOs as did preferences regarding the restoration of SGCN. All but one listed animal type, buffalo/bison, had differences among WVOs in their inclusion under the definition of wildlife. Progression from the animal identified most as falling under the definition of wildlife to the one selected least for all respondents is deer, coyotes, birds, buffalo/bison, fish, snakes, turtles, frogs, bees, snails, mussels, and mosquitos (Table 12). Mammals and birds were most frequently identified by all WVOs, followed by fish, reptiles, amphibians, and lastly invertebrates. Less than 50% of respondents among all WVOs identified mosquitos as wildlife.

DISCUSSION

Shifting demographics of Iowa's human population necessitate gathering information on stakeholders' beliefs and values toward wildlife. This project was implemented to determine baseline information regarding the distribution of WVOs held by Iowa's human population to help in strategizing implementation and operationalization of the IWAP. However, results of the survey should not be taken to represent all stakeholders. Generalizations should be limited to Caucasians because the number of respondents from other racial and ethnic groups was too small to make inferences.

This method of segmenting the public and classifying stakeholder groups by their WVOs is important because commonly used broad level generalizations of stakeholders, such as farmers and hunters, may not adequately identify the breadth of variation within these groups of individuals' attitudes toward management decisions (Fritzell et al., 1995; Lischka et al., 2008). This work will also allow for comparisons between neighboring states based on the information collected by Teel and Manfredo (2009). A better understanding of wildlife concerns at a region specific and statewide level will increase the IDNR's effectiveness in working with stakeholders to manage Iowa's wildlife resources.

As compared to states sampled by Teel and Manfredo (2009), Iowa shows a considerably higher proportion of Distanced individuals (26.9%). Proportions of nearby and neighboring states were 7.9%, 6.3%, 8.4%, and 10.1% for North Dakota, South Dakota, Nebraska, and Kansas, respectively. This discrepancy may be due to the land-use history in Iowa compared to that of the western states surveyed. Iowa is a state dominated

by row crop agriculture and has a greater percentage of land in agriculture than do these four states (U.S. Department of Agriculture, 2009). This situation should be of concern to wildlife managers in Iowa and other states with highly altered agricultural landscapes. Future research should target the Midwest or the Corn Belt to determine if land-use history within a state influences WVOs. As we found differences in WVOs among the regions within Iowa, future work in the state could compare regional differences in WVOs to some metric of agricultural productivity (i.e., crop yields or corn suitability ratings) or land-use (i.e., percentage of land in row crop agriculture).

The high proportion of Distanced individuals in the state should be concerning to wildlife managers because it is unclear as to what challenges managers will face with an increased number of Distanced individuals. Identifying and addressing the underlying reasons for this high proportion of Distanced individuals is of interest to wildlife managers as these individuals may present a challenge to current conservation funding because they are less likely to participate in hunting or fishing, or even to potential new funding sources for conservation due to a decreased interest in wildlife. As Distanced individuals are less likely to score high on the attraction dimension and more likely to express concern for safety, they may also resist restoration and conservation efforts of rare species in their areas.

Because formulation of values occurs early during childhood (Feather, 1975; Stern et al., 1995), it is important to consider how changes in children's activities related to the outdoors and nature may be affecting formation of WVOs. Recent research suggests that children are spending less time playing outside (England Marketing, 2009; Clements, 2004) and that there is an on-going movement away from nature-based

recreation on a national scale (Pergams & Zaradic, 2008; The Outdoor Foundation, 2010). Additionally, children's play has become increasingly supervised (Karsten, 2005). Though the benefits of being proactive to encourage healthy relationships and respect for natural resources in our youth may not be evident in the distribution of WVOs for some years, action is warranted now to potentially decrease the abundance of Distanced WVOs in Iowa in the future. Because of the current prevalence of Distanced individuals in the state and the potential for this segment of the population to grow, more research is needed to understand how best to engage with these stakeholders.

Though most socio-demographic variables were found to be poor indicators of WVOs, we found a moderate effect size on the association between gender and WVO (Table 8). This is consistent with previous research indicating that men and women differ in their WVOs (Bright et al., 2000; Vaske et al., 2001; Zinn & Pierce, 2002; Dougherty et al., 2003; Teel et al., 2005). Pet ownership was the only other socio-demographic variable we found to show a moderate effect size. Our results are consistent with our hypothesis that Mutualistic individuals, who believe humans and animals can coexist and are capable of relationships, would be more likely to own pets. According to the *U.S. Pet Ownership and Demographics Sourcebook* (American Veterinary Medical Association, 2013), > 60% of pet owners considered their pets to be family members, indicating a deep emotional connection between owners and their animals. U.S. expenditures on pets has tripled since 1994, with > $53 billion spent in 2012 (American Pet Products Association, 2013). Pet ownership has also been found to influence an individual's recreation levels (Parabhdeep et al., 2011), which could affect the public's desires for outdoor recreation

programs and spaces. As the societal level changes noted by Teel et al. (2005) continue, relationships of individuals to their pets may serve as a useful metric to monitor.

Our results support previous findings that individuals holding specific WVOs differ in their interactions with wildlife. Utilitarians and Pluralists reported higher levels of participation in consumptive forms of wildlife recreation (i.e., hunting and fishing), while Mutualists were more likely to participate in wildlife watching or photography (Table 9) (Teel et al., 2005; Bright et al., 2000). Though consumptive activities contribute extensively to funding conservation (U.S. Census Bureau, 2013), the foremost problem facing wildlife in Iowa, habitat loss, requires stakeholder participation as well. Greater proportions of Mutualists and Pluralists indicated that they provide habitat for wildlife and feed backyard wildlife, and they more often favored restoration of Iowa's Species of Greatest Conservation Need (SGCN). Additionally, Mutualists were most likely to identify any particular animal type as wildlife and also more frequently identified all 12 animal types as wildlife (Table 12) suggesting that they may value a greater diversity of animals as wildlife. Participation of Mutualists and Pluralists in providing habitat for wildlife and their preference for restoration of SGCN indicates that they may be an important segment of the population that can be mobilized to participate in conservation efforts geared towards preserving or establishing suitable habitat for Iowa's wildlife. Wildlife managers may have more success enticing private landowners with these WVOs to participate in incentive programs that help restore vital habitat land for SGCN (Hadlock, 2002; Sorice et al., 2011).

Consistent with our hypothesis, tendencies toward consumptive or non-consumptive interactions with wildlife of the WVOs were reflected in their reported

acceptability of selected uses of wildlife. Almost all Utilitarians and Pluralists reported that using wildlife for food was acceptable, while fewer than 70% of Mutualists reported the same, emphasizing the disparity between these WVOs. However, some uses, such as selling wildlife for profit or keeping wildlife as pets (Table 10), seem to be unacceptable to all WVOs. This information may be useful as Iowa considers new restrictions on commercial turtle harvest in the state, which has increased in recent years due to foreign and domestic market demands (Convention on International Trade in Endangered Species of Wild Fauna and Flora, 2013). Incorporation of public opinion, in conjunction with ecological research geared toward understanding the long-term effects of increased pressure on turtle populations, serves as an example of practical application of this information in decision-making.

Public input is an increasingly important aspect of regulation development, as evidenced by more stakeholder involvement through ballot initiatives (Minnis, 1998). To increase the IDNR's ability to communicate effectively with all stakeholder groups, we investigated differences among WVOs in the information sources used to learn about Iowa's wildlife and related issues. Six information sources showed differences in the level of use by WVOs, though effect sizes for all were negligible to weak, suggesting that the most frequently selected media sources, television news and local newspapers, may be good outlets for keeping the public informed. Riley and Decker (2000) reported similar findings on the importance of television and news sources for learning about mountain lions in Montana. These sources were also important because they shared the experiences of others' interactions with mountain lions, providing a vicarious experience for readers and viewers. Though few respondents reported using social media for learning

about Iowa's wildlife and related issues, this may be an information source to monitor and study further, as its effective use would allow for rapid dissemination of information. Improving agency understanding of effective information sharing with a diverse public will aid their efforts to reach out to new stakeholders. Urbanization is not the only demographic change occurring in Iowa. Census data shows that Iowa's Hispanic population has increased four-fold since 1990, and currently comprises 5% of the state's total population (U.S. Census Bureau, 2013). As Lopez et al. (2005) stated, the country's growing Hispanic population will be an increasingly important stakeholder in future natural resource management issues. Though we were able to establish a baseline understanding of WVOs among Caucasians in Iowa through the use of a mail-back survey, this method was not successful at identifying WVOs of minority groups within the state. To better query these individuals in the future, other methods should be utilized (Vaske, 2008).

We have presented insights concerning how this WVO typology can be used to better understand the diversity of stakeholders in Iowa. We believe that there are useful applications of this data to identify segments of the population that could potentially be mobilized to engage in conservation actions in their areas. It is our hope that this work will provoke conversations geared toward identifying and understanding potential difficulties that may arise when implementing state wildlife action plans. Now that baseline information is available for Iowa, more in-depth, spatially extensive, or long-term research can build upon it and expand our knowledge and monitoring of stakeholders in Iowa and the Midwest.

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FIGURES

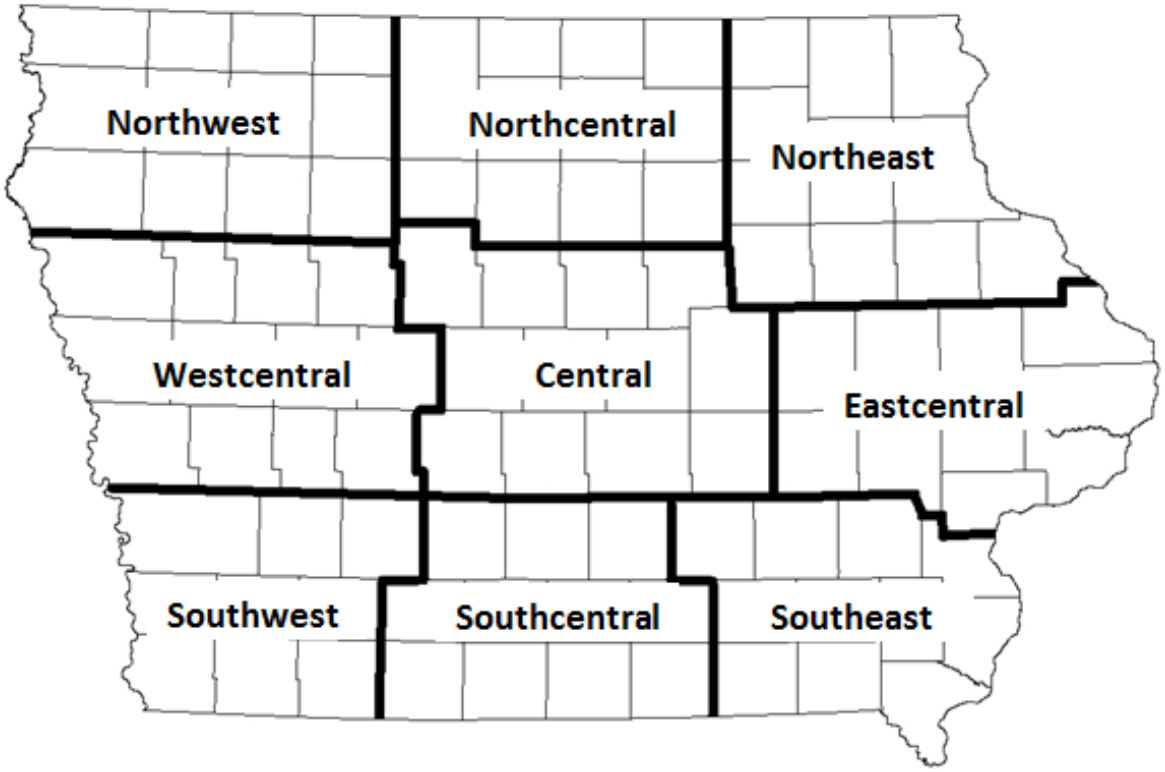

Figure 1. Map of 9 USDA regions within Iowa (from IDNR 2012)

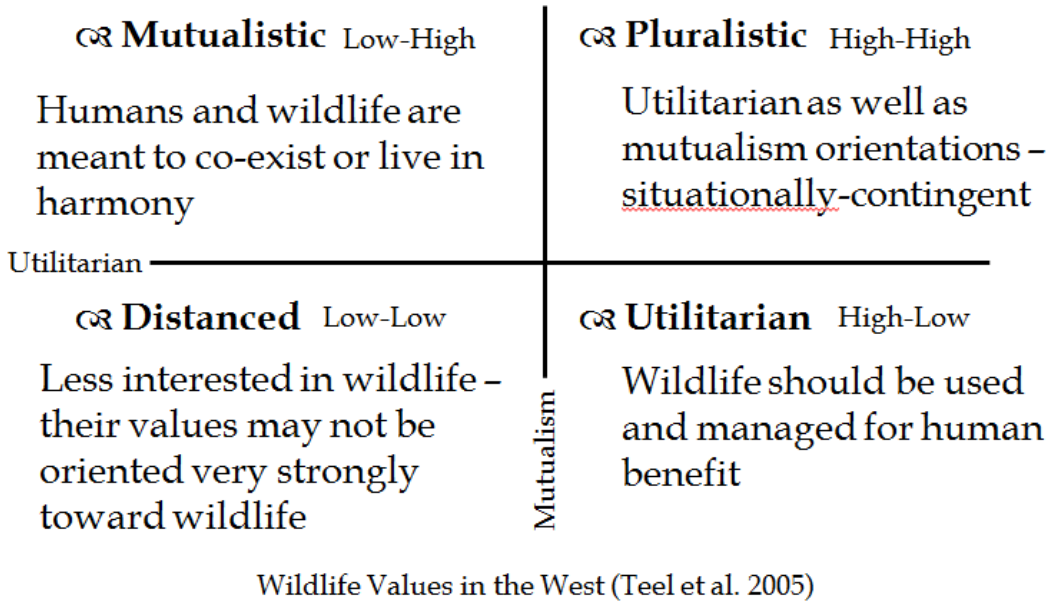

Figure 2. Characteristics of Wildlife Value Orientations (after Teel et al. 2005).

TABLES

Table 1. Stages of mail-back survey administration, as conducted by Stephenson (2012) in Iowa.

Stage	**Time Frame**
I. 100 Sample mail-back survey	May 12, 2012
II. Initial post-card mailing	June 25, 2012
III. Mail-back survey administration: 1st mailing	July 10, 2012
IV. Thank you/reminder post card	July 23, 2012
V. Mail-back survey administration: 2nd mailing	August 4, 2012
VI. Telephone nonresponse follow-up	October 22 – February 27, 2012

Table 2. Distribution of Urban and Rural sampling efforts in each of Iowa's 9 USDA regions, urban and rural response rates, and overall response rate.

Region	*Proposed Urban*	*Proposed Rural*	*Actual Urban*	*Actual Rural*	*Urban Response Rate*	*Rural Response Rate*	*Overall Response Rate*
Central	880	244	847	224	59.1%	62.5%	59.9%
Eastcentral	784	244	758	234	54.7%	46.2%	54.1%
Northcentral	330	244	321	225	24.9%	23.6%	24.4%
Northeast	596	244	569	233	36.2%	31.8%	34.9%
Northwest	0	244	-	234	-	59.4%	59.4%
Southcentral	0	244	-	236	-	48.3%	48.3%
Southeast	459	244	441	234	24.3%	28.2%	25.6%
Southwest	329	244	321	238	22.1%	22.7%	22.4%
Westcentral	53	244	51	234	52.9%	56.0%	55.4%
Total	3431	2194	3308	2092	43%	42.0%	43.6%

Table 3. Reliability results from SPSS for wildlife value orientations scale items (adapted from Teel et al. 2005).

Wildlife value orientation and basic belief dimension	*n*	*Cronbach's alpha*
Utilitarian	2214	**0.731**
Appropriate use beliefs	2271	0.634
Hunting beliefs	2266	0.758
Mutualism	2240	**0.850**
Social affiliation beliefs	2266	0.779
Caring beliefs	2290	0.727

Table 4. Variables that differed between early and late respondents and effect sizes.

