



## Original Article

# Stakeholder Attitudes and Beliefs Toward Wild Pigs in Georgia and Illinois

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**ABSTRACT** A variety of problems are associated with wild pigs (*Sus scrofa*; e.g., crop damage, habitat destruction, transfer of infectious diseases to livestock). We contrasted stakeholder attitudes and beliefs toward wild pigs in 2 U.S. states: 1 with a long-established, widespread population of wild pigs (GA) and 1 with a recently established limited population (IL). We conducted mail surveys of farmers in the Southwest Cooperative Extension Service District in Georgia during January–February 2012 ( $n = 471$ , response rate = 39%) and Illinois farmers ( $n = 3,035$ , response rate = 58%) during July–September 2013. The surveys included 4 positive items (e.g., I enjoy seeing feral hogs around my property) and 3 negative statements (e.g., Feral hogs should be eliminated where ever possible). Survey participants in both states generally agreed with the negative statements about wild pigs and disagreed with positive aspects regarding wild pigs. In general, the level of consensus for these statements was similar for both states. These findings suggest farmers in a state with low populations of wild pigs (IL) shared beliefs and attitudes with farmers in a state with a long-standing wild pig populations (GA). © 2016 The Wildlife Society.

**KEY WORDS** attitudes, farmers, feral pig, Georgia, Illinois, PCI<sub>2</sub>, *Sus scrofa*, wild pig damage.

Invasive nonnative species are a threat to biological diversity and can cause agricultural, pasture, and forestry losses (Convention on Biological Diversity 2015). Attitudes toward invasive nonnative species are influenced by potential economic losses or gains (Wang et al. 2006). Stakeholders have supported control or eradication of invasive species because of potential threats associated with them (Bremner and Park 2007). Wild pigs (*Sus scrofa*) are considered an invasive, nonnative, and nuisance species (Li et al. 2010, SEAFWA 2014). Attitudes toward wild pigs are often negative regardless of the damage they cause (Adams et al. 2005, Li et al. 2010, SEAFWA 2014). For example, among Mississippi, USA, agricultural producers, 68% held negative attitudes toward wild pigs even though few respondents had experienced any damage (Fogarty 2007).

Once largely confined to southern United States (Wood and Lynn 1977), wild pig populations have spread and are now present in  $\geq 42$  states (Else et al. 2012, USDA-APHIS 2013, Bevins et al. 2014). The spread of wild pigs across the United States has become a concern because of the damage they cause. Wild pigs can have an ecological impact by wallowing, rooting, and feeding; these actions increase soil

erosion, degrade water quality, and damage or destroy agriculture and forest crops (Campbell and Long 2009, SEAFWA 2014). Further effects result from pig predation of wildlife, including ground-nesting birds (e.g., wild turkeys [*Meleagris gallopavo*]), reptiles, amphibians, small mammals, and the young of larger mammals (e.g., white-tailed deer [*Odocoileus virginianus*]; Beach 1993, Tolleson et al. 1993, Taylor and Hellgren 1997). Other problems include competition with wildlife for food and carrying diseases harmful to humans, pets, wildlife, and livestock (Wood and Lynn 1977, Beach 1993, Hutton et al. 2006, Schley et al. 2008).

Distribution and size of wild pig populations varies among states; Georgia and Illinois provide contrasting examples in the United States. In Georgia, wild pigs have been reported for approximately 450 years and populations were established by 1900 (Moore 1840, Kemble 1863, Wood and Lynn 1977). Wild pigs were found in 74 of 159 Georgia counties in 1982 (Southeast Cooperative Wildlife Disease Study 1982). Since then their distribution has steadily grown and wild pigs are now in  $\geq 147$  counties in Georgia (Southeastern Disease Cooperative Wildlife Disease Study 2015). In contrast, wild pigs were first reported in Illinois during the early 1990s. At the time of this study, distribution was limited to 4 populations found in  $< 12$  of 102 counties in Illinois (T. Esker, Illinois Department of Natural Resources, personal communication).

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A variety of methods are available to mitigate the impact of wild pigs (e.g., aerial shooting, baiting and shooting, hunting with dogs, sport-hunting, trapping). Lethal control methods, however, are not always acceptable to stakeholders. Effective wild pig management by state and federal agencies requires an understanding of public opinion regarding these animals.

Attitudes are evaluations of a general or specific object and derived from cognitive (e.g., beliefs) and affective (e.g., emotions) components (Eagly and Chaiken 1993). For example, an attitudinal statement might be, "Feral hogs are a threat to people." The object of this general attitude is feral hogs; the evaluative component relates to the "threat to people." The object of a specific attitude might refer to the presence of wild pigs on a person's property and the negative impacts pigs are currently having on livestock. Similar to attitudes, beliefs can have general and specific objects and reflect what people think to be true, but are not necessarily based on facts (Vaske and Manfredo 2012). For example, a belief statement might be, "Feral hogs eat a variety of foods." Unlike an attitude, this statement does not include an evaluation of whether this perceived truth is good or bad.

