

Stakeholder Perspectives on Wild Pig Management in Alabama
by

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Abstract

The wild pig (*Sus scrofa*) is a globally detrimental invasive species with negative economic, ecological, and public health impacts. Despite the well-known negative impacts associated with wild pigs, little is known about the human dimensions of their management. To address this lack of knowledge, my research goal was to determine stakeholder perspectives towards wild pig management. Specifically, I sought to evaluate stakeholder perspectives on the potential use of toxicants and understand wild pig management efforts on privately owned lands, the perceived impact of wild pigs, and policy beliefs. To address these questions, I surveyed farmers, hunters, and forestland owners across the state of Alabama. Overall my findings suggest stakeholders are generally accepting of toxicant use in wild pig management and that pigs have negative economic, ecological, and public health impacts. However less than half of landowners participate in wild pig control, but believe that the responsibility of managing and paying for damages associated with wild pigs lies with individual landowners. These findings informs managers and policy makers that improved wild pig management would be supported by the majority of stakeholders

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Chapter 1

Stakeholder Perspectives Towards the Use of Toxicants for Managing Wild Pigs

Abstract

The wild pig (*Sus scrofa*) is one of the most detrimental invasive mammals in the Southeastern US. Lack of adequate population control has allowed pigs to become well established across the landscape, wreaking economic and ecological havoc. Given the need for additional wild pig management options, two toxicants, warfarin and sodium nitrite, are at the forefront of the discussion regarding potential future management options. However, no research has been conducted looking into stakeholders' perspectives towards the use of toxicants in wild pig management. Given the lack of knowledge, my goal was to determine stakeholders' perspectives towards the legal use of toxicants for managing wild pigs. I surveyed 1822 individuals from three stakeholder groups (hunters, farmers, and forestland owners) across Alabama during February 2018 following the Tailored Design Method and achieved a 9% response rate. All three stakeholder groups were generally supportive of toxicant use, though their views differed slightly by group. Furthermore, all stakeholder groups were supportive of toxicant purchasing and use regulations, while accidental water contamination, human health impact, and incorrect usage of a toxicant were stakeholders' greatest concerns. These results indicate that these groups would likely be in support of using toxicants for wild pig management in the state and could be a model for other states or locations. Consequently, these results have direct implications for shaping the potential future policy and use of toxicants as a future wild pig management strategy.

Keywords: Alabama, human dimensions, invasive species, sodium nitrite, *Sus scrofa*, warfarin,

Introduction

The United States has approximately 50,000 significantly invasive species which are responsible for \$128-131 billion of damage per year (Pimentel et al. 2005). These cost estimates include both the damages caused by invasive species and the costs associated with their management and control (Pejchar and Mooney 2009). Due to novel disease exposure (Wilcove et al. 1998), competition, and/or predation, invasive species in the US are believed to be a major contributing factor for roughly half of the species listed as threatened or endangered under the Endangered Species Act (Wilcove et al. 1998; Czech et al. 2000; Seward et al. 2004; Pimental et al. 2005; Pimentel 2011). As a result, natural resource managers are using a variety of strategies to address the issue. While specific management techniques vary by species, the overall management of invasive species depends where on the invasion curve the species is at (Mihulka and Pysek 2001; Shih and Finkelstein 2008; Fleming et al. 2017). One species that is near the end of the invasion curve and requires long-term management is the wild pig (*Sus scrofa*).

Native to Eurasia and Northern Africa (Pimentel et al. 2005; Mayer 2009b; Barrios-Garcia and Ballari 2012) and present on all continents, excluding Antarctica (Barrios-Garcia and Ballari 2012), wild pigs (*Sus scrofa*) did not reach the continental US until the 1500s when early explorers (De Soto and Cortes) imported pigs as a food source (Seward et al. 2004; Mayer 2009b). Beginning in the late 1900s, people facilitated the rapid expansion of wild pigs across the US, with little expansion due to natural dispersal (Hulme 2003; Mayer and Brisbin 2009; Bevins et al. 2014). Specifically, unlawful translocation of pigs to new areas with the intention of creating a new game species, animals escaping from fenced shooting preserves (Mayer 2009b) or farms, and free-ranging pigs as an approach to husbandry (Mayer and Brisbin 2008) all contributed to the current distribution. Currently, wild pigs have been reported in 44 states