Variable	*Early respondent*[1]	*Late respondent*[1]	χ^2 or *F* (*df*)	*ES*[2]
Age ($\bar{X}$)	47.89	50.52	15.304 (1, 2292)*	0.08
Pet Ownership	0.51[a]	0.56[a]	9.707 (1, 2314)**	0.05
Photograph or watch wildlife	.69[a]	.65[a]	2.007 (1, 2351)	0.04
Provide habitat for wildlife	.34[a]	.28[a]	3.980 (1, 2351)*	0.06
Own Observations	.64[a]	.58[a]	7.588 (1, 2351)*	0.05
Educational Purposes	.70[a]	.66[a]	.363 (1, 2351)	0.04
Highest level of education (%)			12.486 (4)*	0.07
less than high school	3.10	4.20		
high school diploma or equivalent	27.60	29.60		
some college or technical school	24.10	25.80		
college or technical school	30.30	30.40		
graduate or professional school	14.80	10.00		
Current area of residence (%) [3]			7.100 (2)*	0.06
Rural	19.90	17.30		
Suburban	28.90	34.10		
Urban	51.20	48.60		
Seek information about Iowa's wildlife and related issues (%)			14.104 (3)*	0.07
never	13.20	18.70		
rarely	32.40	32.80		
occasionally	44.00	39.10		
frequently	10.40	9.30		

[1]*Numbers denote overall percentages obtained from state-level data*
[2]*ES denotes effect size as either Cramer's V, used to compare two categorical variables or Eta to compare a categorical variable with an interval variable*
[3] *Variable recoded – "rural" combines "rural on a farm" and "rural non-farm", "suburban" represents "suburban", and "urban" combines "small town" and "city"*
** Denotes significance at $p \leq 0.05$*
*** Denotes significance at $p \leq 0.001$.*

Table 5. Variables exhibiting significant differences between survey respondents and non-respondents from a telephone follow-up and effect sizes.

Variable	*Respondent mean response*[1]	*Non-respondent mean response*[1]	χ^2 or *F* (*df*)	ES^2
"I value the sense of companionship I receive from animals"	4.98	6.38	109.748 (1, 2462)**	0.21
"The needs of humans should take priority over wildlife protection"	4.19	5.22	42.614 (1, 2468)**	0.13
"Animals should have rights similar to the rights of humans"	3.43	4.31	28.237 (1, 2455)**	0.11
Pet Ownership	0.53[a]	0.62[a]	4.512 (1, 2464)*	0.09
"People who want to hunt should be provided the opportunity to do so"	5.35	5.89	16.317 (1, 2473)**	0.08
Gender (Male/Female)			5.189 (1)*	0.05
male	0.60[a]	0.51[a]		
female	0.40[a]	0.49[a]		
Hunting	0.26[a]	0.19[a]	4.168 (1, 2501)*	0.04
Photograph or watch wildlife	0.68[a]	0.72[a]	1.197 (1, 2501)	0.08
Feed Backyard wildlife	0.56[a]	0.61[a]	1.700 (1, 2501)	0.03
Fishing	0.46[a]	0.43[a]	0.271 (1, 2501)	0.01
Age ($\bar{X}$)	48.55	59.33	67.045 (1, 2457)**	0.16

[1]*Numbers denote overall percentages obtained from state-level data*
[2]*ES denotes effect size as either Cramer's V, used to compare two categorical variables or Eta to compare a categorical variable with an interval variable.*
** Denotes significance at $p \leq 0.05$*
*** Denotes significance at $p \leq 0.001$.*

Table 6. Wildlife value orientation (WVO) distributions across Iowa's nine USDA regions.

	Wildlife value orientation type[1]					
Variable	*Utilitarian*	*Mutualist*	*Pluralist*	*Distanced*	χ^2	*ES*[2]
Iowa USDA Region					81.412**	0.11
Central	32.40	30.50	7.40	29.80		
Eastcentral	25.90	38.40	7.20	28.50		
Northcentral	31.40	29.70	8.50	30.50		
Northeast	28.20	29.00	15.50	27.40		
Northwest	36.20	28.50	13.80	21.50		
Southcentral	48.60	24.80	13.80	12.80		
Southeast	27.80	30.10	17.90	24.10		
Southwest	30.90	31.70	8.90	28.50		
Westcentral	39.70	22.00	14.90	23.40		
Total	31.30	31.30	10.40	26.90		

[1]*Numbers denote overall percentages obtained from state-level data*
[2]*ES denotes effect size as Cramer's V, used to compare two categorical variables*
*** Denotes significance at* $p \leq 0.001$.

Table 7. Distribution of respondents holding wildlife value orientation types among age categories.

	Wildlife value orientation type[1]					
Variable	*Utilitarian*	*Mutualist*	*Pluralist*	*Distanced*	χ^2	*ES*[2]
Age category					86.815 (21)**	0.12
18-24	12.10	8.10	24.40	9.40		
25-34	17.60	14.30	17.20	16.20		
35-44	17.00	15.20	15.80	16.60		
45-54	16.80	22.00	12.70	22.30		
55-64	16.80	17.30	14.00	16.40		
65-74	9.10	13.20	9.00	8.80		
75-84	9.30	5.60	4.10	7.00		
85+	1.20	4.40	2.70	3.20		

[1]*Numbers denote overall percentages obtained from state-level data*
[2]*ES denotes effect size as Cramer's V, used to compare two categorical variables.*
*** Denotes significance at* $p \leq 0.001$.

Table 8. Comparison of socio-demographic characteristics among respondents holding WVO types.

	Wildlife value orientation type[1]					
Variable	*Utilitarian*	*Mutualist*	*Pluralist*	*Distanced*	χ^2 or *F* (*df*)	*ES*[3]
Age ($\bar{X}$)	47.86[a]	50.79[b]	43.49[c]	48.69[ab]	8.967 (3, 2111)**	0.11
Pet Ownership	40.40[a]	68.90[b]	49.30[a]	41.80[a]	45.990 (3, 2120)**	0.25
Gender (%)					112.410 (3)**	0.23
female	36.30	63.90	39.90	51.80		
male	63.70	36.10	60.10	48.20		
Education (%)					43.336 (12)**	0.11
less than high school diploma	3.90	2.20	8.00	4.00		
high school diploma or equivalent	28.60	28.00	34.40	27.30		
some college or technical school	22.60	20.80	22.80	20.00		
college or technical school	33.80	29.80	24.10	31.10		
graduate or professional school	11.20	19.00	10.70	17.70		
Income (%)					51.137 (15)**	0.11
less than $25,000	20.30	18.30	35.10	16.80		
$25,000-$74,999	45.90	54.50	46.50	51.80		
$75,000-$99,999	15.70	12.10	7.60	11.30		
$100,000-$149,999	9.90	9.10	7.60	11.90		
$150,000-$199,999	4.70	4.10	1.10	4.90		
$200,000 or more	3.50	1.80	2.20	3.20		
Area raised as a youth (%)[2]					94.763 (12)**	0.14
rural	47.90	28.40	48.90	35.60		
suburban	28.60	29.90	25.30	34.30		
urban	23.40	41.70	25.80	30.10		
Current area of residence (%)[2]					21.806 (6)**	0.07
rural	17.20	15.20	16.30	13.10		
suburban	36.70	29.60	32.10	28.10		
urban	46.10	55.20	51.60	58.80		
Assigned urban-rural location					24.828 (3)**	0.11
rural	43.00	32.50	40.10	31.20		
urban	57.00	67.50	59.90	68.80		

[1]*Subscript letters denote statistical difference ($p < 0.05$) as reported by Tamhane's post hoc test, used to address a violation of the equal-variances assumption in analysis of variance (ANOVA), determined by Levene's test of homogeneity.*

[2] *Variable recoded – "rural" combines "rural on a farm" and "rural non-farm", "suburban" represents "suburban", and "urban" combines "small town" and "city"*

[3]*ES denotes effect size as either Cramer's V, to compare two categorical variables or Eta to compare a categorical variable with an interval variable.*

*** Denotes significance at $p \leq 0.001$.*

Table 9. Comparison of interactions with wildlife among respondents holding four WVO types.

	Wildlife value orientation type[1]					
Variable	*Utilitarian*	*Mutualist*	*Pluralist*	*Distanced*	*F* (df_1, df_2)	*ES*[2]
Hunting (%)	15.10[a]	2.50[b]	15.60[a]	4.00[b]	102.048 (3, 2151)**	0.22
Fishing (%)	41.70[a]	30.70[b]	37.90[ab]	31.20[b]	23.218 (3, 2151)**	0.10
Provide habitat for wildlife (%)	21.20[a]	36.60[b]	32.60[b]	20.90[a]	57.885 (3, 2151)**	0.16
Feed backyard wildlife (%)	45.70[a]	62.60[b]	58.90[b]	46.90[a]	51.360 (3, 2151)**	0.16
Watch or photograph wildlife (%)	61.90[a]	74.30[b]	69.80[ab]	65.20[a]	26.149 (3, 2151)**	0.11
Prefer not to interact with wildlife (%)	17.40[a]	7.10[b]	9.40[b]	19.10[a]	50.572 (3, 2151)**	0.15

[1]*Numbers denote overall percentages obtained from state-level data, letters denote groups with statistically different means at the $p < 0.05$.*

[2]*ES denotes effect size as Eta, used to compare a categorical variable with an interval variable.*

[*]*Denotes significance at $p \leq 0.05$.*

*** Denotes significance at $p \leq 0.001$.*

Table 10. Comparison of acceptability of uses of wildlife among respondents holding different WVOs.

	Wildlife value orientation type[1]					
Variable	*Utilitarian*	*Mutualist*	*Pluralist*	*Distanced*	*F* (df_1, df_2)	*ES*[2]
Clothing (%)	46.70	10.90	37.10	20.50	90.795 (3, 2151)**	0.335
Taxidermy (%)	45.90	14.50	27.70	18.10	73.795 (3, 2151)**	0.305
Food (%)	93.80	69.00	92.40	78.90	56.759 (3, 2151)**	0.271
Sale for profit (%)	14.20	1.80	9.80	2.90	35.574 (3, 2151)**	0.217
Alternative medicines (%)	41.00	19.90	37.10	26.90	27.445 (3, 2151)**	0.192
None of the above (%)	1.90	13.10	3.60	9.50	23.596 (3, 2151)**	0.178
Pet (%)	13.50	10.60	20.50	12.90	4.991 (3, 2151)*	0.083
Educational purposes (%)	70.50	64.50	73.70	69.80	3.127 (3, 2151)*	0.066

[1]*Numbers denote overall percentages obtained from state-level data.*

[2]*ES denotes effect size as Eta, used to compare a categorical variable with an interval variable.*

[*]*Denotes significance at $p \leq 0.05$.*

** *Denotes significance at $p \leq 0.001$.*

Table 11. Comparison of frequencies of information seeking and use of information sources for learning about wildlife and related issues among respondents holding different WVOs, expressed as percentages.

	Wildlife value orientation type[1]						
Variable	*Utilitarian*	*Mutualist*	*Pluralist*	*Distanced*	*Total*	χ^2 (*df*)	*ES*[2]
Frequency of seeking information (%)						77.385 (9)	0.11
Never	22.00a	13.60b	15.10b	23.70a	19.10		
Rarely	37.30a	32.00b	29.40b	40.80a	35.80		
Occasionally	34.60a	42.80b	48.20b	31.70a	37.80		
Frequently	6.10ab	11.60c	7.30bc	3.80a	7.30		
TV news (%)	58.20	65.90	65.20	61.60	62.20	9.640 (3)*	0.07
My own observations and experiences (%)	56.60	59.80	57.60	51.60	56.40	8.696 (3)*	0.06
Local newspapers (%)	52.20	54.70	57.10	52.80	53.60	2.108 (3)	0.03
Family members, friends, neighbors (%)	51.60	51.70	53.10	48.80	51.00	1.750 (3)	0.03
Wildlife shows, videos or DVDs (%)	41.50	56.30	57.60	47.80	49.50	36.079 (3)**	0.13
Magazines (%)	42.30	49.00	52.70	40.00	44.90	17.662 (3)*	0.09
Programs at zoos, state parks, etc. (%)	30.00	44.70	41.10	35.40	37.20	33.591 (3)**	0.13
Brochures/pamphlets about wildlife (%)	26.30	35.70	34.40	25.60	29.90	22.638 (3)**	0.10
Websites (%)	25.80	28.40	24.10	23.40	25.80	4.329 (3)	0.05
Conservation professional (%)	23.30	26.30	26.80	21.90	24.20	4.434 (3)	0.05
Radio (%)	24.20	19.90	21.00	19.50	21.30	5.252 (3)	0.05
Social media (e.g., Facebook) (%)	5.60	7.40	8.50	5.50	6.40	4.106 (3)	0.04

[1]*Numbers denote overall percentages obtained from state-level data. Letters denote groups with column proportions that do not differ statistically at the p <0.05level according to a z-test.*

[2]*ES denotes effect size as Cramer's V, used to compare two categorical variable s.*

[*]*Denotes significance at $p \leq 0.05$.*

*** Denotes significance at $p \leq 0.001$.*

Table 12. Comparison of animal types included as wildlife by respondents holding different WVOs.

	Wildlife value orientation type[1]						
Variable	*Utilitarian*	*Mutualist*	*Pluralist*	*Distanced*	*Total*	χ^2 (*df*)	*ES*[2]
Deer (%)	98.80	98.80	96.00	98.40	98.40	9.938 (3)*	0.07
Coyotes (%)	95.60	97.00	86.60	96.40	95.30	44.140 (3)**	0.14
Birds (%)	88.70	93.60	83.90	89.50	90.00	20.536 (3)**	0.10
Buffalo/Bison (%)	86.90	89.20	87.90	89.70	88.50	2.772 (3)	0.04
Fish (%)	81.30	82.00	75.00	77.20	79.80	8.649 (3)*	0.06
Snakes (%)	81.30	83.60	73.20	80.10	80.90	12.042 (3)*	0.08
Turtles (%)	75.00	81.10	70.50	74.50	76.30	14.443 (3)*	0.08
Frogs (%)	73.10	78.10	67.90	74.30	74.50	10.577 (3)*	0.01
Bees (%)	60.10	69.90	64.70	63.10	64.50	14.593 (3)*	0.08
Snails (%)	55.80	66.80	56.70	57.20	59.70	20.721 (3)**	0.10
Mussels (%)	52.30	62.40	52.70	53.80	55.90	17.126 (3)*	0.09
Mosquitos (%)	39.30	48.30	43.80	42.10	43.30	11.761 (3)*	0.07
All selected (%)	33.00a	42.80b	36.60a, b	36.50a	36.50	76.664 (36)**	0.11

[1]*Numbers denote overall percentages obtained from state-level data. Each subscript letter denotes a subset of wildlife value orientations that differ from each other in their means at the $p < 0.05$ level, according to a Tamhane's post hoc test used to address a violation of the equal-variances assumption in analysis of variance (ANOVA), determined by Levene's test of homogeneity.*

[2]*ES denotes effect size as Cramer's V, used to compare two categorical variable s.*

[*]*Denotes significance at $p \leq 0.05$.*

*** Denotes significance at $p \leq 0.001$.*

Table 13. Comparison of preferences for restoration of SGCN by respondents holding different WVOs.
I.) "I would enjoy having this species around and would not worry about any problems they may cause"
II.) "I could enjoy a few individuals of this species, but I would worry about them causing problems"
III.) "I would think of this species as a pest and would not want any in my area"
IV.) "It would not matter to me whether this species was restored in my area"

		Preference for Restoration[1]					
SGCN	Value Type[1]	I	II	III	IV	χ^2 (*df*)	ES[2]
Greater prairie chicken	Utilitarian[a]	56.0	15.7	3.3	24.9	65.114 (9)**	.155
	Mutualist[b]	65.9	13.5	3.1	17.5		
	Pluralist[b]	65.3	18.0	5.0	11.7		
	Distanced[a]	49.0	15.4	7.3	28.3		
Blue-spotted salamander	Utilitarian[a]	31.9	14.4	17.6	36.1	83.254 (9)**	.168
	Mutualist[b]	48.9	17.4	9.0	24.8		
	Pluralist[b]	38.2	18.9	19.8	23.0		
	Distanced[a]	30.8	17.5	18.9	32.7		
Barn owl	Utilitarian[a]	59.0	20.7	3.5	16.9	97.883 (9)**	.196
	Mutualist[b]	77.1	11.7	2.1	9.0		
	Pluralist[b]	70.3	16.2	4.1	9.5		
	Distanced[a]	55.9	15.9	4.4	23.8		
Bobcat	Utilitarian[a, c]	15.9	32.0	41.9	10.2	102.813 (9)**	.172
	Mutualist[b]	27.4	41.2	22.4	9.0		
	Pluralist[a, b]	27.5	26.1	36.5	9.9		
	Distanced[a, c]	18.4	26.9	40.6	14.1		
Wood turtle	Utilitarian[a]	47.0	15.1	5.5	32.4	82.197 (9)**	.193
	Mutualist[b]	67.5	13.1	2.6	16.8		
	Pluralist[b]	61.8	14.1	4.5	19.5		
	Distanced[a]	49.1	14.3	4.9	31.7		

[1]Each subscript letter denotes a subset of wildlife value orientations that differ from each other in their means at the $p < 0.05$ level, according to a Tamhane's post hoc test used to address a violation of the equal-variances assumption in analysis of variance (ANOVA), determined by Levene's test of homogeneity.
[2]ES denotes effect size as Eta, used to compare a categorical variable with an interval variable.