Attitudes and beliefs can change over time, vary depending on the object, and can influence behavior (Manfredo et al. 2009). Studies of wildlife disease have shown that attitudes often do not exist toward a specific disease before disease introduction (Stafford et al. 2007). Immediately following introduction, attitudes can be strong, yet fade quickly (Holsman and Smail 2006). Such changes in attitude can influence behavioral change. These findings suggest that as people become more familiar with something, it becomes less threatening; the same may be true with wild pigs. We examined whether Georgia and Illinois farmers differed in their attitudes toward and beliefs about wild pigs.

## METHODS

### Mail Survey

We conducted 2 separate mail surveys to obtain data. The Georgia survey (Human Subjects Project 2012-10023-0) was conducted in January–February 2012 (Mengak 2012). We selected participants from a list of attendees at educational programs provided by the University of Georgia Cooperative Extension Service in the Southwest Cooperative Extension Service District ( $n = 1,300$ ; <http://extension.uga.edu/about/county/index.cfm>) and from a list of cooperating farmers associated with the Joseph E. Jones Ecological Research Center ( $n = 37$ ). We mailed potential respondents a survey packet containing a cover letter explaining the study, a Frequently Asked Question sheet, a questionnaire, and a bulk mail postage-paid envelope. We sent a reminder/thank you postcard at 2 weeks after the initial mailing and second survey packet 2 weeks after the postcard. We did not conduct a nonresponse check because of budget constraints.

We mailed the Illinois survey (Human Subjects Review no. 10126) July through September 2013 to 5,320 randomly

selected farmers who owned  $\geq 1$  acre (0.4 ha) of land in counties identified by Illinois Department of Natural Resources biologists as those where wild pigs were observed and adjacent counties (Harper et al. 2014). Participants were selected by a commercial sampling company (Survey Sampling International, Minnetonka, MN) and mailed a survey packet containing a cover letter explaining the study, a questionnaire, and a first-class stamped return envelope. We sent a reminder or thank you postcard 2 weeks later. We repeated the mailings on 2-week intervals for a total of 2 survey packets and 2 postcard mailings. We did not conduct a check for nonresponse bias because the response rate exceeded 50% (Babbie 2013).

### Variables

We examined only those variables that were measured in both questionnaires. Variables consisted of 7 belief/attitudinal statements about wild pigs. Of these statements, 4 were positive—"I enjoy seeing feral hogs around my property," "Feral hogs are an important part of the environment," "Feral hogs are not a threat to the safety of people," and "People should learn to live with feral hogs near their homes or farms"; and 3 were negative—"I worry about problems feral hogs might cause to my property," "Feral hogs are a source of disease," and "Feral hogs should be eliminated where ever possible." We used a scale of 1 (strongly disagree) to 5 (strongly agree) on the Georgia questionnaire and 1 (strongly disagree) to 7 (strongly agree) on the Illinois questionnaire, with "Unsure" as the neutral point on each scale. Scales differed because investigators conducted surveys independently of one another. To standardize responses and allow for direct comparison of the 2 studies we collapsed the scales (from 5-point and 7-point) to a 3-point scale: -1 (disagree), 0 (unsure), and 1 (agree).

### Analysis

We calculated the means for attitude and belief statements regarding wild pigs. We also measured consensus regarding these concepts. Traditional measures of consensus have included standard deviation, coefficient of variation, and interquartile range (Krymkowski et al. 2009, Manning 2011). All of these measures, however, are statistics that do not have an upper bound, which challenges the interpretation of findings.

The Potential for Conflict Index<sub>2</sub> (PCI<sub>2</sub>) was developed to help address these issues and facilitate an understanding and applicability of human dimensions findings to managerial concerns (Vaske et al. 2010). The PCI<sub>2</sub> values range from 0 to 1. The least amount of consensus and greatest potential for conflict (PCI<sub>2</sub> = 1) occurs when responses are equally divided between 2 extreme values on a response scale (e.g., 50% extremely unacceptable, 50% extremely acceptable). A distribution with 100% at any one point on the response scale yields a PCI<sub>2</sub> of 0 and suggests complete consensus and no potential for conflict.