making them the most abundant free-ranging ungulate ever introduced in the US (Mayer 2009b). Given their widespread distribution, wild pigs have caused immense economic loss, particularly in the agricultural sector (Pimentel 2007; Mengak, 2012; Tanger et al. 2015; Anderson et al. 2016; Holderiath 2016;), and threatened ecological systems (Wood and Lynn Jr. 1977; Singer et al. 1984; Means and Travis 2007; Siemann et al. 2009; Jolley et al. 2010; Barrios-Garcia and Ballari 2012; Bevins et al. 2014;) and public health (Mayer 2009a; Barrios-Garcia and Ballari 2012; Jack et al. 2012; Bengsen et al. 2014), causing them to be a species of considerable management concern. Because of these economic and ecological impacts, a variety of management techniques have been developed to reduce wild pig populations and their associated impacts.

Wild pig management approaches include both lethal and non-lethal techniques. Lethal control techniques commonly include snares (Anderson and Stone 1993; Massei et al. 2011), ground shooting/hunting (with or without dogs) (Massei et al. 2011; Summers et al. 2017), aerial gunning (Saunders 1993), Judas pigs (McIlroy and Gifford 1997), and trapping (e.g., corral or box trap) followed by euthanasia (Massei et al. 2011; Bengsen et al. 2014). Non-lethal control techniques include fencing to limit exposure to sensitive areas (Reidy et al. 2008; Bengsen et al. 2014), repellents (Vilardell et al. 2008), and diversionary feeding (Massei et al. 2011). In areas with established wild pig populations, management tends to focus on mitigating or reducing impact through lethal and non-lethal methods, whereas areas with small or recently established populations typically use eradication via trapping and shooting to stop establishment (Mack et al. 2000; Hulme 2003; Massei et al. 2011). In either case, management is difficult due to the adaptive capability, evasiveness, and high fecundity of wild pigs. Furthermore, in most settings current management techniques have been ineffective, costly, and inefficient at reducing and

maintaining wild pig population at acceptable levels (Massei et al. 2011; Barrios-Garcia and Ballari 2012). In incidences where wild pig eradication was successful, eradication efforts took years and were extremely costly (Mccann and Garcelon 2008). As a result, researchers and managers have begun investigating the use of two toxicants, warfarin and sodium nitrite, as a cost and time effective and ecologically viable management technique in the US.

Successful reduction in wild pig abundance with warfarin has been demonstrated in various study areas in Australia with population decreases varying between 67% and 99% (McIlroy et al. 1989; Choquenot et al. 1990; Saunders et al. 1990). Additionally, complete eradication was achieved on Santiago Island in the Galapagos through combined hunting efforts and warfarin use (Cruz et al. 2005). Warfarin is an effective toxicant because it competes with vitamin K in the synthesis of a protein which is critical for the occurrence of blood-clotting within the wild pigs' body. Therefore, wild pigs expire via internal hemorrhaging from warfarin toxicity (Saunders et al. 1990). Warfarin as a rodenticide has been registered in the United States since 1952 (EPA, 1991), however it was only recently approved by the United States Environmental Protection Agency (EPA) in 2017 for use in wild pig management (EPA Reg. No. 72500-26, Decision No. 510475). Texas was the only state to legalize its use, but due to threats of litigation from stakeholders, the products registration was withdrawn and subsequently is no longer available for use within the state (Scimetrics LTD, 2017).

The second toxicant that has demonstrated a high degree of potential for effectively reducing wild pig abundance is sodium nitrite (Cowled et al. 2008; Lapidge et al. 2012; Shapiro et al. 2016). Field testing of sodium nitrite in Australia showed reductions in wild pig populations varying between 63% and 89% (Lapidge et al. 2012), while pen trials in the US achieved 95% mortality (Snow et al. 2017). Because wild pigs naturally lack the levels of

methaemoglobin reductase necessary to counteract the effects of sodium nitrite (Cowled et al. 2008), wild pigs expire due to severe methemoglobinemia, resulting in death from tissue hypoxia (Snow et al. 2017). Sodium nitrite is currently only registered for use in wild pig population control in New Zealand (Shapiro et al. 2016), and is in the process of applying for registration in Australia and the US (Lapidge et al. 2012; Snow et al. 2017).