CHAPTER III. STAKEHOLDER VALUATION OF STATE AGENCY CREDIBILITY

A paper to be submitted to the *Human Dimensions of Wildlife*

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ABSTRACT

The North American model of Wildlife Conservation comprises 7 guiding principles for wildlife management in the United States. One of the central tenants of the North America model is that wildlife is a public trust good, and as such it should be managed in the interest of the public. Although, wildlife management has historically focused on the needs and wants of the consumptive users of wildlife, hunters and anglers, upon whom much of the funding for conservation currently relies, as new non-traditional funding sources for wildlife management are identified and implemented it is increasingly important for management agencies to understand the full range and diversity of stakeholders. We surveyed 5,400 Iowans and 611 Iowa Department of Natural Resources employees with a standard mail survey and an online survey, receiving 43.5% and 49.4%, respectively. We compared the wildlife value orientations (WVOs) of stakeholders and agency staff to identify differences that may influence the ability of the IDNR to manage wildlife equitably for all stakeholders. By addressing these discrepancies we can hope to improve communication within the IDNR and between the IDNR and the public, and as a result increase the public's trust in the management agency. We utilized a credibility rating involving four components: trust, competence,

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accessibility, and influence to assess public opinion and the IDNR staff's prediction of public responses. By identifying the public's perceived credibility of the IDNR as well as the IDNR employees' perceptions of public responses we can demonstrate that the IDNR holds a belief that they are not credible in the eyes of the public, likely due to their interactions with small, but vocal, discounted interest groups.

Key words: trust, wildlife, value orientations, credibility, state agency, values

INTRODUCTION

Conservation in the United States has long followed the seven tenants of the North American model of Wildlife Conservation (Arizona Game and Fish Department, 2013). Under this framework one of the key premises is that wildlife is to be managed as a public trust resource (Geist et al., 2001). State agencies are tasked with managing wildlife in the interests of many diverse stakeholder groups. Historically, the most influential of these interest groups have been hunters and anglers. Their level of influence has been attributed to the reliance on hunting and fishing license sales as well as excise taxes on hunting and fishing equipment to fund conservation in the United States (Patterson et al., 2003; Nie, 2004; Anderson & Loomis, 2006). Management for game species has and continues to provide benefits to non-games species; however, as new funding sources for conservation are identified and utilized, agency staff will need to be accountable to a larger more diverse constituency (Franklin & Reis 1996).

Human dimensions research has proven to be an effective tool for understanding the opinions of a variety of stakeholders and has even been used to compare attitudes of wildlife managers to those of the public (Fritzell et al. 1995, Chase et al. 2000, Koval &

Mertig 2004, Casey et al. 2005, Jonker et al. 2006). Comparisons of the opinions of wildlife managers with those of the public have revealed differences in their attitudes toward management techniques (Messmer et al. 1997, Lafon et al. 2003), demographic characteristics (Koval and Mertig 2004), and levels of participation in wildlife-related activities (Phillips et al. 1998). Peyton and Langenau (1985) and Gigliotti (2003) investigated deeper-level differences between state agency employees and the public by comparing their wildlife value orientations (WVOs). WVOs are associated with beliefs, attitudes, and behaviors regarding wildlife (Teel et al. 2005). Understanding these fundamental differences between state agency employees and the public will elucidate how representative agencies are of the diversity of stakeholders they serve and may provide insights that will help agency personnel in managing wildlife in the interest of all stakeholders.

Similarities in WVOs between agency personnel and the public could be a source for developing trust between the two groups (Cvetkovich & Winter, 2003; Winter & Cvetkovich, 2003). Winter et al. (2004) showed that trust in a government's ability may be related more strongly to issues of agency competence than to value orientations. Hovland, Janis, & Kelley (1953) identified trustworthiness and expertness as the two components of credibility. Fritzell et al. (1995) suggested that a combination of these two components, trust and competence or expertise, can be used to assess an agency's credibility in the eyes of its stakeholders. In this paper, we present a means for measuring credibility of a state agency using a scale that includes the two components identified by Fritzell et al., but also includes two additional components, referred to as "accessibility" and "validation," to address contemporary issues facing wildlife managers, such as the

increase in public involvement in wildlife management (Chase et al., 2000). Items pertaining to these components, accessibility and validation, of our agency credibility scale measure the degree to which respondents feel that 1) they can contact the state natural resource agency with any concerns and 2) their opinion will be heard and considered by the agency, respectively.

We evaluate differences between the state agency and the public that may reveal how well the state agency can predict public responses to a number of wildlife related issues. We compared agency employees and the public by their socio-demographic characteristics, their participation in wildlife related recreation and the acceptability of select uses of wildlife, the animal types they consider to be wildlife, and their WVOs. We also compared state agency personnel's sentiments with the public's to identify how state agency employees' beliefs of public perceptions differ from those reported by the public. We identified areas of dissonance between the perceptions of state agency personnel and the public, which may serve to identify potential areas of future conflicts between the agency and its stakeholders.

METHODS

Sampling procedures

We surveyed the 611 employees of the Conservation and Recreation Division of the Iowa Department of Natural Resources. The Division includes six bureaus: 1) Land and Waters, 2) Fisheries, 3) Wildlife, 4) Forestry, 5) Parks and Preserves, and 6) Law Enforcement. We used Survey Monkey® to create and administer an online survey to IDNR staff because we had email addresses for all members of this closed population

(Dillman et al., 2009). IDNR employees were sent an email from their bureau chief, asking them to participate in this study. Public data were collected using a mail survey following Dillman et al.'s (2009) tailored design method. Methodological details of this survey can be found in Chapter 1 of this thesis.

Measurement

Individuals were classified into one of four WVOs (Utilitarian, Pluralist, Mutualist, and Distanced) according to the methods of Teel and Manfredo (2010); however, we employed a reduced set of items (n = 14), from those reported by Teel and Manfredo and confirmed the reliability of the items at the belief dimension level (Table 1). We used dichotomous (yes = 1 or no = 0) scales to query respondents on their interactions with wildlife, perceived acceptable uses of wildlife, and animal types that fall under their definition of wildlife. We used fix response options to collect data on gender, education, area raised as a youth and current residence.

We measured agency credibility with a composite scale consisting of items representing each of our four core components (trust, expertise, accessibility, and validation) and four species specific questions that address expertise related to issues faced by Iowa's wildlife managers. A five-point Likert scale (strongly disagree to strongly agree) was used to indicate respondents' levels of agreement with agency credibility items (Table 2). IDNR employees were asked to predict the public's responses to agency credibility items and preferences regarding the potential restoration of selected species of greatest conservation need (SGCN). SGCN were selected for inclusion in the questionnaire based on input from the IDNR and also to represent a variety of taxa.

Analysis

We conducted reliability analysis in SPSS to determine internal consistency of the agency credibility scale. We used a composite score of agency credibility items to determine whether a respondent believed the IDNR to be credible, and categorized respondents into one of three groups based on their beliefs: Credible, Not credible, or Neutral, which indicated that they did not have a well-defined opinion regarding agency credibility. Values of -2 (strong disagree) to +2 (strongly agree) were assigned to the possible responses for all credibility related questions and an "agency credibility" score was then calculated using the mean of the eight items. Individuals were only assigned to a category if they responded to all 8 measures of the credibility scale. They were assigned to Credible and Not credible categories if the mean of their responses to all scale items was greater than 0.5 or less than -0.5, respectively. This number was chosen because it indicates that at least half of their responses were in the direction of agreement or disagreement.

We compared IDNR employees and the public on socio-demographic characteristics, interactions with wildlife, WVOs, uses of wildlife deemed acceptable and the types of animals they consider to be wildlife using Chi-squared tests and analysis of variance (ANOVA) procedures. We report effect size to account for the increased likelihood of finding statistical significance with a large sample size (Cohen, 1988; Gliner et al., 2001). We compared IDNR employees' predictions of public responses with reported public responses to questions regarding Iowa's deer population, preferences for the restoration of species of greatest conservation need and perceived agency credibility

using Chi-squared tests. An alpha level of $p < 0.05$ was used to designate statistical significance for all tests.

RESULTS

We invited 611 IDNR employees from the Conservation and Recreation Division of the IDNR to participate in our survey and received responses from 302, resulting in a response rate of 49.4% overall. Bureaus varied in their response rates (Table 3), but we did not detect significant differences in the distribution of WVOs among bureaus (Table 4). Thus, IDNR employee responses were pooled and all comparisons between the public and IDNR employees were conducted at the division level.

IDNR employees differ from the public on five of six socio-demographic characteristics tested, four of which showed moderate effect sizes: pet ownership, gender, current area of residence, and highest level of education attained. IDNR employees are more likely to be male, own pets, live in a rural area, and have completed a college degree (Table 5). IDNR employees and the public differed in their WVOs (Table 6). IDNR employees are more likely to hold Utilitarian WVOs, which indicates that they are more likely to accept management actions that result in death to wildlife (Teel et al., 2005). IDNR employees are more likely to be Pluralistic, exhibiting both Utilitarian and Mutualistic value orientations and less likely to exclusively hold Mutualistic WVOs. IDNR employees are less likely to be classified as Distanced than the public (Table 6).

We detected differences between IDNR employees and the public in regards to their reported interactions with wildlife. IDNR employees are more likely to participate in hunting, fishing, providing habitat for wildlife, watching or photographing wildlife,

and feeding backyard wildlife and they are less likely to indicate that they "prefer not to interact with wildlife." Hunting and fishing participation rate differences had large effect sizes, while the effect size was moderate for providing habitat for wildlife (Table 7). IDNR employees and the public differed in the uses of wildlife they deemed to be acceptable. IDNR employees were more likely to consider any use of wildlife more acceptable than the public. Clothing and taxidermy showed large effect sizes, while food and educational purposes showed weak effect sizes. All other effect sizes were negligible (Table 8). There were differences in the animal types considered as wildlife by IDNR employees and the public. IDNR employees identified ten of the twelve animal types, excluding buffalo/bison and deer, as wildlife more often than the public and identified all twelve species presented as wildlife more frequently than the public (Table 9).

Comparisons of IDNR employees' predictions of public responses with reported public responses revealed other differences. IDNR employees' predictions of the public's opinion regarding the deer population were different than that reported by the public in two of three choices. However, IDNR employees accurately predicted that the majority of the public believes the deer population to be too high. Both predictions of public opinion and reported public opinion differed from that of IDNR employees (Table 10).

IDNR employees were able to accurately predict public response regarding preference for restoration of one of the five listed SGCN, the barn owl (Table 11). IDNR employees did not accurately predict public responses to the items regarding agency credibility; differences between mean scale scores of predicted public responses and actual public responses showed a large effect size (Table 12). Comparisons of the agency

credibility groups with socio-demographic characteristics revealed differences in gender and urban-rural assignment; though both had negligible effect sizes (Table 13).

DISCUSSION

This investigation of differences in WVOs held by employees of a state natural resource agency with those held by the public and how these differences may affect state agency employees' abilities to predict public responses provides a starting point from which to enhance representation of public WVOs into Iowa's wildlife management. However, results of the public survey and that of the IDNR staff should not be taken to represent all stakeholders. Generalizations should be limited to Caucasians as the number of respondents from other racial and ethnic groups was too small to make inferences.

Though IDNR employees and the public differ in socio-demographic characteristics, some of these (i.e. highest level of education) may be attributed to the employment requirements of the IDNR. Other differences cannot be attributed to employment requirements, such as gender, but may explain further differences between the IDNR and the public. Our results support previous findings that employees of wildlife management agencies tend to participate in consumptive methods of wildlife recreation at higher rates than the general public (Organ and Fritzell, 2000). The Conservation and Recreation Division of the IDNR is mostly composed of men, which may be one of the overriding differences in many of our comparisons with the public. Angus (1995) reported that hunting and fishing were the two most important influences for men in pursuing a career in natural resources. Sanborn and Schmidt (1995) suggest that heightened frequency of participation in these activities may influence management

decisions, in that those that participate in them have a vested interest in maintaining the ability to continue that action. Other previous research has shown that gender is moderately associated with participation in wildlife related activities, attitudes toward wildlife, and WVOs (Bright et al., 2000; Vaske et al., 2001; Zinn & Pierce, 2002; Dougherty et al., 2003; Teel et al., 2005). This study showed a greater participation by IDNR employees in consumptive wildlife recreation, but also showed a discrepancy in the WVOs of IDNR employees and the public.

As compared to the public, a greater proportion of the IDNR employees hold Utilitarian values toward wildlife; this is consistent with the findings of Peyton and Langenau (1985) in what they refer to as Dominionistic attitudes or mastery over wildlife. These findings are consistent with what managers are tasked with, manipulating natural systems to maintain wildlife populations within management objectives. The prevalence of these WVOs within the IDNR is illustrative of the tendency for humans to associate with those whom are similar to them, a phenomenon known as homophily (McPherson, Smith-Lovin, & Cook, 2001). While this often builds relationships with like-minded individuals, the danger of alienating those whom are not similar is great (McPherson et al., 2001). Agencies must be aware of this as they work with stakeholders with views or WVOs different from their own and as agency staff itself diversifies (Organ & Fritzell, 2000).

Furthermore, previous research has shown that individuals are more trusting of those whom they perceive to share their values (Vaske et al., 2007; Cvetkovich and Winter, 2003; Winter and Cvetkovich, 2003), which may influence their willingness to interact with those individuals. While discrepancies in values between the IDNR

employees and the public may indicate potential problems according to the salient value similarity and homophily principles, the absence of differences in the perceived creditability of the IDNR among the WVOs suggests that the public may not perceive this overrepresentation of Utilitarian value orientations within the IDNR or that the IDNR employees are interacting effectively with a variety of stakeholder groups. This may be related to the focus of our credibility questions being the entirety of the IDNR, not just the Divisions of Conservation and Recreation or that the IDNR employees sampled are not representative of the IDNR as a whole and that more diverse WVOs can be found in other Divisions. Though the IDNR currently benefits from a high level of perceived credibility from the public, ensuring continuation of this in the future requires mindfulness on the part of the IDNR.