We compared Georgia and Illinois responses using a  $\chi^2$  test. We used Cramer's  $V$  to evaluate effect size. Based on the guidelines suggested by Vaske (2008), we considered a  $V = 0.1$  to be a minimal effect size,  $V = 0.3$  to be typical, and

**Table 1.** Attitudes and beliefs toward wild pigs conveyed by farmers via mail surveys conducted in the U.S. states of Georgia (2012; Mengak 2012) and Illinois (2013; Harper et al. 2014).

Statement	State	Disagree %	Unsure %	Agree %	$\chi^2$	<i>P</i>	<i>V</i>
Feral hogs are a source of disease.	GA	7	32	61	37.10	<0.001	0.11
	IL	7	20	73			
I enjoy seeing feral hogs around my property.	GA	90	3	7	29.00	<0.001	0.09
	IL	93	5	3			
Feral hogs are an important part of the environment.	GA	81	11	8	23.19	<0.001	0.08
	IL	88	8	4			
Feral hogs are not a threat to people.	GA	67	14	19	19.58	<0.001	0.08
	IL	77	11	12			
People should learn to live with feral hogs near their homes or farms.	GA	86	7	7	11.04	<0.005	0.06
	IL	91	4	5			
I worry about problems feral hogs might cause to my property.	GA	15	4	81	5.11	0.078	0.04
	IL	17	6	78			
Feral hogs should be eliminated wherever possible.	GA	10	7	83	1.57	0.455	0.02
	IL	8	7	84			

$V=0.5$  to be substantial. We used the  $PCI_2$  and associated statistical difference ( $d$ ) tests for comparing 2  $PCI_2$  values. A  $d$  value  $>1.96$  was considered to be statistically different ( $P < 0.05$ ; Vaske et al. 2010).

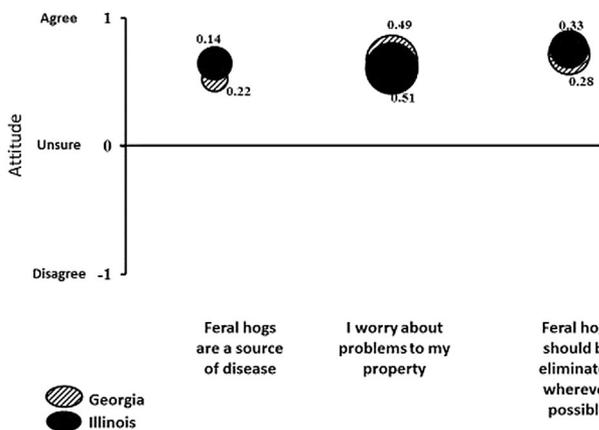
## RESULTS

For the initial Georgia mailing ( $n = 1,337$ ), 137 surveys were undeliverable because of incorrect addresses or deceased participants. Of the returned surveys, 471 (response rate = 39%) were usable. For the initial Illinois mailing ( $n = 5,320$ ), 45 were undeliverable because of incorrect addresses or deceased participants. We received 3,061 questionnaires (response rate = 58%), of which 3,035 were usable.

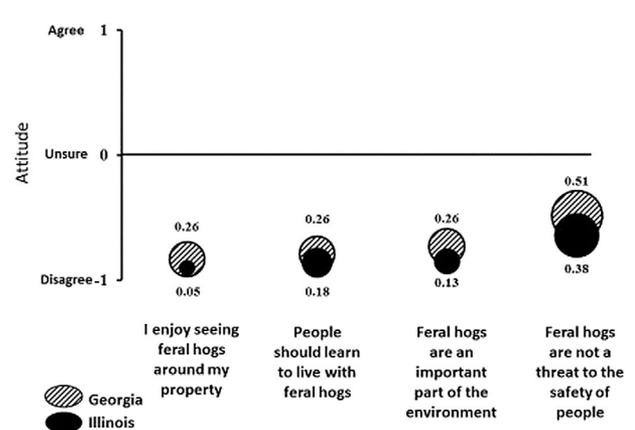
We found differences between the Georgia and Illinois respondents for 5 of the 7 statements ( $\chi^2$  ranged from 11.04 to 37.10,  $P \leq 0.005$ ); however, effect sizes ( $V$ ) were minimal and ranged from 0.06 to 0.11 (Table 1). Tests for differences in  $PCI_2$  ( $d$ ) for the 3 negative statements revealed no differences in  $PCI_2$  values (Fig. 1): “Feral hogs are a source of disease” (Georgia  $PCI_2 = 0.22$ ; Illinois  $PCI_2 = 0.14$ ,  $d = 1.72$ ), “I

worry about problems to my property” (Georgia  $PCI_2 = 0.49$ ; Illinois  $PCI_2 = 0.51$ ,  $d = 0.42$ ), and “Feral hogs should be eliminated wherever possible” (Georgia  $PCI_2 = 0.49$ ; Illinois  $PCI_2 = 0.51$ ,  $d = 1.14$ ). In other words, the level of consensus regarding each statement was similar between Illinois and Georgia.