As the potential is growing for the use of toxicants for managing wild pig populations in the US, understanding stakeholders' knowledge and perspectives about its use becomes increasingly important. In particular, the use of toxicants can be extremely controversial, and future wild pig management plans involving toxicants could be exceptionally slow or even fail without stakeholder support. While research has focused on understanding stakeholder attitudes towards wild pigs (Rollins et al. 2007; Mengak 2012; Harper et al. 2016; Caplenor et al. 2017), wild pig damage (Higginbotham et al. 2008; Mengak 2012; Jerrolds et al. 2014; Anderson et al. 2016) and management (Adams et al. 2005; Higginbotham et al. 2008; Anderson et al. 2016; Caplenor et al. 2017; Poudyal et al. 2017), no research has evaluated stakeholder attitudes towards the use of toxicants for managing wild pigs in the US. In fact, only one study from Australia has ever evaluated stakeholder attitudes towards toxicant use in pigs (Koichi et al. 2013). Koichi et al. (2013) found that only 34% of residents in the study area supported the use of toxicants for managing wild pig populations, with reasons for opposition including lack of target specificity and humaneness (Koichi et al. 2013). On the other hand, stakeholders' attitudes towards the use of toxicants for managing species including rats (*Rattus rattus* and *rattus novogicus*, Morzillo and Mertig 2011), foxes (*Vulpes vulpes*, Fisher et al. 2006), and various non-native species of New Zealand (Farnworth et al. 2014) suggest that while stakeholders have

valid concerns about toxicants, they are generally supportive of their use in managing populations.

Considering that toxicants may be on the verge of wider spread use for managing wild pigs, but that stakeholder attitudes towards their use are relatively unknown, my overarching goal was to quantify stakeholder perspectives towards the use of toxicants for wild pig population control. To address this goal, I had four main objectives that sought to determine: 1) stakeholder acceptability of two toxicants, sodium nitrite or warfarin, for managing wild pig populations; 2) perspectives on various types of possible purchasing and use regulations of wild pig toxicants, should they be legalized; 3) stakeholder concerns related to environmental and human health, application, and legal liability associated with the use of toxicants; and, 4) if stakeholder groups differ in their perspectives.

Methods

To address the research objectives, I created a social survey instrument consisting of 58 total questions, 11 of which were considered as part of this study. These 11 questions pertained to attitudes towards wild pigs, toxicants and hypothetical toxicant use, and wild pig management approaches (Appendix 1). Survey questions regarding respondents' attitudes towards wild pigs addressed questions such as whether or not respondents felt positively or negatively about the presence of wild pigs, and how respondents would like to see wild pigs population ns changed in the future. Before respondents were able to answer any questions pertaining to toxicant use in wild pig management, they were provided with a list of pertinent information about both warfarin and sodium nitrite (Appendix 1). Such information was provided in order to ensure that each respondent had the equivalent baseline knowledge and understanding of the two toxicants being considered. Questions regarding toxicant use addressed stakeholders' level of

acceptability, concerns surrounding the use of toxicants, and various hypothetical purchasing and use regulation, should a toxicant be legalized. The remaining questions addressed respondent perspectives on future wild pig management objectives. Previous surveys on stakeholder perspectives towards wild pigs provided insight for survey questions and formatting (Mengak 2012, Harper et al. 2014; Mississippi State University, Wild Hog Public Attitude Survey, unpublished).

The survey instrument was designed to be disseminated to three key stakeholder groups, hunters, farmers, and forestland owners throughout Alabama. These three groups were selected because they own the majority of private land within Alabama (US Census Bureau 1991; Hartsell and Johnson, 2005; USDA NASS, 2018) and therefore likely harbors wild pigs, but are also the most likely to interact with and be affected by wild pigs in the state. The draft survey was peer-reviewed in a pilot study of 10 volunteers from the School of Forestry and Wildlife Sciences at Auburn University, and reviewed by the Alabama Farmers Federation (ALFA), and Alabama Forest Owners Association (AFOA) to improve the quality of the survey instrument which was subsequently revised. The final survey was approved by the Auburn University Institutional Review Board (IRB) (Protocol #17-397 EX 1710), prior to administration.