We identified stark discrepancies between the public's evaluation of agency credibility and IDNR employees' predictions of public perceptions of agency credibility. We attribute the IDNR employees' belief that the public does not see the agency as credible to agency staff interactions with a small, but vocal, number of discontented stakeholders. Maintaining the belief that the public does not deem the agency credible may have implications regarding the willingness of agency staff to engage the public in discourse. Baumeister and Bratslavsky (2001) suggested that the self is motivated more to avoid what it perceives to be bad and that individuals remember bad experiences more than good ones, which may lead them to perceive them as more abundant. Davenport, Leahy, Anderson, and Jakes (2007) reported that stakeholders attributed their trust in the Forest Service to the personnel with whom they had developed relationships. Under these premises, one can see how negative experiences can quickly corrode an individual's

willingness to interact with stakeholders that do not share their values. Actions taken by state agency staff to avoid contentious situations with stakeholders can create a feedback loop that may quicken the desiccation of what trust may have existed.

As state and national population demographics continue to change, becoming more urban and more diverse, and shifting away from traditional WVOs (Teel et al., 2005), management agencies will need to be vigilant of changing stakeholder WVOs and incorporate these diverse views in their management decisions. If not, agencies risk the loss of credibility in their management actions and increase the potential for recreancy (Freudenburg, 1993). Loss of trust could lead to more difficulty in implementing important management actions. Although the public holds views and opinions not entirely in line with state agency employees, ultimately they trust the agency to manage wildlife in their best interest. This is consistent with Reiter et al.'s (1999) findings that though the public wants a greater role in developing wildlife policy, they respect the judgment of wildlife professionals. This type of information can not only serve as a morale boost for agency personnel, but refutes the belief that the public does not trust the agency, creating a platform that promotes positive interactions between the IDNR and the public. Trust is one of four components we identified as being necessary to identify agency credibility now and in the future as public involvement in wildlife management increases. The three other components are competency as evaluated by the stakeholders, accessibility of the IDNR to the public, and the public's perception of the validation of their input in decision-making.

An important aspect of preserving the public's trust and their view of the IDNR as credible is ensuring open lines of communication between IDNR staff and the public.

This will be especially important as stakeholder' desires for a greater role in wildlife management decision-making increase. As public involvement changes, so too must the evaluation of the state agency's effectiveness in serving the public. Our additions to the assessment of agency credibility, "accessibility" and "validation," evaluate the public's perception of their ability to interact with IDNR staff and participate in the decision-making process. Inclusion of these components in our definition of credibility demonstrates recognition of the increasing prevalence of stakeholder involvement and represents proactive actions to account for these impending changes. Monitoring these components over time will allow the IDNR to evaluate changes in the public's perception of the IDNR's incorporation of their input in decision making and allow them to assess changes in perceived credibility as a function of changes in public trust in the IDNR, perceived competence of the IDNR, accessibility of state agency employees, and perceived validation of public input.

Though the public's ability to provide input is important for maintaining agency credibility with the public, state agencies are also interested in sharing information with the public. An area for further investigation is the effectiveness of the messages from the IDNR regarding wildlife and related issues in Iowa and the differences in the intended message and the interpreted message. Specifically, we detected differences in the types of animals that are considered wildlife by IDNR employees and the public. The Merriam-Webster dictionary (2013) defines wildlife as "living things and especially mammals, birds, and fishes that are neither human nor domesticated." Iowa law defines wildlife as any species of wild mammal, fish, bird, reptile and amphibian and the Iowa Wildlife Action Plan extends that definition to include "butterflies, land snails, fresh water

mussels, dragonflies, and damselflies" (Zohrer, 2005). The differences in the animal types considered as wildlife by the IDNR employees and the public suggests that measures are needed to ensure that the meaning of the IDNR's messages regarding wildlife are conveyed and understood as intended. The term wildlife does not seem to evoke images of mussels or snails for the public as often as it does snakes or fish, and even less than mammals and birds. It is important that these discrepancies are considered when designing messages about conservation and the benefits it has for wildlife. Though it is unclear what, if not wildlife, these animal types are considered, these results suggest that the public may value theses animal types in different ways. This has implications regarding the restoration of SGCN that may be similar to these animal types and indicates that increased effort may be needed to garner public support for restoration activities. These findings should be considered as outreach materials and programs are designed for use with the public.

MANAGEMENT RECOMMENDATIONS

Our presentation of agency credibility incorporates trust as one of four core components in evaluating an agency's relationship with diverse stakeholders. As stakeholder values continue to change, and the public's interest in being involved in decision-making grows, it will be essential to communicate effectively with all stakeholders. We have addressed this by identifying and incorporating two other components that evaluate the public's perceived ability to communicate with the state agency and their impressions regarding whether their opinions are valued by the agency. Our approach to assessing agency credibility would provide useful information to any state agency. The core scale items can accommodate any state's use and additional

questions regarding expertise can be tailored to include measurements specific to a state's needs. We included four additional items to gauge perceived expertise regarding mountain lions and deer, which present opportunities for conflict among Iowa stakeholder groups. However, reliability analysis of the four core items of our scale (Cronbach's alpha, 0.89) indicates that they have high internal consistency amongst themselves. Further investigations of the relationship between stakeholder participation and maintaining trust in the state agency, ultimately determining the agency's credibility in the eyes of its stakeholders, are needed.

As efforts to identify stakeholders by their WVOs increase, we recommend that investigators consider enhancing their work by also evaluating WVOs of state natural resource agency employees. Long term studies investigating the WVOs of agency staff may illustrate dissonance between agency staff and abilities of these staff to accurately read their stakeholders. Where once it was commonplace and arguably required that state agencies consider exclusively the wants and needs of hunters and anglers, it is now increasingly important for wildlife agencies to consider the opinions of all stakeholders in wildlife management. This information could help ensure that the agencies are managing wildlife as a public trust good and effectively serving all stakeholders.

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TABLES

Table 1. Reliability results from SPSS for wildlife value orientations scale items.

Wildlife value orientation and basic belief dimension	*Cronbach's alpha*
Domination	**0.731**
Appropriate use beliefs	0.634
Hunting beliefs	0.758
Mutualism	**0.850**
Social affiliation beliefs	0.779
Caring beliefs	0.727

Table 2. Reliability analysis results for agency credibility scale.

Agency Credibility	*Cronbach's alpha if item deleted*[1]
All items	*0.915*
I am confident the IDNR has the necessary information to make adequate decisions regarding wildlife in Iowa.[2]	0.904
I am confident that I can contact the IDNR to voice my concerns regarding wildlife in Iowa.[2]	0.903
I am confident that the IDNR will listen to my concerns about wildlife in Iowa.[2]	0.903
I trust the IDNR to manage wildlife in the best interest of Iowans[2]	0.898
The IDNR understands the risks to the public associated with having deer in Iowa.	0.906
The IDNR has the expertise to develop appropriate response strategies for deer in Iowa.	0.900
The IDNR understands the risks to the public associated with having mountain lions in Iowa.	0.911
The IDNR has the expertise to develop appropriate response strategies for mountain lions in Iowa.	0.908

[1] Reliability analysis showed a Cronbach's alpha of 0.915 for all variables.
[2] Denotes core credibility questions; reliability of the core credibility items alone was 0.89

Table 3. Distribution of Urban and Rural sampling efforts in each of Iowa's 9 USDA regions, urban and rural response rates, and overall response rate.

IDNR Bureau	*Solicited*	*Responses*	*Response Rate*
Land and Waters	15	6	40.0%
Fisheries	116	67	57.8%
Wildlife	166	95	57.2%
Forestry	69	31	44.9%
Parks and Preserves	89	51	57.3%
Law Enforcement	156	52	33.3%
Total	611	302	49.4%

Table 4. Wildlife value orientation (WVO) distributions across IDNR bureaus.

	Wildlife value orientation type[1]					
Variable	*Utilitarian*	*Mutualist*	*Pluralist*	*Distanced*	χ^2 (*df*)	*ES*[2]
IDNR Bureau					23.493 (15)	0.16
Land and Waters	33.30	16.70	0.00	50.00		
Fisheries	63.60	6.10	13.60	16.70		
Wildlife	55.80	10.50	25.30	8.40		
Forestry	48.40	16.10	12.90	22.60		
Parks and Preserves	43.10	19.60	17.60	19.60		
Law Enforcement	59.60	9.60	13.50	17.30		

[1]*Numbers denote overall percentages obtained from IDNR survey data*
[2]*ES denotes effect size as Cramer's V, used to compare two categorical variables*

Table 5. Comparison of IDNR employees and public respondents on socio-demographic characteristics.

Variable	*IDNR*[1]	*Public*[1]	χ^2 or *F* (*df*)	*ES*[2]
Age ($\bar{X}$)	44.01	47.11	7.721 (1, 2610)*	0.05
Pet Ownership	81.80	49.70	110.831 (1)**	0.20
Gender (%)			103.125 (3)**	0.23
female	15.20	50.80		
male	84.80	49.20		
Area raised as a youth (%)[3]			1.722 (2)	0.03
rural	50.20	51.80		
suburban	42.70	39.20		
urban	7.10	8.90		
Current area of residence (%)[3]			122.284 (2)**	0.27
rural	56.30	24.60		
suburban	38.50	52.30		
urban	5.20	23.10		
Highest level of education (%)			302.799 (4)**	0.34
Less than high school	0.00	4.00		
High school diploma or equivalent	1.70	29.50		
Some college or technical school	4.70	22.30		
College or technical school	75.70	29.00		
Graduate or professional school	17.90	15.20		

[1]*Numbers denote overall percentages obtained from state-level data.*

[2]*ES denotes effect size as either Cramer's V, to compare two categorical variables or Eta to compare a categorical variable with an interval variable.*

[3] *Variable recoded – "rural" combines "rural on a farm" and "rural non-farm", "suburban" represents "suburban", and "urban" combines "small town" and "city"*

[*]*Denotes significance at* $p \leq 0.05$.

** *Denotes significance at* $p \leq 0.001$.

Table 6. Comparison of IDNR employees and public respondents by WVOs.

Variable	*IDNR*[1]	*Public*[1]	χ^2 (*df*)	*ES*[2]
Wildlife value orientation			136.478 (1)**	0.21
Utilitarian	54.80	31.30		
Mutualist	11.60	31.40		
Pluralist	17.60	10.40		
Distanced	15.90	26.90		

[1]*Numbers denote overall percentages obtained from state-level data.*

[2]*ES denotes effect size as either Cramer's V, to compare two categorical variables.*

*** Denotes significance at $p \leq 0.001$.*

Table 7. Comparison of IDNR employees and public respondents on interactions with wildlife.

Variable	*IDNR*	*Public*	χ^2 or *F* (*df*)	ES^2
Hunting	83.10	8.00	1102.427 (1)**	0.64
Fishing	90.70	34.70	347.148 (1)**	0.36
Watch or photograph wildlife	83.40	66.90	34.186 (1)**	0.11
Provide habitat for wildlife	68.90	28.00	203.235 (1)**	0.28
Feed backyard wildlife	61.90	53.00	8.623 (1)*	0.06
Prefer not to interact with wildlife	0.70	13.60	42.217 (1)**	0.13

[1]*Numbers denote overall percentages obtained from state-level data.*

[2]*ES denotes effect size as either Cramer's V, to compare two categorical variables.*

[*]*Denotes significance at $p \leq 0.05$.*

*** Denotes significance at $p \leq 0.001$.*

Table 8. Comparison of wildlife value orientation type acceptability of uses of wildlife.

Variable	*IDNR*[1]	*Public*[1]	χ^2 (*df*)	*ES*[2]
Clothing (%)	84.40	26.90	399.894 (1)**	0.39
Taxidermy (%)	83.40	26.00	402.819 (1)**	0.39
Food (%)	99.00	80.60	63.331 (1)**	0.15
Sale for profit (%)	9.90	6.40	5.199 (1)*	0.04
Alternative medicines (%)	40.40	30.00	13.576 (1)**	0.07
None of the above (%)	0.30	7.30	21.529 (1)**	0.09
Pet (%)	8.30	13.40	6.273 (1)*	0.05
Educational purposes (%)	91.70	67.70	74.144 (1)**	0.17

[1]*Numbers denote overall percentages obtained from state-level data.*

[2]*ES denotes effect size as Cramer's V, used to compare two categorical variables.*

[*]*Denotes significance at $p \leq 0.05$.*

*** Denotes significance at $p \leq 0.001$.*

Table 9. Comparison of IDNR employees and the public by inclusion of animal type in definition of wildlife.

Variable	*IDNR*[1]	*Public*[1]	χ^2 (*df*)	*ES*[2]
Deer (%)	99.30	98.20	2.013 (1)	0.03
Coyotes (%)	99.00	95.20	9.246 (1)*	0.06
Birds (%)	98.30	89.00	26.120 (1)**	0.1
Buffalo/Bison (%)	87.10	87.60	0.056 (1)	0.01
Fish (%)	86.40	78.60	10.083 (1)*	0.06
Snakes (%)	93.70	80.20	32.644 (1)**	0.11
Turtles (%)	93.00	75.30	48.038 (1)**	0.13
Frogs (%)	92.10	73.50	49.955 (1)**	0.14
Bees (%)	76.50	63.40	20.176 (1)**	0.09
Snails (%)	82.50	58.70	63.618 (1)**	0.15
Mussels (%)	82.80	54.70	86.672 (1)**	0.18
Mosquitos (%)	61.60	43.10	37.105 (1)**	0.12
All selected (%)	54.00	36.90	33.246 (2)**	0.11

[1]*Numbers denote overall percentages obtained from state-level data.*
[2]*ES denotes effect size as Cramer's V, used to compare two categorical variables.*
[*]*Denotes significance at* $p \leq 0.05$.
** *Denotes significance at* $p \leq 0.001$.

Table 10. Comparison of IDNR employees perceived public opinions and actual public respondents' opinions about the number of deer in Iowa.

Variable	*IDNR employees*	*IDNR's perceived Public response*	*Public*[1]	χ^2	*ES*[2]
Iowa's deer population is…				441.730 (4)**	0.36
Too low or much too low	31.00[a]	17.80[b]	4.20[c]		
About right	58.80[a]	19.20[b]	34.90[c]		
Too high or much too high	10.20[a]	62.90[b]	60.90[b]		

[1]*Numbers denote overall percentages obtained from IDNR and public survey data. Each subscript letter denotes groups whose column proportions do not differ significantly from each other at the $p < 0.05$level.*

[2]*ES denotes effect size as Eta, used to compare a categorical variable with an interval variable.*

*** Denotes significance at $p \leq 0.001$.*

Table 11. Comparison of IDNR employees perceived public responses and actual public responses by agency credibility

Variable	*IDNR employees*	*IDNR's perceived Public response*	*Public*	χ^2	ES^2
Agency Credibility				386.791 (4)**	0.36
Credible	78.10[a]	18.10[b]	62.90[c]		
Neutral	16.70[a]	39.20[b]	28.20[c]		
Not credible	5.20[a]	42.70[b]	8.90[a]		

[1]*Numbers denote overall percentages obtained from IDNR and public survey data***.** *Each subscript letter denotes groups whose column proportions do not differ significantly from each other at the $p < 0.05$level.*
[2]*ES denotes effect size as Cramer's V, used to compare two categorical variables*
*** Denotes significance at $p \leq 0.001$.*

Table 12. Comparison of perceived state agency credibility by gender, urban-rural assignment, participation in hunting and angling, and WVOs.

