RESEARCH ARTICLE

Predicting acceptance of lethal management of wood bison in Alaska, USA

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Abstract Wood bison (*Bison bison athabasca*) were reintroduced into Alaska after a 170-year absence in the state. Wildlife reintroductions may cause problems by damaging property, spreading disease, increasing fear levels, and human injury and death. We examined the influence of urban Alaskan's wildlife value orientations (WVO; domination and mutualism), fear, and attitudes toward wood bison on their behavioral intention to support lethal management under specific situations. We hypothesized that: (a) domination, mutualism and fear would influence public attitudes toward wood bison, and (b) attitudes would predict an individual's behavioral intention to support lethal management of the newly restored bison population. We collected data through a self-administered questionnaire randomly distributed to residents in Anchorage ($n = 243$) and Fairbanks ($n = 272$). Regression analyses indicated that both mutualism and domination positively correlated with attitudes, and fear negatively correlated with attitudes. Attitudes did not predict behavioral intention to support lethal management practices. Both WVOs and fear predicted behavioral intentions. The model helps to illustrate how cognitive and emotional components can influence acceptance of newly restored herbivore species. Our findings also suggested that for situations where an attitude may not exist, people may use more basic value orientations and emotions when thinking about how they would react in specific situations.

Keywords Attitudes · Behavioral intentions · Fear · Herbivores · Reintroduction · Value orientations

INTRODUCTION

Failure to adequately involve the public in wildlife decisions has resulted in ineffective management (Bath 1998; Riley et al. 2002; Manfredo 2008; Bennett et al. 2017) and decreased public support for a variety of initiatives (Decker and Chase 1997; Stern et al. 2017). Public support for wildlife reintroductions, for example, is often a key to success (Bath 1998; Hermann et al. 2012). This was especially true for wood bison (*Bison bison athabasca*) in Alaska, where a group of diverse interests supported the idea of reintroduction (Alaska Wood Bison Planning Management Team 2015). However, little was known about the nuances of how those animals should be managed on the landscape (Doney et al. 2018).

After approximately 170 years of state-wide absence, 130 wood bison were restored to the rural Alaska wilderness in the spring and summer of 2015 by the Alaska Department of Fish & Game and partner organizations. Wood bison have been listed as threatened under the U.S. Endangered Species Act (ESA) since 2012 (U.S Fish and Wildlife Service 2013), highlighting the ecological importance of this restoration effort (Stephenson and Gerlach 2001; Seaton 2016). A federal rule in the ESA, however, designates these reintroduced animals as a “nonessential experimental population,” meaning bison can be killed in situations of social, economic, or political conflict (Alaska Wood Bison Planning Management Team 2015). The management plan states that a “nuisance” wood bison can be removed (Alaska Wood Bison Planning Management Team 2015), but fails to define what “nuisance” means. Lethal control is a cost-effective, yet controversial method of managing conflicts between humans and wildlife (Sanborn and Schmidt 1995; Sponarski et al. 2015). While lethal management is a common management

intervention in Alaska, it could be controversial in this case, due to the current threatened status of wood bison under the ESA. Wood bison were restored as an additional wild food source and new hunting opportunity. If lethal management is used in situations deemed unacceptable to the public, trust in the agency is likely to diminish and may affect public support for future restoration initiatives.

Understanding public acceptance of lethal management requires knowledge of the cognitive and emotional considerations underlying the issues (Decker et al. 2006; Bruskotter et al. 2009; Loyd and Miller 2010; Vaske et al. 2013; Jacobs et al. 2014a). The objectives of this article were to: (a) understand the level of support for lethal management of wood bison in specific contexts, and (b) identify predictors of public support for lethal management to inform educational outreach and communication strategies.

Conceptual framework

Cognitions are mental processes that individuals use to understand situations (Vaske and Manfredi 2012). The “cognitive hierarchy” arranges these cognitions from general to specific (Vaske and Donnelly 1999). The hierarchy outlines the relationships between values, value orientations, and attitudes to better discern how cognitions influence behaviors and behavioral intentions of individuals and decision makers. An increasing amount of empirical research has applied this conceptual approach to wildlife and wildlife management (Manfredi 2008).