Following the Tailored Design Method (Dillman et al. 2009), I administered the survey via the Internet in January, 2018, using Qualtrics. An invitation email with the link to the survey was disseminated to each of the three stakeholder groups using email addresses of the group members, followed by two reminder emails at two and four weeks after the initial email. Specifically, emails were sent by ALFA to all Alabama row crop, produce, hay, cattle, domestic pig, poultry, and sheep farmers within the ALFA membership list, which equated to approximately 10,700 individual farmers. To survey hunters I purchased 5,000 email addresses

of individuals who had purchased an Alabama hunting license for the 2017-2018 season from the Alabama Department of Conservation and Natural Resources (ADCNR). However, only 4,621 of the 5,000 email addresses were valid due to duplicates and obsolete email addresses. Finally, the AFOA distributed the email to all associated members who owned forestland in Alabama, approximately 4,000 individuals. In total approximately 19,321 people received invitation to participate in the survey. To differentiate between stakeholders each group received a separate and unique online link to the survey.

Unfortunately, testing for non-response bias was not possible based on the invitation and data collection requirements of both the software and human subjects' requirements. Specifically, IP addresses of respondents were not collected in order to protect respondent anonymity in accordance with the Auburn University IRB. Therefore I was unable use that information for non-response bias testing. Additionally, because ALFA and AFOA did not want to release the contact information of their members, each organization sent the survey in an email directly to their members. Again, because I lacked access to member email addresses in addition to IP addresses, there was no way to identify specifically who participated in the survey and who did not. Therefore non-response bias testing was not possible.

All survey respondents were required to provide consent in order to gain access to the survey, thereby acknowledging that they had read the consent letter, verifying that they were at least 19 years of age and agreeing to participate in the research project. At the end of the survey individuals were given the opportunity to provide their email address if they wanted to receive a summary of the survey results. To increase response rates, the survey was incentivized. At the completion of the survey, individuals were given the option to submit their name and mailing

address in a prize drawing to win 1 of 5 Amazon gift cards, each valued at \$100. The survey was closed at the beginning of March 2018.

Aside from demographic questions used to describe the sample, the remaining survey questions were scored on a Likert scale with the majority being either five or seven point to eight points. A single eight point Likert scale was the result of adding an eighth option of “eradication” to the seven point survey question pertaining to how stakeholders would like to see future wild pig populations change (Appendix 1). Variation occurred between Likert scale sizes in attempts to gain a more nuanced understanding of stakeholder perspectives to certain questions.

Initial statistical analysis consisted of descriptive statistics of all questions. An important note, not all respondents were required to answer all questions in the survey therefore response rate varied by question. To determine if perspectives towards wild pigs and the use of toxicants in wild pig management differed between hunters, forestland owners, and farmers, I used a one-way ANOVA. If differences were found, I used a Tukey post-hoc test to determine which groups differed from one another. Due to the large sample size associated with each question, I used a univariate general linear model to determine the betas of each stakeholder group per survey question. The betas were used to examine effect size and whether or not the significant differences found by the ANOVA had any subject-matter significance associated (Johnson 1999). Beta values ≥ 0.5 were considered important as they equated to a $\frac{1}{2}$ point change on the Likert scale. Results are presented as means \pm standard deviation, with general linear model results presented as beta, confidence interval, and p-value. All statistical analysis were conducted in accordance with Vaske (2008) and run in SPSS 24 (IBM Corp. 2016) with p-value ≤ 0.05 considered significant.

Results

Response Rate

A total of 1822 (~9%) individuals responded to the survey. Response rates varied by stakeholder group, with hunters comprising 668 responses (14% response rate), farmers comprising 1055 responses (10%), and forestland owners comprising 99 responses (2%). The low response rate of forestland owners compared to farmers and hunters is a break in survey method by AFOA. Specifically, AFOA did not send a specific email inviting members to participate in the survey over concerns of spamming and instead included the survey invitation as part of a general email that also contained additional information associated with the AFOA. Therefore AFOA members likely did not notice the survey option within the body of the email. However, despite the low sample size, forestland owner responses were similar to the other two groups in any one instance, therefore they are included in the analyses.

Demographics

The average respondent was in their late 50's, Caucasian, male, had a household income between \$75,000 and \$99,999 in 2017, and had lived in Alabama for roughly 53 years (Table 1.1). The majority of respondents had some form of higher education (Table 1.1) and most owned land in Alabama (91%, n = 1347) that averaged approximately 493 acres (n = 1321) with farming being the most common primary purpose (~30%, n = 1348, Table 1.2). Respondents lived in urban, suburban, and rural communities, with ~29% living in a town or city with many neighbors, ~28% living in an area outside of a town with scattered neighbors, and ~43% living in a rural area with few neighbors (n = 1705, Table 1.1). Respondents were from every county in

Alabama, with Baldwin, Mobile, Jefferson, and Tuscaloosa County having the greatest number of respondents.