Variable[1]	*Credible*	*Neutral*	*Not Credible*	χ^2 or *F* (*df*)	*ES*[2]
Gender (%)				10.707 (3)*	0.07
female	54.10	29.80	13.40		
male	60.50	25.50	11.10		
Urban-rural assignment				7.947 (3)*	0.06
rural	55.30	30.80	10.80		
urban	58.10	26.30	13.10		
Hunting				1.764 (3)	0.03
Hunters	59.80	28.10	12.40		
Non-hunters	56.80	26.50	10.10		
Fishing				2.167 (3)	0.03
Anglers	57.20	27.20	12.10		
Non-anglers	56.90	28.40	12.20		
Wildlife value orientation				4.758 (9)	0.03
Utilitarian	56.60	27.10	13.60		
Mutualist	55.90	29.00	11.70		
Pluralist	61.20	25.00	12.10		
Distanced	57.50	27.40	12.20		

[1]*Numbers denote overall percentages obtained from public survey data*
[2]*ES denotes effect size as either Cramer's V, used to compare two categorical variables.*

Table 13. Comparison of IDNR employee perceived public preference and actual public respondents' preference for restoration of SGCN

I.) "I would enjoy having this species around and would not worry about any problems they may cause"
II.) "I could enjoy a few individuals of this species, but I would worry about them causing problems"
III.) "I would think of this species as a pest and would not want any in my area"
IV.) "It would not matter to me whether this species was restored in my area"

		Preference for Restoration[1]					
SGCN	Value Type[1]	I	II	III	IV	χ^2 (*df*)	ES[2]
Greater prairie chicken	Perceived public responses	73.20	6.00	1.70	16.60	34.372 (4)**	0.11
	Actual Public	57.60	14.90	4.10	21.50		
Blue-spotted salamander	Perceived public responses	42.40	5.60	1.30	47.70	90.128 (4)**	0.18
	Actual Public	35.20	15.90	14.90	29.40		
Barn owl	Perceived public responses	58.30	15.20	4.30	19.50	4.446 (4)	0.04
	Actual Public	62.60	16.10	3.20	15.70		
Bobcat	Perceived public responses	17.20	54.00	22.50	3.30	74.385 (4)**	0.17
	Actual Public	20.70	31.10	35.50	11.00		
Wood turtle	Perceived public responses	45.70	3.60	0.70	47.40	76.305 (4)**	0.17
	Actual Public	52.40	13.70	4.50	26.10		

[1]*Numbers denote overall percentages obtained from IDNR and public survey data*
[2]*ES denotes effect size as Cramer's V, used to compare two categorical variables.*
*** Denotes significance at $p \leq 0.001$.*

CHAPTER IV. ASSESSMENT OF THE PUBLIC'S ATTITUDES TOWARD AND TOLERANCE OF MOUNTAIN LIONS IN IOWA.

A paper to be submitted to the *Human Dimensions of Wildlife*

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ABSTRACT

Confirmed cases of mountain lions have increased throughout the Midwest, in areas where mountain lions were previously extirpated. Though research regarding public attitudes toward mountain lions exists, it has often been conducted in areas with already established mountain populations. We surveyed 5,400 Iowans regarding their wildlife value orientations, as well as their attitudes toward and tolerance of having mountain lions in Iowa. We used cluster analysis procedures in SPSS to determine similarly tolerant segments of the population, finding three we identified as Tolerant, Semi-tolerant, and the Intolerant. Comparisons of these resulting cluster showed that an individual's attitudes toward mountain lions was strongly associated with their behavioral intentions regarding responses to potential conflict associated with the presence of mountain lions in Iowa. As is suggested in the cognitive hierarchy model, we found that value orientations also showed moderate levels of association to ones' behavioral intensions. This information could be useful to wildlife managers in states with potentially recolonizing large predators, and aid them in policy-related decision-making as they determine appropriate response strategies for these animals.

Key words: tolerance, mountain lions, cougar, recolonize, large predator, Midwest

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INTRODUCTION

Mountain lions (*Puma concolor*) have shown an increased presence in the Midwest in recent years. Increases in reported sightings as well as confirmed cases of mountain lions have occurred in areas where mountain lions were previously extirpated (Cougar Network, 2013). It is believed that juvenile males are dispersing from Western populations due to increased competition for resources and avoidance of inbreeding as populations approach ecological carrying capacity (Thompson & Jenks, 2005; Thompson, Fecske, Jenks, & Jarding, 2009). Iowa has experienced a rise in the number of reported mountain lion sightings and confirmed presences within the state and along its borders with neighboring states that do have extant populations (Cougar Network, 2013). LaRue and Nielsen (2008) suggest that Iowa has suitable habitat for mountain lion dispersal although it remains to be seen whether there is suitable habitat for long-term residence. Sweanor et al. (2000) found that cougars cross wide expanses (> 50km) of inhospitable habitat (i.e. agricultural lands) generally in < 7 days; greater than 80% of Iowa's landscape is in row crop agriculture (Hofstrand, 2010).

Previous research has suggested that large carnivores require favorable management policy for their conservation (Linnell et al., 2001). Currently mountain lions have no legal status in the Iowa Code and therefore are afforded no protection by Iowa Law. The Iowa Department of Natural Resources (IDNR) requested consideration of legislation that would classify mountain lions as furbearers and afford them minimal protections while maintaining that anyone with special concerns (i.e., threatened livestock) would be allowed to destroy an animal (Evelsizer, 2012). The request did not pass the House. Similar legislation was introduced in the 2007 legislative session, but the

topic received no consideration (Evelsizer, 2012). Though the IDNR has no authority over managing this species, they have had to refute claims that they are stocking or introducing mountain lions into the state (Evelsizer, 2012).

The IDNR received >2,000 reports of mountain lions in Iowa since 2010 (Evelsizer, 2012); however, it is believed that >95% of are cases of misidentification (IDNR, 2010). Identifying public opinion in areas not known to support extant populations is made especially difficult due to media sensationalism and the validity of sightings, thus complicating the status of cougars (Cardoza & Langlois, 2002). In a publication about mountain lions, (Iowa Department of Natural Resources, 2010), intended to disseminate factual information about mountain lions preemptively, the IDNR identified the need for better understanding of the "constraints and limits of the tolerance of human kind" (Evelsizer, 2012) regarding mountain lions in Iowa. Though research regarding attitudes toward mountain lions is extensive, most studies occur in areas where there are long established populations (Riley & Decker, 2000; Manfredo, Zinn, Sikorowski, & Jones, 1998; Wolch, Gullo, & Lassiter, 1997). We investigated human attitudes toward, and tolerance of, mountain lions potentially recolonizing a habitat in which they have not been present for > 100 years (Davenport et al., 2010).

Understanding the public's attitudes toward mountain lions has been used by state agencies to develop management plans for the species (Casey et al., 2005), however some research suggests that measures of attitudes toward large predators alone are of limited value in wildlife management (Kleiven et al., 2004). In this paper we investigate the relationships between respondents' attitudes toward and tolerance, as indicated by behavioral intentions, of mountain lions in Iowa. Previous research has demonstrated

correlations between values, attitudes, and behaviors (Fulton et al., 1996; Homer and Kahle, 1998) and an upside down triangle has been used to show how these elements build upon one another (Figure 1).

To understand the tolerance of Iowans for mountain lion presence in the state we focused on impacts mountain lions could have that may alter the publics' attitudes toward and tolerance of these animals. Specifically, the possible negative impacts of a species' restoration have been linked to stakeholders' attitudes toward the species restoration (Bright & Manfredo, 1996; Pate et al., 1996). In their work regarding wolf reintroduction in New York, Enck and Brown (2002) found that most respondents were concerned about wolves killing pets and livestock and though infrequent, mountain lion attacks on humans have been documented (Beier, 1991). The objectives of this research were:

1) to identify Iowans' attitudes toward and tolerance of mountain lions;
2) to investigate the relationships between these attitudes and tolerances among different stakeholder groups, i.e., wildlife value orientations (WVOs); and
3) to discuss how this information can be used to develop management response plans for mountain lions in Iowa.

METHODS

We conducted 28 interviews (Guest et al., 2006) with patrons at two Iowa malls, the North Grand Mall in Ames, IA and the Jordan Creek Town Center in West Des Moines, IA, from December 19, 2011 to May 24, 2012 (IRB ID 11-533, 11/14/2011). These interviews helped determine salient issues and local vernacular regarding mountain lions in Iowa. Previous research has shown that mountain lions can pose a risk to pets, livestock, and people (Mansfield and Torres, 1994). Because of this we focused our interview questions on assessing individuals' perceptions of risk posed to their pets,

livestock, self or family from the presumed presence of mountain lions in Iowa. Results of the interviews guided the development of two scales used to measure attitudes toward and tolerance of mountain lions in Iowa. These scales were a part of a self-administered mail questionnaire intended to identify WVOs and attitudes toward Iowa's wildlife.

Measurements

Attitude scale

To determine stakeholder attitudes toward mountain lions in Iowa, we used a 10 item 5-point Likert-type scale (Vaske, 2008). Item responses ranged from -2 (strongly disagree) to +2 (strongly agree) and some items were reverse coded to maintain the same conceptual direction. Scale development was influenced by the results of our interviews and by previous research regarding attitudes toward mountain lions (Riley, 1998; Zinn and Manfredo, 1996).

Tolerance scale

We assessed individuals' tolerance to mountain lions in Iowa using a set of 10 statements of increasing severity (Christoffel, 2007; Peyton et al., 2001) that represent possible situations that could occur with mountain lions in the state. Respondents were asked to identify how they believed they would likely respond to each situation: *I would not do anything, I would ask someone what I should do, I would tell someone to move the mountain lion, I would tell someone to kill the mountain lion,* or *Unsure,* with associated values of 1-5 respectively. "Unsure" responses, coded as "5," were defined as missing values. Cluster analysis was used to determine groups with different tolerance levels for mountain lions in Iowa. Individuals with missing values for any response were excluded

from the cluster analysis. Reliability analysis of the 10 item tolerance scale yielded a Cronbach's alpha of 0.93 (Table 2).

Wildlife value orientations, demographics, and interactions with wildlife

Individuals were classified into one of four WVOs (Utilitarian, Pluralist, Mutualist, and Distanced) according to the methods of Teel and Manfredo (2009); however, we employed a reduced set of items, 14 questions, from those reported by Teel and Manfredo, which were used by Dietsch et al (2012) in their investigation of Arizonans, and confirmed the reliability of the items at the belief dimension level (Table 1). We used dichotomous (yes = 1 or no = 0) scales to query respondents on their interactions with wildlife. To collect data on gender, education, youth residence and current residence, we used fixed response options.

Data collection

Data were collected using a statewide self-administered mail survey (N=5,400), following Dillman et al.'s (2009) tailored design method; a response rate of 43.5% was attained. Non-response checks consisted of telephone non-response, comparisons of early and late respondents (Tyndall et al., 2011) and comparisons of respondents to state-level demographic data (U.S. Census Bureau, 2013) and participation in hunting (U.S. Department of the Interior et al., 2008). Given the findings of our non-response checks, data were weighted by gender, age, and participation in hunting to reflect state-level data. The full methodology of this survey can be found in Chapter 1 of this thesis.

Analysis

The attitude scale was a summated rating scale; responses were assigned values ranging from -2 to +2 on a 5-point Likert scale format. Individuals were classified as

exemplifying positive (≥ 3), neutral (> -3 and < 3), or negative ≤ -3) attitudes toward mountain lions in Iowa based on their summed scores.

We used cluster analysis to determine if respondents contained detectable groups with different tolerance levels for mountain lions. Clusters were created using the SPSS 2-step cluster procedure (IBM Corp, 2011). We specified 3 clusters for the clustering procedure. Other options used for clustering included log-likelihood distance measure (Peyton et al., 2007), Akaike's Information Criterion (AIC) and a noise handling treatment of 5% for outliers. Additionally we limited cluster features; tree branches were limited to a maximum of four and tree depth was restricted to a maximum of 3. Cluster analysis initially used all 10 items and subsequently the item with the least importance was removed from the cluster analysis until the remaining variables all showed high importance for clustering and three groups were maintained. Final clusters were formed around responses to 5 scale items (Table 2) and the cluster model resulted in an average silhouette of 0.5, indicating reasonable partitioning of the data (Kaufman and Rousseeuw, 1990).

One-way analysis of variance (ANOVA) tests were used to determine if tolerance groups differed in their attitudes toward mountain lions in Iowa, by age, and by how they interact with wildlife. Comparisons of WVOs and socio-demographic characteristics among the tolerance groups were conducted using chi-squared tests to determine levels of association, indicated by Cramer's V (Cohen, 1988).

RESULTS

Reliability analysis showed that the attitude scale with all 10 items had little internal consistency with the population sampled, as indicated by a Cronbach's alpha of

0.094. Removing 4 items improved the internal consistency of the scale to 0.85 (Table 1) and is supported from a theoretical perspective. Reliability analysis of the tolerance scale yielded a Cronbach's alpha of 0.93 and no items would increase the internal consistency if removed.

Cluster analysis resulted in four groups, referred to here as Tolerant, Semi-tolerant, and Intolerant and an outlier cluster that was not used in analyses comparing tolerance groups (n=114). The Tolerant group represents individuals who would respond to mountain lion conflict by seeking information about what actions should be taken, the Semi-tolerant group indicated they would tell someone to move the mountain lion in most situations, and the Intolerant group would tell someone to destroy the animal. Six-hundred-fifty-nine individuals could not be classified because of missing values in their scale item responses. Of the remaining respondents, 19.6% was classified as being Tolerant, 43% as Semi-tolerant, and 37.3% as Intolerant (Table 3). Significant differences were found at the region level, though the effect size was weak (Table 3). The clustering model used 5 variables to determine appropriate clusters, but significant differences on all tolerance scale items were detected among tolerance groups (Table 4). The predictor importance of 4 of the 5 variables was 1.0, indicating equal relative importance in cluster formation for those variables. The last variable was shown to be important for partitioning the data into three clusters rather than two.

Socio-demographics

Clusters differed in their socio-demographic characteristics. Intolerant individuals are younger, less likely to own pets, more likely to live in rural areas, less well educated, and have a lower income than both Semi-tolerant and Tolerant individuals. Semi-tolerant

and Tolerant individuals showed similar demographic characteristics, though tolerant individuals are older on average (Table 5).

Interactions with wildlife

Tolerant and Semi-Tolerant clusters showed no significant differences in the ways they interact with wildlife, with both groups participating in non-consumptive interactions with wildlife at a greater rate than Intolerant individuals. Tolerant and Semi-tolerant individuals are more likely to provide habitat for wildlife, feed backyard wildlife, and watch or photograph wildlife. The Semi-tolerant group showed higher levels of fishing participation and lower levels of hunting participation than the Intolerant group. The Intolerant cluster had a greater proportion of members indicate that they prefer not to interact with wildlife (Table 6).

Attitudes toward mountain lions

A majority of Iowans showed neutral or positive attitudes toward mountain lions in Iowa, with significant differences detected among regions in the state (Table 7). Tolerance clusters showed very high levels of association with attitudes toward mountain lions in Iowa, Cramer's V = 0.88 and Eta = 0.83 (Gliner et al., 2001). The mean attitude scores for the clusters were -5.28, -0.85, and 5.94 for the Intolerant, Semi-tolerant, and Tolerant clusters respectively (Table 8). Among the Intolerant group, >95% of its members had negative attitudes toward mountain lions in Iowa. A great majority of Semi-tolerant individuals, >89%, were classified as having Neutral attitudes toward wildlife, and a similar proportion, >89%, of Tolerant respondents were identified as having positive attitudes toward wildlife (Table 6).

Mountain lion population dynamics and support for furbearer status

Tolerance groups differed, with negligible effect sizes, in their estimates of the current mountain lion population in Iowa and how it has changed in the last 5 years, but with moderate effect sizes for how they would like to see it change in the next 5 years, and whether they would support the designation of mountain lions as furbearers (Table 9). Over one-third of all respondents indicated that they were unsure of the number of mountain lions in Iowa, and were unable to approximate it, though <3% indicated that they thought that there were no mountain lions in Iowa. Tolerance groups differed in their degree of uncertainty regarding Iowa's current mountain lion population, with >45% of Intolerant individuals responding "Don't Know", the most of all the groups. A majority of Tolerant respondents, > 40%, identified the mountain lion population to be between 1-20 individuals.

Over 55% of respondents indicated that they would like to see the mountain lion population stay the same or increase. Stark differences in how respondents would like to see the mountain lion population change in the next 5 years were noted among tolerance groups. More than 75% of the Intolerant respondents indicated that they would like to see the mountain lion population decrease in the next 5 years, while the majority of Semi-tolerant and Tolerant respondents indicated they would like to see it stay the same. A greater proportion of Tolerant respondents than other respondents indicated that they would like to see the mountain lion population increase in the next 5 years (Table 9).

Responses for designating mountain lions as furbearers was split almost equally between support, oppose, and neither support nor oppose; 34.4%, 30.4%, and 35.2% respectively. However, differences among tolerance groups were observed. Tolerant and

Semi-tolerant respondents supported the change in status more than they opposed it, with > 56% of Tolerant and > 39% of Semi-tolerant respondents indicating support. Intolerant respondents were the most likely to oppose the classification of mountain lions as furbearers (Table 9).