The cognitive hierarchy separates values from value orientations. *Values* are qualities of life such as honesty or fairness (Rokeach 1973). Values are general constructs that do not evaluate specific situations. For example, people who value “honesty” will be honest when interacting with their family/friends and in business deals. Because values are widely shared by all members of a culture, they do not explain much of the variance in specific behaviors. *Basic beliefs*, on the other hand, represent general classes of objects (e.g., all wildlife) that give meaning to values. *Value orientations* are arrangements of basic beliefs that provide context for fundamental values in regard to a particular realm such as wildlife (Fulton et al. 1996; Manfredi et al. 2009; Teel and Manfredi 2010).

The majority of human dimensions’ research on wildlife value orientations (WVO) focuses on *domination* and *mutualism* (Teel et al. 2007; Jacobs et al. 2014b). Domination oriented individuals hold utilitarian views and believe wildlife should be managed for the benefit of humans. They are likely to prioritize human well-being over wildlife in their attitudes and behaviors (Gamborg and Jensen 2016) and are likely to support management actions that result in death or harm to wildlife. Mutualist oriented

individuals are less supportive of behaviors that harm wildlife, more likely to take actions that benefit wildlife, and often see wildlife as similar to humans (Wildavsky 1991; Gamborg and Jensen 2016). WVOs have proven effective in predicting attitudes toward wildlife (Hartel et al. 2015) and behavioral intention to support wildlife management decisions (e.g., Bright et al. 2000; Dougherty et al. 2003; Hermann et al. 2012; Sijtsma et al. 2012).

Attitudes are an evaluation, either favorable or unfavorable, of a person, object, or action (Manfredi and Dayer 2004) and are important because they influence behavior. Attitudes can focus on either a general or a specific object. For example, if “wood bison” are the object, the evaluation reflects a general attitude. If “wood bison reintroduction in Alaska during 2015” is the object, the evaluation reflects a more specific evaluation. We focused on general attitudes toward wood bison.

Attitudes have both a cognitive and an evaluative (or affective) dimension. The cognitive aspect refers to beliefs about the attitude object. Beliefs are what we think to be true, but are not necessarily objective facts. The evaluative component refers to whether the individual views the attitude object as positive or negative. To predict behavior, both the cognitive and the evaluative characteristics of an attitude must be understood. For example, one person may have a cognitive belief that wood bison are dangerous to humans and evaluate bison negatively because of fear. Another person may also believe wood bison are dangerous, but feel positively toward them because they are excited by the potential danger. Both individuals share the belief that wood bison are dangerous, but their evaluations are different and may vary depending on context.

In attitude research, *affect* represents *feelings* experienced by humans; *emotions* are in this category (Manfredi 2008). Although the relationships among value orientations, attitudes, and behavioral intention have received considerable amount of attention in the literature (Vaske and Manfredi 2012), less attention has focused on the role of emotions in wildlife decision making (Manfredi 2008; Jacobs et al. 2012a, b; Engel et al. 2016).

People do not exhibit emotional reactions randomly, but rather in response to specific objects, events, or situations. The evaluation of a situation leads to an emotional appraisal, which affects the emotional response (Scherer 1999). The criteria that influence the appraisal are emotional dispositions. Emotional dispositions reflect *who* you are as an individual (Hamaker et al. 2007), are always present, even if they are not active, and are relatively stable. Similar to many phobias, a disposition to fear wood bison is usually stable.

Fear can include a range of emotional components such as anxiety, worry, and outrage (Sjöberg 2000; Gore et al. 2006). Large herbivores may elicit fear if they are seen

near roads and runways, attack and injure people, damage property, transmit disease, and/or cause vehicle collisions (Sudharsan et al. 2009; Decker et al. 2010; Vaske and Lyon 2011). We focused on fear as an emotional disposition.

Based on previous research (e.g., Fulton et al. 1996; Vaske and Donnelly 1999; Whittaker et al. 2006; Manfredo 2008; Vaske and Manfredo 2012; Engel et al. 2016), we hypothesized that mutualism, domination, and fear would influence attitudes and behavioral intention (Fig. 1). Based on the cognitive hierarchy, we predicted that attitude would mediate the relationships between the general WVO/fear disposition and the specific support for lethal management. The following hypotheses were advanced:

- H₁:** Domination will negatively correlate with attitudes toward wood bison.
- H₂:** Domination will positively correlate with behavioral intention to support lethal management of wood bison.
- H₃:** Mutualism will positively correlate with attitudes toward wood bison.
- H₄:** Mutualism will negatively correlate with behavioral intention to support lethal management of wood bison.
- H₅:** Fear will negatively correlate with attitudes toward wood bison.
- H₆:** Fear will positively correlate behavioral intention to support lethal management.
- H₇:** Attitudes will negatively correlate with behavioral intention to support lethal management.