Across stakeholder groups, all had respondents that were predominantly Caucasian men, with forestland owners being the oldest (64.0 ± 11.3) and having lived in Alabama the longest (55.2 ± 15.6 , Table 1.1). Forestland owners had the highest education level (5.9 ± 1.6), while hunters had the lowest (4.3 ± 1.9 , Table 1.1). The average 2017 household income was greatest in forestland owners (7.7 ± 1.5) and least in farmers (7.1 ± 1.6 , Table 1.1). Farmers generally were more likely to live in rural areas (2.3 ± 0.8) compared to the other two groups, while both hunters (1.9 ± 0.8) and forestland owners (1.7 ± 0.9) predominantly lived in areas outside of a town with scattered neighbors (Table 1.1).

Forestland owners were on average most likely to own land (1.0 ± 0.2) with the primary purpose being split between leasing and forest products or timber, while hunters (1.4 ± 0.5) were most likely to lease land compared to the other two groups (Table 1.2). Hunters who leased land indicated that hunting was the primary purpose of that land (Table 1.2). On average, forestland owners owned the largest parcels of land (822.5 ± 1249.2), and hunters on average leased the largest parcels of land (1460.5 ± 1768.4 , Table 1.2). Of stakeholders who owned land, farmers were most likely to live on their property (1.5 ± 0.9) while forestland owners visited their properties the most infrequently (2.2 ± 1.0 , Table 1.2). Stakeholders who indicated that they leased land, farmers most frequently visited that land (2.2 ± 0.7 , Table 1.2).

Attitudes Towards Wild Pigs

All stakeholder groups indicated a general attitude of “dislike” for wild pigs (1.8 ± 1.2), but differed significantly in their specific attitudes towards wild pigs (Table 1.1). Specifically, all

groups wanted to see a declining wild pig population trend but hunters wanted to see a significantly less drastic trend than the other two groups (2.3 ± 1.4 , Table 1.3). There were no significant differences found between stakeholder groups regarding the level of importance that a management plan be developed to meet the above stated wild pig population trend preferences (3.9 ± 1.4 , Table 1.3). In terms of the hypothetical wild pig management objectives presented to survey respondents, “decreasing wild pig populations within the state” (6.2 ± 1.3), “reducing wild pig damage” (5.8 ± 1.1), and “increasing research to develop more cost and time effective control strategies” (5.4 ± 1.5 , Table 1.3) were of greatest priority to all groups. Farmers, forestland owners and hunters differed significantly regarding the priority level they designated for “decreasing wild pig populations within the state,” while hunters deemed “reduce wild pig damage” and “increase research to develop more cost and time effective control strategies” as significantly less of a priority than farmers and forestland owners (Table 1.3).

Toxicants

Before participating in the survey, approximately 70% ($n = 1586$) and 68% ($n = 1577$) of survey respondents had heard of sodium nitrite and warfarin, respectively (Table 1.3). Sodium nitrite (3.9 ± 1.4) was found to be more acceptable than warfarin (2.8 ± 1.5 , Table 1.3) as a method to control wild pig populations. However all groups significantly differed in their acceptability of using sodium nitrite as a method for wild pig population control while only hunters differed significantly from farmers and forestland owners regarding the acceptability of warfarin (Table 1.3).

In regards to various hypothetical purchasing and use regulations, hunters showed significantly lower levels of support for an individual being “19 years of age or older to purchase a toxicant” (3.8 ± 1.6), and the “toxic bait and bait dispenser being required by law to be sold

together to limit access by non-target species” (3.7 ± 1.5) than farmers and forestland owners (Table 1.3). Additionally hunters showed significantly lower support for a toxicant only being sold by licensed vendors (3.7 ± 1.5), and requiring an individual to obtain a use permit by completing an online training course in toxicant application and safety before being allowed to purchase a wild pig toxicant (3.8 ± 1.5) than farmers (Table 1.3).