Wildlife value orientations

Comparisons of respondents WVOs and tolerance of mountain lions in Iowa showed moderate levels of association, Cramer's V = 0.24 (Table 10). Intolerant individuals were more likely to score high on the Utilitarian belief dimension and low on the Mutualistic belief dimension than Semi-tolerant or Tolerant individuals. Both Semi-tolerant and Tolerant individuals showed the opposite trend, more often scoring high on the Mutualistic belief dimension and low on the Utilitarian belief dimension (Table 10). Comparisons of attitudes toward mountain lions among WVOs showed significant differences between WVOs with a moderate effect size. Utilitarian individuals exhibited more negative attitudes toward mountain lions, Mutualists and Distanced individuals were more often neutral in their attitudes, and a greater proportion of Pluralists were classified as having positive attitudes toward mountain lions in Iowa (Table 11).

DISCUSSION

Interviews demonstrated that Iowans have a wide range of attitudes toward mountain lions. Interviewees indicated that mountain lions are important for their ecological impacts to the ecosystem (i.e., regulating deer populations), that they had a right to exist, and that promoting biodiversity is justification for their presence; however, concerns were raised as to whether Iowa provides suitable habitat for mountain lions

> "It's always an advantage to have animals that naturally belong here because they keep the habitat in check, but Iowa is pretty much a big corn field now so I'm assuming most of these animals don't even live here…" – FB2

Additionally, interviewees expressed concern that mountain lions may pose a general threat to people, pets, and livestock:

> "The only disadvantage is that [mountain lions] might hurt you. And they might kill my pets more readily… So, I'd have to learn more about him to feel really comfortable to have him around." - FB6

Despite their concerns, most interviewees disapproved of indiscriminate killing of mountain lions as a result of the general lack of regulations concerning them, but did believe that individuals should be allowed to destroy a mountain lion in the event of threat to person or property. This was expressed particularly well by one interviewee:

> "No, I don't think we should, hunt them or anything. I think if they're messing with our livestock, you have the right to shoot them. Or get rid of them by some means, call the DNR, but. I mean, I don't, I don't think we should open hunt on them. I mean for one they have nothing good to eat, really. Off of. I don't know, they're part of nature. Just, let them be unless they're harming you or your property really, so." - MB5

This may be a reflection of the general unacceptability of consumptive uses of wildlife, other than for food, by a majority of Iowans that was presented in chapter 1 of this thesis. The results of the interviews suggest that threats from mountain lions do not frequently occupy the minds of Iowans, but that when presented with a situation in which mountain lions were present in their area, individuals differ in their reactions. We were able to investigate in more depth some of these different reactions through our survey results.

The lack of internal consistency in the attitude scale could be attributed in part to the timing and population of the sample (Vaske, 2008). The survey questionnaire was tested using 100 individual mail-back questionnaires, of which >28% of respondents were hunters, and in a classroom of undergraduate students studying the natural resources. Responses from these groups may not have accurately indicated the lack of internal consistency of the attitude scale when applied to a broader audience. The items

removed pertain more to an individuals' attitudes toward mountain lions in general rather than to mountain lions in Iowa specifically. Gearing all questions specifically to Iowa may have resulted in greater internal consistency. The remaining scale questions used in analyses identify attitudes regarding the perceived risks associated with having mountain lions in Iowa and show high internal consistency. Future research in Iowa should investigate other ways to frame attitude scale items to better understand how an individual would feel about varying degrees of mountain lion presence not associated with risks or damage.

Riley and Decker (2000) found that most Montanan's felt very little personal risk from mountain lions. Our study demonstrates that Iowa's human population is diverse in both their attitudes toward mountain lions and their tolerance for having this species in the state. Attitudes toward mountain lions were shown to be moderately associated with individuals' WVOs (Table 8) and showed very strong association with individuals' tolerance for mountain lions in Iowa (Table 6), supporting the principles of the cognitive hierarchy theory, in which values influence beliefs, attitudes, and behavioral intentions (Fulton et al., 1996). We also found that attitudes were associated with individuals' beliefs regarding the size of Iowa's mountain lion population. The uncertainty expressed by Intolerant respondents may indicate elevated perceived risk of threat from mountain lions (Lerner et al., 2003; Lerner & Keltner, 2000). We have shown that the severity of conflict events can influence stakeholder attitudes toward and tolerances of mountain lions.

Though the majority of respondents were neutral or positive in their attitudes toward mountain lions, a significant portion expressed negative attitudes. These negative

attitudes coincide with an individual's tolerance for mountain lions and suggest that this portion of the population perceives mountain lions as an unacceptable threat to people, livestock, and pets. These Intolerant individuals are more accepting of the use of lethal force than the other clusters and are more likely to exhibit a Utilitarian WVO, consistent with Zinn and Pierce's (2002) findings. While gender did not show significant differences between tolerance clusters, the Intolerant cluster, was more likely to be younger, with lower levels of formal education, and more likely to hunt. Teel et al. (2002) identified individuals with similar socio-demographic characteristics to the Intolerant cluster to be more accepting of killing mountain lions.

Semi-tolerant and Tolerant groups differed only in their age and their attitudes toward mountain lions, with Tolerant individuals being on average older and having more positive attitudes towards mountain lions in Iowa. A closer investigation reveals that the tolerance scale specifically focuses on an individuals' capacity to tolerate conflict associated with the presence of mountain lions. The distinction between Semi-tolerant and Tolerant clusters can be seen in Table 3; differences in the clusters' responses become evident once "damage" occurs (i.e. livestock have been harassed).

If a mountain lion passes by their home once, the majority of the Semi-tolerant individuals are inclined to seek information about proper actions they should take. If a mountain lion were to frequent their home, they are more inclined to ask someone to move it or to seek information than to do nothing. Their willingness to seek information may be beneficial to wildlife managers, if their information is from a reputable source. However, attitudes towards predators can be influenced by friends, family, the act of

myth-building, etc., and are subject to change swiftly (Davenport et al., 2010; Williams et al., 2002).

Due to the infrequency of mountain lions in Iowa, Iowan's attitudes toward mountain lions may be more heavily influenced through vicarious learning, in which attitudes toward an object are modified by observing the consequences of another individual's interaction with it (Morgan & Gramann, 1989). Cardoza and Langlois (2002) warn that media sensationalism and validity of sightings complicates the status of cougars in areas not known to support extant populations. Houston et al. (2010) reinforced this notion with their content analysis of print news media that showed an increasing use of negative expressions within articles related to wolves in states with new wolf populations compared to states with permanent populations, despite having lower wolf densities.
In Chapter 1 of this thesis, we showed that TV news, newspapers, and other media source are important to Iowans in learning about Iowa's wildlife and related issues. Applying content analysis methods to mountain lions in Iowa may provide perspectives on the prevalence of negative attitudes toward this species. Working closely and promptly with media sources following a verified mountain lion presence may help insure the dissemination of accurate information regarding mountain lion abundance in the state. Pre-emptive actions, such as providing an updated status guide regarding mountain lions in Iowa to media outlets and the public may help avoid periods of misinformation or speculation about this species' abundance in the state.

Previous studies have recommended strategies to increase public awareness of cougars through targeted education and public involvement (Thornton & Quinn, 2010). However, some research regarding potentially dangerous animals suggests that when fear

is involved, informational messages are mostly ineffective for changing attitudes (Morgan & Gramann, 1989; Bandura et al., 1969,). However, if used, they should be targeted to specific audiences to ensure saliency (Morgan & Gramann, 1989). Based on the concerns expressed in our interviews, as well as the results of the survey, salient issues for many Iowans might include the likelihood of mountain lion attacks on pets, livestock, or people in Iowa and research as to the effectiveness in changing attitudes of stakeholders using messages with those themes may be warranted.

As demographic changes occur in Iowa, such as the rate of urbanization, 64% of the human population was reported as urban in 2010 (U.S. Census Bureau, 2013), up 3% since 2000 (U.S. Census Bureau, 2001). This rate of urbanization has implications for changes at the value orientation level and others (Teel & Manfredo, 2009; Thornton & Quinn, 2010). As our results demonstrate, there is a moderate level of association between WVOs, tolerance of, and attitudes toward mountain lions in Iowa. Changes at value-orientation level brought on by continued demographic shifts may affect change elsewhere (i.e., beliefs, attitudes, and behaviors). Anticipating the effects of changing demographics on stakeholder attitudes toward and tolerance of mountain lions should be considered when developing response strategies and determining the future status of the species in the state (i.e., furbearer).

MANAGEMENT RECOMMENDATIONS

Efforts to have mountain lions recognized as a species under management authority of the IDNR should be undertaken. Though habitat suitability for mountain lions in the state is not well understood, current policy impedes the ability for any mountain lion to persist in Iowa and jeopardizes their access to states East of Iowa.

Assigning furbearer status to mountain lions would not hinder individuals from protecting their property should conflict situations arise, nor increase the number of mountain lions in Iowa, but it would restrict the indiscriminate killing of this endemic species. Additionally this status would place management responsibility under the jurisdiction of Iowa's wildlife management agency, the IDNR, which is believed to be capable of this task, as demonstrated in chapter 2 of this thesis. The IDNR has the public's trust to manage Iowa's wildlife in the interest of Iowans, understands the risks associated with this species' presence in Iowa and is believed to be accessible to concerned stakeholders and considerate of stakeholder beliefs and views when making management decisions.

This paper is intended to provide information regarding stakeholders' attitudes toward mountain lions in Iowa to help inform future decision-making regarding this species. Results of this study could aid in development of a response plan for mountain lions in Iowa, as we now have a clearer idea regarding the severity of conflicts that may need to be addressed by state agency employees (i.e., pet was killed by a mountain lion). This research provides a better understanding of the attitudes and beliefs of Iowa's public regarding mountain lions in the state and should be used in conjunction with other information such as abundance, distribution, and potential recruitment to develop appropriate response strategies and management activities concerning their presence in Iowa.

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FIGURES

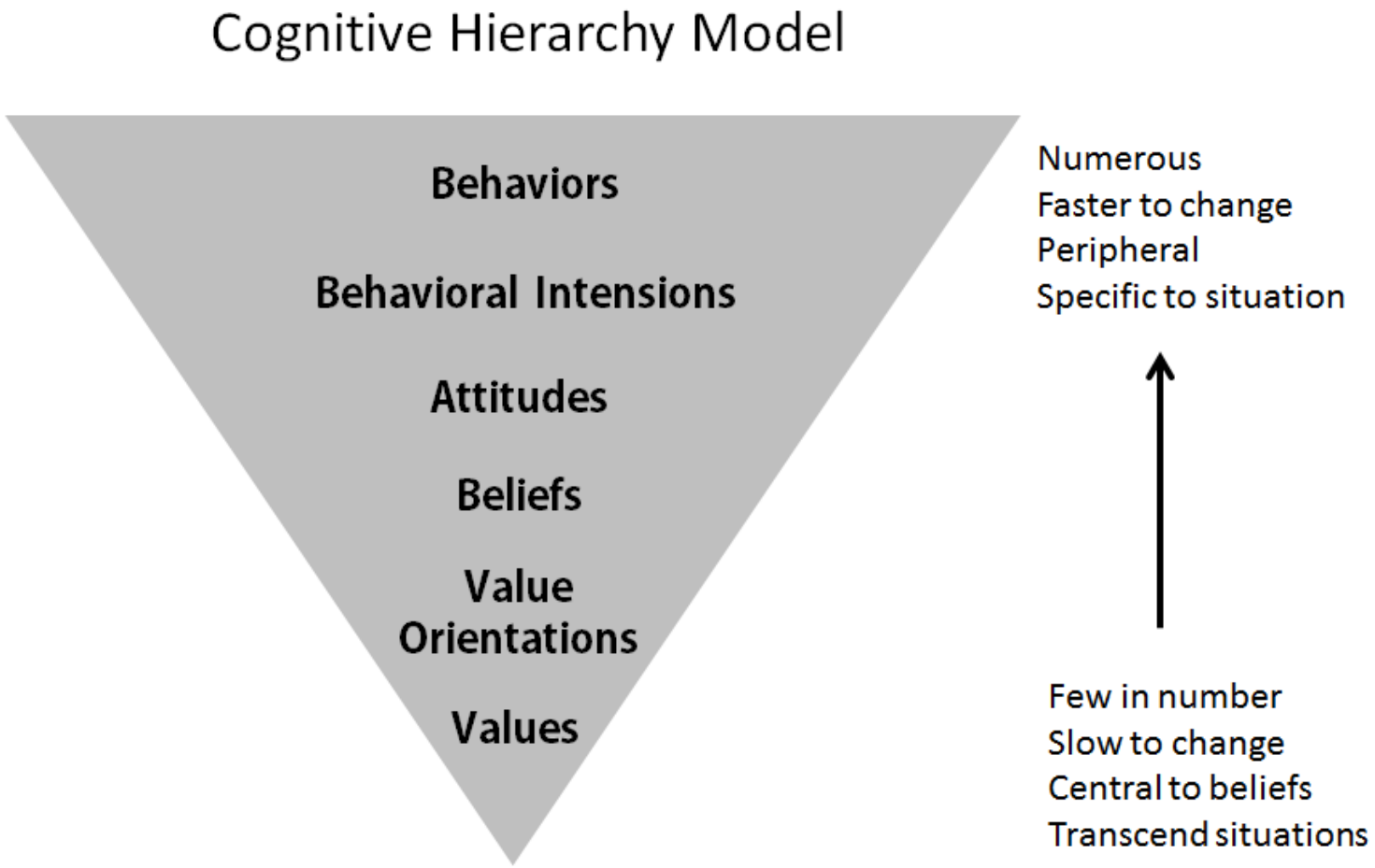

Figure 1. The cognitive hierarchy model of human behavior, from Vaske and Donnelly (1999).

TABLES

Table 1. Reliability analysis results for attitudes toward mountain lions in Iowa.

	Cronbach's alpha if item deleted
Attitudes toward mountain lions	
Mountain lions pose a threat to people by their presence in Iowa.	
In Iowa, mountain lions pose an unacceptable threat to pets.	*0.85*
If I knew a mountain lion lived within my county it would decrease my enjoyment of living there.	0.83 0.82
Where mountain lions live near people, mountain lion attacks on people are common.	0.83
In Iowa, mountain lions pose an unacceptable threat to livestock.	0.82
Iowa is better off without mountain lions.	
Removed from scale	0.82 0.85
I would enjoy seeing a mountain lion in the wild in Iowa.	-
Predators, such as mountain lions, help maintain the balance of nature.	- -
Mountain lions have the right to exist wherever they may occur.	-
Whether or not I see one, I get some benefit from just knowing that mountain lions may live in Iowa.	

Table 2. Reliability analysis results for Tolerance scale.

	Cronbach's alpha if item deleted[1]
Tolerance Scale	*0.93*
You see a mountain lion near your home once	0.93
You see a mountain lion near your home more than once in a month [1]	0.93
A mountain lion harassed livestock in your county [1]	0.92
A mountain lion harassed a neighbor's pet [1]	0.92
A mountain lion killed a neighbor's pet [1]	0.92
Multiple neighborhood pets have been killed by a mountain lion	0.92
A farmer in your county lost livestock to a mountain lion on one occasion [1]	0.92
A farmer in your county lost livestock to a mountain lion on more than one occasion	0.92
Your neighbor felt threatened by a mountain lion	0.93
A resident of your county was mauled by a mountain lion	0.93

[1] Indicates a variable used to form 3 tolerance clusters.

Table 3. Distribution of tolerance groups by Iowa's nine USDA regions.