MATERIALS AND METHODS

Study area and population

The study was conducted in Anchorage and Fairbanks, Alaska, U.S.A; the two urban centers closest to the wood bison restoration location (Fig. 2). In Alaska, urban centers form the largest public constituencies and thus have the potential to influence decision making. Understanding how urban residents view wood bison management is important for gauging public trust and support for this species. Only adult (> 18 years) Anchorage and Fairbanks residents participated in the study. The sampling frame was generated from the most recent telephone directories (Alaska Communications 2014a, b) for each city. A random sample of phone numbers and a random selection of an individual within the household were used to obtain the potential respondent base. Potential respondents were then called to request permission to send a questionnaire to their address.

Data collection

Data were obtained between the months of June and August of 2015. Each potential respondent was sent the questionnaire, a cover letter outlining the research and its importance, and a pre-stamped return envelope. A total of 750 questionnaires were mailed to Anchorage residents and 700 to Fairbanks residents. There were 68 questionnaires undeliverable to Anchorage residents and 53 were undeliverable to Fairbanks residents. The response rate for Anchorage residents was 36% ($n = 243$) and for Fairbanks

Fig. 1 Hypothesized model of relationships between value orientations, fear, attitudes, and behavioral intention. (+) indicates a positive hypothesized relationship between constructs and (−) indicates a negative hypothesized relationship between constructs

Fig. 2 Map of Alaska illustrating the urban study area and the reintroduction site of wood bison (Courtesy of Nathan Pamperin, Alaska Department of Fish and Game)

42% ($n = 272$), yielding an overall response rate of 39%. Budget restraints did not allow for a non-response bias check. In general, however, distribution of responses in terms of gender and race were similar to that of the population of Alaska.

Variables in the model

The questionnaire contained 18 variables, organized into four latent constructs: WVO (3 mutualism, 4 domination), fear of wood bison (5 items), attitudes toward wood bison (3 items), and the behavioral intention to support or oppose lethal management under specific situations (3 items). All items used were coded on a 5-point Likert scale ranging from -2 for strongly disagree to 2 for strongly agree (WVO, fear, attitudes) or extremely unacceptable to extremely acceptable (behavioral intention).

The three general mutualism variables were: (1) animals should have rights similar to the rights of humans, (2) I feel a strong emotional bond with animals, and (3) we should strive for a world where humans and wildlife can live side

by side without fear. The four domination items were: (1) humans should manage wildlife populations so that humans benefit, (2) we should strive for a world where there is abundance of wildlife for hunting and fishing, (3) wildlife are on earth primarily for people to use, and (4) people who want to hunt should have the opportunity to do so (Fulton et al. 1996; Jacobs et al. 2014b). The general fear disposition of wood bison was measured with five variables: (1) fear for own personal safety, (2) fear for own children's safety, (3) fear for own pet's safety, (4) fear for the spread of disease, and (5) fear for damage to own personal property.

Attitudes were measured by asking respondents to evaluate whether they thought wood bison in Alaska to be: bad or good, harmful or beneficial, and negative or positive (Manfredo et al. 1992, 2004). Behavioral intention to support or oppose lethal management was measured for three scenarios: (1) if a wood bison is seen near the runway, (2) if a wood bison damages your property, and (3) if a wood bison attacks and injures you or someone in your community (Table 1).

Table 1 Means and standard deviations for behavioral intention scenario items

Behavioral intention scenarios	Mean ^a	SD
If a wood bison is seen near the runway how acceptable or unacceptable would it be for Fish & Game to kill the wood bison?	− 0.86	1.29
If a wood bison damages property how acceptable or unacceptable would it be for Fish & Game to kill the wood bison?	− 0.94	1.24
If a wood bison attacks and injures you or someone in your community how acceptable or unacceptable would it be for Fish & Game to kill the wood bison?	− 0.06	1.54

^a Variable coded on a 5-point Likert scale from strongly disagree (− 2) to strongly agree (2)

Data analysis

Independent sample *t* tests were used to verify that responses from residents of Anchorage and Fairbanks were not statistically different to allow for combining of the two samples. Cronbach's alpha was used to measure internal consistency within each construct (Bland and Altman 1997; Vaske 2008). Ordinary least squares regression

models were used to determine whether specific attitudes mediated the relationship between WVO (domination and mutualism)/general fear and behavioral intention (support or opposition for lethal management).