The  $PCI_2$  values for the positive statements toward wild pigs differed between the states (Fig. 2). For all statements, respondents from Illinois reported greater consensus than those from Georgia. For example, Illinois respondents had a  $PCI_2$  value of 0.05 for the statement “I enjoy seeing feral hogs around my property;” the  $PCI_2$  value for Georgia respondents was 0.26 ( $d = 3.75$ ). For the statements “People should learn to live with feral hogs” (Georgia  $PCI_2 = 0.26$ ; Illinois  $PCI_2 = 0.18$ ,  $d = 1.99$ ) and “Feral hogs are an important part of the environment” (Georgia  $PCI_2 = 0.26$ ; Illinois  $PCI_2 = 0.13$ ,  $d = 3.34$ ),  $PCI_2$  values differed. Each score suggested low potential for conflict; moreover, responses were skewed toward “disagree,” suggesting respondents from both states disliked wild pigs. The final statement, “Feral hogs are not a threat to the safety of people”



**Figure 1.** Potential for Conflict Index ( $PCI_2$ ) for statements measuring 3 negative beliefs toward wild pigs as determined from mail surveys of farmers in the U.S. states of Georgia (2012; Mengak 2012) and Illinois (2013; Harper et al. 2014).



**Figure 2.** Potential for Conflict Index ( $PCI_2$ ) for statements measuring 4 positive beliefs toward wild pigs as determined from mail surveys of farmers in the U.S. states of Georgia (2012; Mengak 2012) and Illinois (2013; Harper et al. 2014).

had the greatest potential for conflict among Georgia ( $PCI_2 = 0.51$ ,  $d = 2.93$ ) and the second greatest among Illinois ( $PCI_2 = 0.38$ ) respondents. Compared with Illinois respondents, those from Georgia consistently had greater  $PCI_2$  values, meaning less consensus.

## DISCUSSION

Survey respondents from both Georgia and Illinois agreed with the negative statements and disagreed with the positive aspects regarding wild pigs. These findings suggested that attitudes and beliefs of respondents in both states were negative toward the species. This is consistent with invasive species data. Effect sizes (Cramer's  $V$ ) for comparisons between states were all  $< 0.11$ , meaning practical significance was minimal. Given differences in the time span for population establishment in these 2 states, our findings of similar negative beliefs and attitudes suggested farmers may not develop a tolerance or acceptance for this species as with other species (e.g., white-tailed deer; Decker and Purdy 1988). A study of beliefs toward wild pigs in Texas, USA, that included similar statements as those in our study also suggested that people viewed wild pigs negatively (Adams et al. 2005). Anecdotal evidence from wildlife managers throughout North America proposed greater acceptance of wild pig populations for hunting purposes; however, our findings do not support this attitude among farmers upon whose lands such populations must reside. Evidence of this lack of acceptance was found in the Georgia study, where farmers held negative beliefs toward wild pigs as game species and farmers with pigs on their land were more negative in their beliefs than farmers without wild pigs (Mengak 2012).

Lack of difference in attitudes and beliefs suggested presence of wild pigs, in terms of distribution and size of population, might not affect beliefs and attitudes toward wild pigs. Acceptance over time has been noted with wildlife species such as white-tailed deer, black bear (*Ursus americanus*), resident Canada geese (*Branta canadensis*), and coyote (*Canis latrans*; see Miller et al. 2000, 2013; Organ and Ellingwood 2000; Agee and Miller 2009), species for which beliefs and attitudes became more positive over time. Further research is needed to support this proposition, but if it holds it may be due to landowner perceptions of wild pigs not as wildlife, but invasive nonnative species (Stephenson 2013). Such a perception, if true, would be at odds with hunters who view wild pigs as game species.

## MANAGEMENT IMPLICATIONS

Anthropogenic factors resulting in movement of wild pigs into new areas is an issue of concern among wildlife managers. Although some people may view hunting as a means to reduce wild pig populations, most managers believe that hunting may encourage the spread of wild pigs into new areas (C. Soard, Kentucky Department of Fish and Wildlife Resources, personal communication; C. Yoest, Tennessee Wildlife Resources Agency, personal communication). Our study suggests that, consistent with the views of wildlife managers, farmers are opposed to moving wild pigs into states without existing populations. Assessing conflict

becomes important in managing wild pigs because lower potential conflict may translate to management and implementation programs being more readily accepted by farmers. Understanding landowner attitudes and concerns enables managers to approach farmers from their perspective regarding wild pigs (Adams et al. 2005, Harper et al. 2014).

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