Variable	*Intolerant*	*Semi-tolerant*	*Tolerant*	χ^2	ES^2
Iowa USDA Region				62.415**	0.11
Central	33.50	36.40	22.20		
Eastcentral	31.80	46.20	19.20		
Northcentral	33.00	38.80	14.60		
Northeast	35.60	43.30	17.30		
Northwest	24.30	42.70	24.30		
Southcentral	48.60	31.10	13.50		
Southeast	37.40	42.70	13.00		
Southwest	37.40	39.60	13.20		
Westcentral	48.30	30.20	12.90		
Total	34.90	40.20	18.40		

[1]*Numbers denote overall percentages obtained from state-level data*
[2]*ES denotes effect size as Cramer's V, used to compare two categorical variables*
***Denotes p<0.001*

Table 4. Comparison of Clusters by Tolerance scale items.

Tolerance Scale items[1]	*Tolerance Group* $\bar{X}$ (SD)			
	Tolerant	*Semi-tolerant*	*Intolerant*	*F* (df_1, df_2)
You see a mountain lion near your home once	1.39(0.52)	2.10(0.78)	2.96(0.94)	20.26 (3, 1404)**
You see a mountain lion near your home more than once in a month[2]	1.76(0.53)	2.55(0.64)	3.34(0.75)	35.61 (3, 1474) **
A mountain lion harassed livestock in your county[2]	1.64(0.58)	2.93(0.48)	3.91(0.33)	44.75 (3, 1474) **
A mountain lion harassed a neighbor's pet[2]	1.87(0.56)	2.99(0.14)	3.96(0.20)	33.49 (3, 1474) **
A mountain lion killed a neighbor's pet[2]	2.23(0.70)	3.24(0.44)	4.00(0.00)	34.65 (3, 1474) **
Multiple neighborhood pets have been killed by a mountain lion	2.64(0.82)	3.47(0.51)	3.98(0.01)	33.80 (3, 1428) **
A farmer in your county lost livestock to a mountain lion on one occasion[2]	1.69(0.72)	3.06(0.56)	3.77(0.02	25.46 (3, 1474) **
A farmer in your county lost livestock to a mountain lion on more than one occasion	2.22(0.87)	3.40(0.53)	3.91(0.02)	29.47 (3, 1454) **
Your neighbor felt threatened by a mountain lion	2.18(0.80)	3.11(0.66)	3.70(0.63)	27.72(3, 1404) **
A resident of your county was mauled by a mountain lion	2.98(1.02)	3.77(0.46)	3.96(0.26)	23.45 (3, 1406) **

[1] Responses based on a 5-point scale (1). *I would not do anything* (2). *I would ask someone what I should do* (3). *I would tell someone to move the mountain lion* (4). *I would tell someone to kill the mountain lion,* or (recoded as a missing value) *Unsure*.

[2] Used to form 3 tolerance clusters. Relative importance was 1.0, indicating all members of cluster answered the same, for all but one item: you see a mountain lion near your home more than once in a month.

Table 5. Comparison of tolerance groups by socio-demographic characteristics and interactions with wildlife.

Variable[1]	*Intolerant*	*Semi-Tolerant*	*Tolerant*	χ^2 (*df*) or F (df_1, df_2)	*ES*[2]
Age ($\bar{X}$)	42.89a	50.16b	56.67c	64.56 (2, 1574)**	0.28
Pet Ownership (%)	39.60a	57.50b	63.10b	31.41 (2, 1588)**	0.20
Gender (%)				4.87 (2)	0.06
female	48.50	54.60	52.80		
male	51.50	45.40	47.20		
Urban-rural assignment				43.66 (2)**	0.17
rural	46.60	30.80	29.10		
urban	53.40	69.20	70.90		
Highest level of education (%)				92.65 (8)**	0.17
Less than high school	4.50	3.30	0.90		
High school diploma or equivalent	37.10	21.00	20.80		
Some college or technical school	24.00	23.00	21.10		
College or technical school	27.20	33.30	35.20		
Graduate or professional school	7.20	19.30	22.00		
Income (%)				32.35 (10)**	0.11
less than $25,000	25.20	16.00	16.80		
$25,000-$74,999	46.10	51.30	44.90		
$75,000-$99,999	13.20	15.20	13.70		
$100,000-$149,999	8.70	12.10	14.00		
$150,000-$199,999	4.10	3.10	7.90		
$200,000 or more	2.60	2.30	2.70		

[1]*Numbers denote overall percentages obtained from state-level data, letters represent groups with significantly different means at the p <0.05 level.*
[2]*ES denotes effect size as either Cramer's V, to compare two categorical variables or Eta to compare a categorical variable with an interval variable*
*** Denotes significance at p ≤ 0.001.*

Table 6. Comparison of tolerance groups and their interactions with wildlife.

Variable[1]	*Intolerant*	*Semi-Tolerant*	*Tolerant*	F (df_1, df_2)	*ES*[2]
Hunting (%)	12.00a	4.90b	8.90ab	21.19 (2, 1606)**	0.23
Fishing (%)	32.80a	39.50b	38.20ab	3.32 (2, 1606)*	0.10
Provide Habitat for wildlife (%)	23.00a	28.90b	36.00b	10.45 (2, 1606)**	0.16
Feed backyard wildlife (%)	44.60a	56.80b	61.40b	3.73 (2, 2606)**	0.16
Watch or photograph wildlife (%)	59.40a	73.30b	79.40b	24.78 (2, 1606)**	0.12
Prefer not to interact with wildlife (%)	21.70a	7.10b	4.70b	44.84 (2, 1606)**	0.13

[1]*Numbers denote overall percentages obtained from state-level data, letters represent groups with significantly different means at the p <0.05 level.*

[2]*ES denotes effect size as either Cramer's V, to compare two categorical variables or Eta to compare a categorical variable with an interval variable*

[*]*Denotes significance at $p \leq 0.05$.*

** *Denotes significance at $p \leq 0.001$.*

Table 7. Distribution of attitudes toward mountain lions by Iowa's nine USDA regions.

Variable	*Negative*	*Neutral*	*Positive*	χ^2	ES^2
Iowa USDA Region				37.793*	0.09
Central	22.20	51.40	26.40		
Eastcentral	22.30	54.80	23.00		
Northcentral	15.00	57.90	27.10		
Northeast	18.80	53.80	27.40		
Northwest	19.60	59.40	21.00		
Southcentral	14.70	49.50	35.80		
Southeast	15.60	55.90	28.50		
Southwest	13.90	50.80	35.20		
Westcentral	11.80	49.70	38.60		
Total	19.20	53.50	27.20		

[1]*Numbers denote overall percentages obtained from state-level data*
[2]*ES denotes effect size as Cramer's V, used to compare two categorical variables*
**Denotes* $p<0.05$

Table 8. Comparison of attitudes toward mountain lions in Iowa among tolerance groups.

Variable[1]	*Intolerant*	*Semi-Tolerant*	*Tolerant*	χ^2 (*df*) or *F* (df_1, df_2)	*ES*[2]
Attitudes scale classification				2331.80 (4)**	0.88
Positive	0.00	7.20	89.60		
Neutral	4.40	89.30	10.40		
Negative	95.60	3.50	0.00		
Attitudes scale $\bar{X}$ (SD)	-5.28	-0.85	5.94	112.84 (2, 1605)**	0.83

[1]*Numbers denote overall percentages obtained from state-level data.*
[2]*ES denotes effect size as either Cramer's V, to compare two categorical variables or Eta to compare a categorical variable with an interval variable*
[*]*Denotes significance at $p \leq 0.05$.*
*** Denotes significance at $p \leq 0.001$.*

Table 9. Comparison of perceived mountain lion population dynamics among tolerance groups and support for designating mountain lions as furbearers.

Variable[1]	*Intolerant*	*Semi-Tolerant*	*Tolerant*	Total	χ^2 (*df*)	*ES*[2]
Current population					46.76 (15)**	0.1
0	3.70	2.80	3.80	3.20		
1-20	27.60	35.60	41.60	33.30		
21-50	11.40	14.60	15.10	13.70		
51-100	7.40	8.60	9.10	8.20		
>100	4.40	3.20	1.60	3.50		
Don't Know	45.60	35.10	28.70	38.00		
Population change last 5 years					27.561 (6)**	0.09
Decrease	5.40	10.30	10.60	9.00		
Stayed the Same	37.60	42.00	44.90	41.30		
Increased	57.00	47.70	44.60	49.70		
Population change next 5 years					404.57 (6)**	0.35
Decrease	75.80	29.40	22.10	44.90		
Stayed the Same	21.60	54.70	46.80	41.30		
Increased	2.60	15.90	31.20	13.80		
Designation as Furbearer					164.81 (6)**	0.22
Oppose	41.90	24.40	20.30	30.40		
Neither support nor oppose	40.80	35.70	23.40	35.20		
Support	17.30	39.90	56.30	34.40		

[1]*Numbers denote overall percentages obtained from state-level data.*
[2]*ES denotes effect size as either Cramer's V, to compare two categorical variables*
**Denotes significance at* $p \leq 0.05$.
*** Denotes significance at* $p \leq 0.001$.

Table 10. Comparison of wildlife value orientations among tolerance groups.

Variable[1]	*Intolerant*	*Semi-Tolerant*	*Tolerant*	χ^2 (*df*)	*ES*[2]
Wildlife value orientation				172.85 (6)**	0.24
Utilitarian	49.20	22.20	22.70		
Mutualist	13.00	42.20	44.10		
Pluralist	11.00	9.50	9.40		
Distanced	26.80	26.10	23.80		

[1]*Numbers denote overall percentages obtained from state-level data.*
[2]*ES denotes effect size as Cramer's V used to compare two categorical variables.*
*** Denotes significance at p ≤ 0.001.*

Table 11. Comparison of attitudes toward mountain lions among wildlife value orientations of 2,353 respondents to a mail-back questionnaire in Iowa.

	Wildlife value orientation type[1]					
Variable	*Utilitarian*	*Mutualist*	*Pluralist*	*Distanced*	χ^2 (*df*) or *F* (df_1, df_2)	*ES*[2]
Attitudes scale classification					165.97 (6)**	0.24
Positive	13.80	27.10	46.40	18.20		
Neutral	28.80	56.70	34.10	42.10		
Negative	57.40	16.20	19.60	38.10		
Attitudes scale $\bar{X}$	-2.49	0.63	-1.62	-1.41	44.71 (3, 1473)**	0.29

[1]*Numbers denote overall percentages obtained from state-level data*
[2]*ES denotes effect size as Cramer's V, used to compare two categorical variables*

CHAPTER V: GENERAL SUMMARY

Iowa is undergoing significant demographic changes and as the population dynamics of Iowa's citizenry continue to change, urbanizing and becoming more ethnically diverse (U.S. Census Bureau, 2013), the Iowa Department of Natural Resources (IDNR) needs to fully incorporate the interests of these new stakeholders when making decisions regarding appropriate management of Iowa's wildlife. We have used this opportunity to improve understanding of all stakeholders in Iowa by identifying them by their attitudes toward wildlife and their wildlife value orientations (WVOs) (Teel et al., 2009). Through this research we have created a platform from which longitudinal and geographic comparisons can be made within Iowa and with other states.

In addition to WVO distributions across the state, our study documented important differences in the ways these segments of the population interact with wildlife that may aid in implementation and operationalization of the Iowa Wildlife Action Plan (IWAP). Though Utilitarians represent the values of hunters and anglers, historically the most influential stakeholders in wildlife management (Nie, 2004; Anderson & Loomis, 2006), and more similar in their value orientations to IDNR employees, Mutualists and Pluralists were more likely to provide habitat for wildlife, a vital conservation action in a state with less than 2% public land (Zohrer, 2005)

We introduced a new metric for measuring credibility of a state agency, built off the definitions presented by Fritzell et al. (1995), consisting of four core components we identified as trust, competency, accessibility, and validation. We found that a majority of the public indicated that the IDNR is credible. IDNR employees did not predict this

accurately, rather they indicated that they thought a majority of the public believed them to not be credible. We incorporated the components of accessibility and influence to ensure that these findings and the scale we used would remain relevant as stakeholders' interest and involvement in decision-making grows. Our findings reflect those of previous work, which has shown that though stakeholders desire a greater role in developing wildlife-policy, they ultimately trust wildlife managers' judgment (Reiter et al., 1999).

We were able to demonstrate an application of aspects of the cognitive hierarchy model in wildlife management. We found moderate effect sizes among WVOs on individuals' attitudes and behavioral intentions regarding potential conflict situations with mountain lions in Iowa. We also observed strong associations between attitudes and behavioral intentions toward mountain lions, noted as risk perceptions and tolerance of mountain lions in Iowa. Our findings suggest that there is support from some segments of Iowa's human population for mountain lions to be recognized as a wildlife species in Iowa and that a majority of the public believes the IDNR is capable of managing the species in their best interest.

Our findings support the assertion that the traditional segmentations of the public (i.e., hunters/non-hunters, etc.) are not adequate in describing the variation within those groups regarding attitudes (Fritzell, 1995; Lischka, 2008) toward management decisions or their value orientations toward wildlife. We suggest further research using the WVOs typology to establish baseline information across the nation. Additionally we suggest incorporating comparisons of wildlife managers and the public in future studies of WVOs because of the lack of information regarding WVOs of wildlife managers and the ability

to survey state agency employees using online methods, which are inexpensive and can be used reliably because email addresses are available for all members of the population (Dillman et al., 2009).

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APPENDIX A. SURVEY METHODOLOGY

Appendix A. Survey methodology was designed to sample residents of Iowa in a manner that was representative of the state's Urban-Rural population distribution of 61% Urban and 39% Rural (U.S. Census Bureau 2001). We used a square root proportional distribution to address the uneven distribution of urban centers across Iowa's 9 USDA regions and an even sampling distribution for rural individuals across regions due to the adequate availability of rural addresses in each region. Steps included: (1.) calculated the square root of the number of urban and rural addresses within each region (2.) determined the desired proportion of urban and rural responses in each region[1], assuming a 40% response rate and that 20% of addresses were undeliverable, while maintaining the 61%-39% Urban-Rural distribution that is reflective of the states' population distribution (3.) calculated n for each region assuming 40% response rate and 20% address attrition.

A = Number of Urban addresses in each county
B = √A
C = Desired number of Urban respondents in each region
D = Desired number of Rural respondents in each region
E = Number of Urban addresses in initial mailing in each region
F = Number of Rural addresses in initial mailing in each region

Region	A	Step 1	B	Step 2	C	D	Step 3	E	F
Central	74155		272.3		282	78		880	244
Eastcentral	58811		242.5		251	78		784	244
Northcentral	10436		102.2		106	78		330	244
Northeast	34029		184.5		191	78		596	244
Northwest	0	√A=B	0.0	$C = \frac{\sum C * B}{\sum B}$	-	78	E = C/(0.4*0.8) F = D/(0.4*0.8)	-	244
Southeast	20214		142.2		147	78		459	244
Southcentral	0		0.0		-	78		-	244
Southwest	10348		101.7		105	78		329	244
Westcentral	273		16.5		17	78		53	244
TOTAL	208266		1061.9		1098	702		3,431	2,194

[1] *Desired number of responses calculated considering a sample size n=5,625 Sample size was determined by an original desired regional sample size n=625, before assumed attrition of 20%, due to undeliverable addresses, and a desired 60% response rate, which would result in 300 responses per region..*

APPENDIX B. HEADS-UP POSTCARD

Dear Iowa resident,

I am a graduate student at Iowa State University in the Natural Resource Ecology and Management department. I am contacting you for help with my survey research project. My survey will help managers make future decisions about Iowa's wildlife. Your views are very important and will make a difference. Even if you are not especially interested in wildlife, your thoughts matter to me, and I would love to hear from you.

When the survey arrives, after the 4th of July, please have the adult in your household with the next birthday complete the questionnaire.

Thank you for your time and have a Happy 4th of July!