RESULTS

Descriptive statistics

There were no significant differences ($p > 0.05$) in responses from Anchorage and Fairbanks residents for the variables used in the analysis; responses from the two cities were combined. The mean age of respondents was 61 years; 58% of the respondents were male, 42% were female.

Cronbach's alphas for the five constructs ranged from 0.66 to 0.91 (Table 2). Deleting any of the items from its associated concept did not improve the overall alpha. The corrected item total correlations were always larger than the recommended 0.4 (Vaske 2008). For all of these reasons, items were grouped with their respective latent concepts and composite indices were computed.

Table 2 Reliability analyses for WVO, fear, and attitude constructs used in the regression model

Concept variable	Item total correlation	Alpha if item deleted	Cronbach alpha	Mean ^a	SD
WVO: domination			0.77		
Humans should manage wildlife populations so that humans benefit	0.66	0.67		0.54	1.25
We should strive for a world where there is an abundance of wildlife for hunting and fishing	0.54	0.74		1.05	1.08
Wildlife are on earth primarily for people to use	0.55	0.74		− 0.45	1.40
People who want to hunt should have the opportunity to do so	0.59	0.72		1.20	0.96
WVO: mutualism			0.66		
Animals should have rights similar to the rights of humans	0.50	0.51		− 0.44	1.31
I feel a strong emotional bond with animals	0.45	0.59		0.58	1.14
We should strive for a world where humans and wildlife can live side by side without fear	0.46	0.57		0.12	1.33
Fear			0.91		
I fear for my own personal health and safety	0.88	0.87		− 1.75	0.60
I fear for my children's health and safety	0.87	0.87		− 1.73	0.64
I fear for my pet's health and safety	0.86	0.87		− 1.71	0.66
I fear for the spread of disease by wood bison	0.59	0.95		− 1.40	0.92
I fear for my own property	0.79	0.89		− 1.72	0.67
Attitudes			0.91		
Do you think of wood bison as bad or good?	0.81	0.87		1.44	0.83
Do you think of wood bison as harmful or beneficial?	0.81	0.87		1.32	0.88
Do you think of wood bison as negative or positive?	0.82	0.86		1.44	0.85

^a Variable coded on a 5-point Likert scale from strongly disagree (− 2) to strongly agree (2)

Fig. 3 Regression model illustrating regression coefficients for significant relationships within the model. The superscripts represent the specific situation the regression is testing the behavioral intention for. ^aSupport for lethal management if a wood bison is seen near the runway, ^bsupport for lethal management if a wood bison damages your property, and ^csupport for lethal management if a wood bison attacks you or someone in your community. **A p value < 0.001 and *a p value < 0.005

Regression models

The first regression predicted attitudes toward wood bison using mutualism, domination, and fear as the independent variables (Fig. 3). Consistent with H3, mutualism was positively related to attitudes ($\beta = 0.18$, $p < 0.001$). Individuals with a mutualism orientation were more likely to hold positive attitudes toward wood bison. As predicted by H5, fear was negatively related to attitudes ($\beta = -0.38$, $p < 0.001$). People who were fearful of wood bison were more likely to hold negative attitudes. Although domination statistically influenced attitudes toward bison ($\beta = 0.19$, $p < 0.001$), the coefficient was positive (i.e., not in the predicted negative relationship). This finding does not support H1. Taken together, the three predictors explained 12.5% of the overall variance in attitudes toward wood bison.

The second regression looked at the scenario where a wood bison is seen near a community's airport runway. The model examined relationships between WVO, fear, attitudes, and behavioral intention (Fig. 3). Domination (H2), mutualism (H4), and fear (H6) all significantly influenced behavioral intention to support lethal management. As predicted, domination ($\beta = 0.19$, $p = 0.003$) and fear ($\beta = 0.16$, $p < 0.001$) positively related to behavioral intention, whereas the mutualism negatively related to the behavioral intention to support lethal management ($\beta = -0.17$, $p < 0.001$). Attitudes toward bison did not

significantly influence behavioral intention (rejecting H7). This regression explained 9.7% of the overall variance.

The third regression looked at the scenario where a wood bison damages property. The model examined relationships between WVO, fear, attitudes, and behavioral intention (Fig. 3). The results again showed that domination (H2), mutualism (H4), and fear (H6) all significantly influenced behavioral intention to support lethal management. As hypothesized, domination ($\beta = 0.20$, $p < 0.001$) and fear ($\beta = 0.15$, $p = 0.001$) positively related to behavioral intention, whereas mutualism negatively related to the behavioral intention to support lethal management ($\beta = -0.15$, $p = 0.001$). Attitudes toward bison did not significantly influence behavioral intention (rejecting H7). This regression explained 12.1% of the overall variance.

The fourth regression looked at the scenario where a wood bison attacked and injured someone. The model included the same variables as regressions two and three (Fig. 3). The results showed that domination (H2) and mutualism (H4) significantly influenced behavioral intention to support lethal management of wood bison. For this scenario, however, fear as well as attitudes did not significantly influence behavioral intention (rejecting H6, H7). The domination value orientation ($\beta = 0.17$, $p < 0.001$) positively related to behavioral intention, whereas the mutualism value orientation negatively related to the behavioral intention to support lethal management ($\beta = -0.14$, $p = 0.003$). This regression explained 8.1% of the overall variance.

DISCUSSION

Overall, our findings show a high degree of tolerance by the sampled population to coexist with wood bison. Acceptance of lethal management strategies for wood bison was very low in the less severe situation and still generally low in the more severe scenarios. Residents were more supportive of non-intensive management strategies in most scenarios.

These results supported previous findings regarding the influence of WVO on behavioral intention (e.g., Loyd and Miller 2010; Hermann et al. 2012; Sijtsma et al. 2012). Consistent with theory, individuals with a mutualism value orientation were less likely to support lethal wildlife management (Teel and Manfredo 2010). Similarly, those with a domination value orientation were more likely to support lethal control (Schwartz 2006; Manfredo et al. 2009; Teel and Manfredo 2010). This finding might reflect the high density of hunters in Alaska. In 2015, around 190 000 Alaska residents possessed hunting and fishing licenses; representing approximately 27% of the total population (Statewide Licensing Database 2015). This number might suggest a utilitarian population that is dependent and appreciative of wildlife; thus, explaining the positive relationship.

Previous research has repeatedly found that attitudes are a direct predictor of behavioral intention (e.g., Vaske and Donnelly 1999; Vaske and Manfredo 2012; Engel et al. 2016) and mediate the relationship between value orientations and behavior. In our data, attitude did not influence behavior in any of the three scenarios, thus contradicting previous research. Given that this study was conducted in 2015, the same year as the reintroduction, attitudes toward wood bison might not have been strong and present on people's mind. Although attitudes can be created, it takes a concentrated effort (Enck and Brown 2002). Prior to the discovery of chronic wasting disease (CWD) in Wisconsin, for example, few people knew about this disease; yet, they demonstrated strong attitudes toward deer and deer hunting (Heberlein and Stedman 2009). Because deer are important in Wisconsin, major newspapers published CWD stories at a rate of more than one a day for 10 months during 2002. Within weeks, new attitudes were created along with behavioral intentions and documented changes in behavior. This level of publicity and communication did not happen in Alaska with respect to the reintroduction to wood bison. Such evidence suggests that people interviewed might lack the knowledge and information about the wood bison reintroduction initiative, thus influencing their attitudes and behavioral intentions. Previous research has found that knowledge both indirectly and directly influence behavioral intention (Vaske and Donnelly 2007; Espinosa and Jacobson 2012; Slagle et al. 2012). In the case of desert

tortoise management in California, high knowledge levels were linked to more well developed attitudes and therefore effectively influenced behavioral intention (Vaske and Donnelly 2007). A model including knowledge levels could be effective in helping grasp cognitive understandings of the complex and anomalous Alaskan context as well as offer a baseline assessment of residents' knowledge levels surrounding wood bison conservation in the state.