Sincerely,

Andrew Stephenson

Iowa State University
Dept. Natural Resource
Ecology and Management
339 Science II
Ames, IA 50011

<<SURVEYID>>
«FIRST_NAME» «MI» «LAST_NAME»
«ADDRESS»
«CITY», «STATE» «ZIP»

APPENDIX C. FIRST-MAILING COVER LETTER

Date: July 9th, 2012

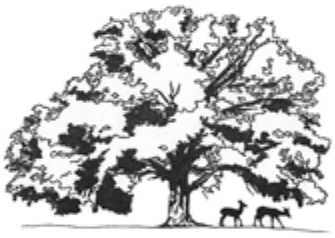
Dear:

Bobcats… beetles…bats! What do you consider wildlife?
I recently sent you a postcard asking for your participation in my survey research project. Your household is one of a small number in which people are being asked for their beliefs and opinions about Iowa's wildlife. Upon receipt of your returned survey, you will be entered in a drawing to win 1 of 10 $25 gift cards to Hy-Vee. Even if you are not especially interested in wildlife, your views count and are of great interest to me.

The goal of my research is to learn about people's beliefs, attitudes, and behaviors toward wildlife in Iowa and to use this knowledge to improve wildlife management decision-making. Your thoughts are very important to me and will contribute to wildlife management in our state. Your response is important for study results to truly represent the thinking of people in your community.

Would you please have the adult (≥18 years) residing in the household who will next celebrate a birthday complete the survey? The survey has 9 pages and should take 10-15 minutes to complete.

Thank you very much for your participation in this research!



Sincerely,

Andrew Stephenson, Project Coordinator

Study Participant Rights:
You can be assured that your privacy will be protected, and that your responses will remain confidential. The survey has an identification number for mailing purposes only. This is so that I may check your name off the mailing list when your questionnaire is returned. Your name will never be placed on the survey itself. Survey completion is voluntary. You indicate your voluntary agreement to participate by completing and returning the questionnaire. You may choose not to participate at all, or to refuse to answer certain questions.
I would be happy to answer any questions or concerns you may have about this study. Please write me or call me, Andrew Stephenson, toll free at 1-866-419-6767. If you have questions or concerns regarding your rights as a study participant, or are dissatisfied at any time with any aspect of this study, you may contact – anonymously, if you wish – Jerry Zamzow, the Acting Program Manager of the Office for Responsible Research by phone: 515-294-3115, e-mail: jzamzow@iastate.edu , or regular mail:1138 Pearson Hall, Ames, IA 50011-2200.

APPENDIX D. REMINDER POSTCARD

Dear Iowa resident,

Last week I mailed a survey to you. Your household was randomly selected to share its views about Iowa's wildlife.

If someone in your household has already completed and returned the survey, thank you very much! If not, please have the adult in your household who will next celebrate a birthday complete and return the survey right away. It is only by asking people like you to share your beliefs and attitudes about Iowa's wildlife that I can evaluate how accurately current management practices reflect the opinions of Iowa's public. I am especially grateful for your help with my graduate research project.

If you did not receive a survey or if it was misplaced, please call me toll free at 1-866-419-6767 and I will get another one in the mail to you today.

Sincerely,

Andrew Stephenson

Iowa State University
Dept. Natural Resource
Ecology and Management
339 Science II
Ames, IA 50011

<<SURVEYID>>
«FIRST_NAME» «MI» «LAST_NAME»
«ADDRESS»
«CITY», «STATE» «ZIP»

APPENDIX E. SURVEY TOOL

Now we would like to find out how you feel about a common IOWA game species, the white-tailed deer, and IOWA's wildlife management agency, the Iowa Department of Natural Resources (IDNR).

8. Please select the answer that most closely represents your opinion about the number of DEER in IOWA.

Much too Low	Too Low	About Right	Too High	Much too High
○	○	○	○	○

9. To what degree do you agree or disagree with the following statements?

	Strongly Disagree		Neither		Strongly Agree
I am confident the IDNR has the necessary information to make adequate decisions regarding Iowa's wildlife.	○	○	○	○	○
I am confident that I can contact the IDNR to voice my concerns regarding wildlife in Iowa.	○	○	○	○	○
I am confident that the IDNR will listen to my concerns about wildlife in Iowa.	○	○	○	○	○
I trust the IDNR to manage wildlife in the best interest of Iowans.	○	○	○	○	○
The IDNR understands the risks to the public associated with having DEER in Iowa.	○	○	○	○	○
The IDNR has the expertise to develop appropriate response strategies for DEER in Iowa.	○	○	○	○	○

Next we would like your opinion on two species that are NOT managed by the Iowa Department of Natural Resources, the mountain lion and black bear.

10. To what degree do you agree or disagree with the following statements?

	Strongly Disagree		Neither		Strongly Agree
The IDNR understands the risks to the public associated with having MOUNTAIN LIONS in Iowa.	○	○	○	○	○
The IDNR has the expertise to develop appropriate response strategies for MOUNTAIN LIONS in Iowa.	○	○	○	○	○

11. Approximately how many MOUNTAIN LIONS do you believe currently live in IOWA? (Select only ONE)

○ 0 ○ 1-20 ○ 21-50 ○ 51-100 ○ >100 ○ Don't Know

12. Approximately how many BLACK BEARS do you believe currently live in IOWA? (Select only ONE)

○ 0 ○ 1-20 ○ 21-50 ○ 51-100 ○ >100 ○ Don't Know

13. Please select the ONE response for each of the following statements that most accurately reflects your opinion.

	Decreased Greatly		Stayed the Same		Increased Greatly
How has the number of MOUNTAIN LIONS changed in Iowa in the last five years?	○	○	○	○	○
How would you like to see the population of MOUNTAIN LIONS change in the next five years?	○	○	○	○	○
How has the number of BLACK BEARS changed in IOWA in the last five years?	○	○	○	○	○
How would you like to see the population of BLACK BEARS change in the next five years?	○	○	○	○	○

Currently harvest of MOUNTAIN LIONS and BLACK BEARS is not regulated in Iowa, they can be killed at any time. If these species were classified as furbearers, harvest would be regulated, prohibiting their indiscriminate killing.

14. Please indicate how strongly you support or oppose classifying these species as furbearers in IOWA.

	Strongly Oppose		Neither Support nor Oppose		Strongly Support
MOUNTAIN LIONS >>>	○	○	○	○	○
BLACK BEARS >>>>>	○	○	○	○	○

Moutain lions have been documented in the state of IOWA within the past 10 years. The next questions are designed to help us better understand YOUR views about mountain lions.

15. Please fill in the circle that most accurately represents your level of agreement or disagreement for each statement.

	Strongly Disagree		Neither		Strongly Agree
I would enjoy seeing a mountain lion in the wild in Iowa.	○	○	○	○	○
Predators, such as mountain lions, help maintain the balance of nature.	○	○	○	○	○
Mountain lions pose a threat to people by their presence in Iowa.	○	○	○	○	○
In Iowa, mountain lions pose an unacceptable threat to pets.	○	○	○	○	○
If I knew a mountain lion lived within my county it would decrease my enjoyment of living there.	○	○	○	○	○
Mountain lions have the right to exist wherever they may occur.	○	○	○	○	○
Where mountain lions live near people, mountain lion attacks on people are common.	○	○	○	○	○
In Iowa, mountain lions pose an unacceptable threat to livestock.	○	○	○	○	○
Iowa is better off without mountain lions.	○	○	○	○	○
Whether or not I see one, I get some benefit from just knowing that mountain lions may live in Iowa.	○	○	○	○	○

7. Below are statements representing different ways that people may think about wildlife. We're interested in knowing your views about wildlife. (Please fill in ONE circle per statement)

	Strongly Disagree			Neutral			Strongly Agree
Humans should manage wildlife populations so that humans benefit.	○	○	○	○	○	○	○
Animals should have rights similar to the rights of humans.	○	○	○	○	○	○	○
We should strive for a world where there's an abundance of wildlife for hunting and fishing.	○	○	○	○	○	○	○
I view all living things as part of one big family.	○	○	○	○	○	○	○
Hunting does not respect the lives of animals.	○	○	○	○	○	○	○
I feel a strong emotional bond with animals.	○	○	○	○	○	○	○
The needs of humans should take priority over wildlife protection.	○	○	○	○	○	○	○
I care about animals as much as I do other people.	○	○	○	○	○	○	○
Wildlife are on the earth primarily for people to use.	○	○	○	○	○	○	○
Hunting is cruel and inhumane to the animal.	○	○	○	○	○	○	○
We should strive for a world where humans and wildlife can live side by side without fear.	○	○	○	○	○	○	○
I value the sense of companionship I receive from animals.	○	○	○	○	○	○	○
Wildlife are like my family and I want to protect them.	○	○	○	○	○	○	○
People who want to hunt should be provided the opportunity to do so.	○	○	○	○	○	○	○

4. Which do you consider acceptable uses of wildlife? (Select ALL that apply)

Food	○	Clothing (hide, fur, jewelry)	○
Taxidermy (e.g., antler mount, head mount)	○	Educational purposes	○
Alternative Medicines	○	Pet	○
Sale for profit	○	None of the above	○

5. How often do you seek out information about IOWA's widlife and related issues?

Never	Rarely	Occasionally	Frequently
○	○	○	○

6. Which of the following sources do you use to learn about IOWA's wildlife and related issues? (Select ALL that apply)

Family members/friends/neighbors	○	TV news	○
Programs at zoos, state parks, etc.	○	Radio	○
Wildlife shows, videos or DVDs	○	Magazines	○
Brochures/pamphlets about wildlife	○	Websites	○
Social media (e.g., Facebook)	○	Local newspapers	○
Conservation professional (e.g., naturalist, conservation officer)	○	Other (please specify below)	○
My own observations and experiences	○		

16. For each event below indicate which ONE of the five choices you would most likely make by filling in the appropriate circle.

A >>> **I would not do anything.**

B >>> **I would ask someone what I should do.**

C >>> **I would tell someone to move the mountain lion.**

D >>> **I would tell someone to kill the mountain lion.**

E >>> **Unsure**

Event	A	B	C	D	E
You see a mountain lion near your home once.	○	○	○	○	○
You see a mountain lion near your home more than once in a month.	○	○	○	○	○
A mountain lion harassed livestock in your county.	○	○	○	○	○
A mountain lion harassed a neighbor's pet.	○	○	○	○	○
A mountain lion killed a neighbor's pet.	○	○	○	○	○
Multiple neighborhood pets have been killed by a mountain lion.	○	○	○	○	○
A farmer in your county lost livestock to a mountain lion on one occasion.	○	○	○	○	○
A farmer in your county lost livestock to a mountain lion on more than one occasion.	○	○	○	○	○
Your neighbor felt threatened by a mountain lion.	○	○	○	○	○
A resident of your county was mauled by a mountain lion.	○	○	○	○	○

Natural Resource Ecology and Management
339 Science II Ames, IA 50011

This survey is part of a study to assist wildlife managers with making future decisions about Iowa's wildlife. Your views are very important and are needed to determine how wildlife is managed in Iowa. Even if you are not especially interested in wildlife, we want to hear from you.

Please have the adult (≥ 18 years) residing in the household who will next celebrate a birthday complete the survey.

Once you have completed the survey, seal it with the attached sticker, and drop it in the mail.

Your responses will remain confidential and will never be associated with your name.

As an added *BONUS*, by completing and returning this survey before July 21st, 2012, you will be entered twice in a drawing to win one of ten $25 Hy-Vee gift cards. Surveys postmarked after July 21st, will be entered once in the drawing.

If you have questions about this survey, please contact me, Andrew Stephenson, Project Coordinator, at the above address, or call me toll free at 1-866-419-6767.

Thank you for your participation!

23. Do you have any pets? ○ Yes ○ No

24. Which best describes the area where you were raised as a youth?

○ Rural on a farm ○ Small town ○ City
○ Rural non-farm ○ Suburb

25. Which best describes the area where you live now?

○ Rural on a farm ○ Small town ○ City
○ Rural non-farm ○ Suburb

26. What is your highest level of schooling completed?

○ Less than high school diploma
○ High school diploma or equivalent
○ Some college or technical school
○ College or technical school (Bachelors or Associates etc.)
○ Graduate or professional school (M.A., Ph.D., etc.)

27. What is your approximate annual household income before taxes?

○ <$25,000 ○ $25,000-74,999 ○ $75,000-99,999
○ $100,000-149,999 ○ $150,000-199,999 ○ $200,000 or more

28. What percent of your total household income is derived from farming?

○ none ○ 1-25% ○ 26-51% ○ 51-75% ○ 76-100%

29. Please indicate with which categories you most closely identify yourself? (Please select ALL that apply)

○ White ○ Hispanic/Latino ○ Asian
○ Black ○ American Indian or Alaskan Native ○ Native Hawaiian or Other Pacific Islander

Please mark the box below and write your email address in the space provided if you would be willing to be contacted again for your views about IOWA's wildlife.

☐

Comments:

Iowa State University
Dept. Natural Resource
Ecology and Management
339 Science II
Ames IA 50011

Andrew Stephenson
Iowa State University
Dept. Natural Resource
Ecology and Management
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Iowa's Wildlife:

A survey of your beliefs and attitudes

Conducted by Iowa State University
Department of Natural Resource Ecology and Management

APPENDIX F. STRUCTURED INTERVIEW GUIDE

The purpose of this project is to gather information from people regarding their beliefs, attitudes and behaviors toward medium and large sized predators in Iowa. All data collected will be on password protected computers and your name will never be connected with your responses.

RECORD: Are you ok with me recording this interview for analysis purposes later?

Questions:

1.) I will give you pictures of some species of medium-sized and large predators which currently exist in Iowa, or did exist in Iowa in the past but not now and some natural hazards. Can you describe any experience you have had with any of the animals or natural hazards pictured?

Probes: Can you tell me more about that…?

What can you tell me about the animals pictured?

2.) I want you to imagine that all these animals currently live in Iowa, will you please place the animal and natural hazard pictures on the scale according to the level of risk each presents to you or your family. You can put as many or few of the pictures on any one point on the scale. A ten on my scale represents great threat. By this I mean that you believe this animal or natural hazard exists only to harm you. A zero on my scale indicates no-threat; you are totally comfortable around this animal or in the presence of this natural hazard, and you would not feel overly concerned to learn that these animals share your neighborhood or that these natural hazards occur frequently in your area.

Probes: Can you tell me where you've placed each picture and why you have placed it there?

Probes: Are any of the pictures animals or events you might say you like? dislike? Neutral?

3.) Do you have any pets?

A. If YES - What kinds? Are they indoor or outdoor? Continue to C
B. If NO – I would like you to imagine you have a pet... continue to C
C. Please look at how you've ranked each of the animals and natural hazards on the scale with regards to risk to you and your family. I would like you to consider the risk toward your pets. Would you change the location of any of the pictures? If so, please do so now.
Probes: Why did you move picture A there?

4.) Do you have any Livestock?

A. If YES - What kinds? How are they housed? Continue to C
B. If NO – I would like you to imagine you have livestock... continue to C

C. Please look at how you've ranked each of the animals and natural hazards on the scale with regards to risk to your pets. I would like you to consider the risk toward your livestock. Would you change the location of any of the pictures? If so, please do so now.
Probes: Why did you move picture A there?

5.) A. Can you think of any advantages of having any of the pictured animals in Iowa?
Probes: Can you tell me more about that….

Would you feel the same or differently if they were in your county?

B. Can you think of any disadvantages of having any of the animals in Iowa?

Probe: Tell me what it is about this animal that makes you feel…..

6.) Are you aware of any laws or regulations in Iowa that provide protection or harvest limits on any of these animals? Would you support/oppose passage of such legislation for any of the pictured animals? Neutral?

7.) Currently there are no breeding populations of these (select mountain lions and wolf/bear) animals in Iowa, if they were to return naturally on their own, what Actions should be taken?

I'd like to learn a little about yourself and background for the purposes of analysis. Again, I'd like to reiterate that your personal information will never be associated with your name.

1.) Do you have any kids? How many? What ages?
2.) Could you describe the area you live in? Rural, Sub-Urban, Urban?
3.) In what year were you born?

I'm interested in how people view predators as threats, is it influenced by past personal experience, stories from friends or family, newspapers, the media. What do you think most influenced your decisions regarding these animals?

Thank you very much for your participation in this study. Are there any questions that I might answer for you regarding Iowa's medium-sized and large mammalian predators?

If you're interested in a 1 page summary of my results when I'm done, I can send you an electronic copy via email, please write your email here.