Lack of experiences and exposure to lethal management of a reintroduced species might also have influenced the fact that attitudes did not predict behavioral intentions (Fazio et al. 1982). As experiences increase, whether positive or negative, attitudes will become more developed and will likely better predict behavioral intentions (Bath and Enck 2003). Despite the evidence that attitudes predict behavioral intentions, when attitudes and behavioral intention are not in the same level of specificity (i.e., attitudes toward wood bison reintroduction), attitudes may not predict the support/opposition to reintroduction (Ajzen and Fishbein 1977; Manfredo 2008). The lack of specificity between attitudes and behavioral intention in this analysis could be another factor affecting the lack of correlation between these two variables.

Fear was the strongest predictor of attitudes, and influenced behavioral intention in two of three scenarios. While it influenced behavioral intentions in scenarios where a bison is seen near the runway or when a bison damages property, fear did not predict behavioral intention in the scenario that a wood bison attacked and injured someone. The model provided a clear example of the predictive power of the emotional disposition of fear on attitudes toward wildlife and support for lethal management (Vaske and Manfredo 2012). Our results indicated that individuals who have higher levels of fear toward wildlife are likely to have more negative attitudes toward them and, in turn, influence their intention to support wildlife management decisions (Decker et al. 2010; Johansson et al. 2012). Our findings, however, contradict research by Jacobs et al. (2014a) where fear was not a strong predictor for acceptance of lethal management of wolves among Dutch and Canadians. This difference may be attributable to the different species in questions. Nonetheless, our findings depict the predictive potential of fear as an emotional disposition in the cognitive hierarchy framework.

CONCLUSION

We have provided a baseline for understanding WVO, fear, attitudes, and support/opposition for lethal management of wood bison in Alaska. In an environment of uncertainty, when managers might not know how best to respond to bison-human interactions, we have provided direction on

when the public wants action to be taken. Future research regarding lethal management, wildlife restoration, and cognitive and emotional research may consider the following points. First, fear was the only emotional disposition we examined. More emotion-based research is necessary to understand wildlife restorations and lethal management in different contexts. Including multiple emotions would build theory and identify better situational understandings (e.g., Jacobs et al. 2012b, 2014a; Vaske et al. 2013).

Second, research is necessary to examine the role that knowledge plays in a cognitive model. The lack of attitudinal mediation between value orientation and behavioral intention could be explained by an overall lack of knowledge of the wood bison project. Third, the average age of respondents in this study (61) was higher than the average age of residents in both of the study areas. Part of our results may be attributed to the older age of our sample. Future research should explore these relationships with a younger sample. Lastly, we examined two urban regions closest to the resource. Future research might focus on rural areas near the restoration site. Research suggests that proximity to a resource influences the attitudes and behavior toward the resource (Boholm and Löfstedt 2004; Jurowski and Gursoy 2004; Karlsson and Sjöström 2007). This suggests that attitudes and behaviors of urban Alaskan's may be different than residents in close proximity to the wood bison restoration site. Anchorage and Fairbanks residents make up nearly half of the state's population (Alaska Census 2010). Despite the distance to the resource, understanding this urban population can assist wildlife managers in implementing successful and preferred wildlife management plans in the future. In addition to the urban population, understanding the rural residents' perceptions toward wood bison reintroduction and lethal management is equally important as they are closest to the resource and likely to have more interaction with the animals.

The “social climate” (Bright and Manfredi 1996) of the wood bison restoration project is in its infancy and therefore we anticipate it changing over time as bison numbers grow, interactions increase, and hunting opportunities begin. In this sense, it is crucial to understand and monitor these changes to best inform future management decisions. Future efforts, however, should study changes over time. Human dimensions of wildlife research are a holistic and continuous process, especially with the uniqueness and changing nature of this restoration project. The strength of this research is in providing baseline information in the beginning of the restoration project. The benefits of having a baseline study will be fully realized when conducting

longitudinal research in conjunction with the biological monitoring.

Our model contributes to a theoretical and practical understanding of large herbivore restoration. For example, this research can assist wildlife managers and decision makers in identifying key areas of concern associated with public attitudes and sentiments toward newly reintroduced herbivore species, helping to inform appropriate management strategies. We have articulated the level of tolerance and support for wood bison in Alaska by the urban public of Anchorage and Fairbanks. Residents expressed low levels of fear, positive attitudes, and low support for lethal management. Despite limitations, our results allow managers to better understand the implications of taking certain actions with a newly reintroduced species.

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