Regarding the level of concern in relation to any toxicant use as a method of wild pig population control in Alabama, “accidental water contamination” (4.3 ± 0.9), “human health impact” (4.3 ± 1.0), and “incorrect usage of a toxicant” (4.2 ± 1.0) had the greatest combined mean Likert scale score (Table 1.3). Amongst the top three concerns, only “incorrect usage of a toxicant” significantly differed between stakeholder groups (Table 1.3). When looking at the collective list of concerns, farmers were significantly less concerned about “incorrect usage of a toxicant” (4.20 ± 0.96), “eradicating wild pigs entirely” throughout the state (2.6 ± 1.6), and “public opinion” about a toxicant (2.8 ± 1.3) than hunters (Table 1.3). While hunters were significantly more concerned about the “personal financial cost” associated with a toxicant (3.0 ± 1.2) and “eradicating wild pigs entirely” (2.9 ± 1.5) than forestland owners (Table 1.3).

Stakeholders were asked to identify their level of preference for “legal or potentially legal future management strategies” for wild pigs. “Altering wild pig policy to better reflect those being negatively impacted by wild pigs” (4.2 ± 0.9) and “increased agency assistance in wild pig removal” (4.1 ± 1.0 , Table 1.3) received the highest combined mean Likert scale scores in which hunters differed significantly from farmers and forestland owners. The use of a wild pig toxicant had a comparatively lower combined mean Likert scale score (3.6 ± 1.4 , Table 1.3) and as seen previously, hunters showed significantly less preference for any future wild pig toxicant use than farmers and forestland owners (Table 1.3).

A total of 51 significant differences were found between stakeholder groups amongst the 11 questions and associated sub-questions analyzed, excluding socio-demographic questions. Of those 51 significant differences found, 19 occurred between hunters and forestland owners (~37%), 4 occurred between forestland owners and farmers (~ 8%), and 28 occurred between farmers and hunters (~55%, Table 1.3).

Univariate Analysis

When analyzing the betas from the univariate analysis to assess the subject-matter significance in addition to statistical significance, due to the large sample size of the survey, approximately 17% (n = 126) were considered noteworthy with a value of $\geq \pm 0.50$. Of that noteworthy 17%, roughly 55% occurred between forestland owners and hunters while the remaining 45% occurred between hunters and farmers. Hunters had 0.54 (± 0.12) more positive attitude towards wild pigs than farmers. While forestland owners had -0.88 (± 0.27) more negative attitude towards wild pigs than hunters. Hunters had 0.62 (± 0.12) more positive desire for future wild pig population trend than farmers, while forestland owners had a -0.88 (± 0.26) desire for future wild pig population trends than hunters (Table 1.3).

Hunters had -0.5 (± 0.15) less acceptability of sodium nitrite as a method of wild pig population control than farmers. Forestland owners had 1.00 (± 0.32) greater acceptability of sodium nitrite as a method of wild pig population control than hunters. Forestland owners had 0.53 (± 0.36) greater acceptability of warfarin as a method of wild pig population control than hunters. Additionally, forestland owners had 0.86 (± 0.32) more support for requiring an individual to be 19 years of age or older to be able to purchase a toxicant than hunters. And forestland owners had -0.63 (± 0.36) less concern for eradicating wild pigs entirely than hunters (Table 1.3).

Furthermore, hunters designated reducing wild pigs damage as $-0.50 (\pm 0.12)$ less of a priority than farmers, while forestland owners designated reducing wild pig damage as $0.83 (\pm 0.26)$ greater of a priority than hunters. Additionally, forestland owners identified increasing wild pig populations within the state as $-0.55 (\pm 0.28)$ less of a priority than hunters. Hunters showed $-0.53 (\pm 0.13)$ greater priority for decreasing wild pig populations within the state than farmers while forestland owner showed $0.94 (\pm 0.29)$ greater priority for decreasing wild pig populations within the state than hunters. Hunters designated having stronger enforcement of current wild pig policy and regulations as $-0.74 (\pm 0.19)$ less of a priority than farmers. Contrastingly, forestland owners deemed having stronger enforcement of current wild pig policy and regulation as $0.81 (\pm 0.41)$ greater of a priority than hunters. Forestland owners identified increasing research to develop more cost and time effective wild pig control strategies as $0.75 (\pm 0.34)$ greater priority than hunters. Furthermore, making high tech wild pig trapping equipment available to rent to landowners at a reasonable cost was designated as $0.56 (\pm 0.35)$ greater priority to forestland owners than hunters. Hunters deemed making recreational wild pig hunting illegal as $-0.5 (\pm 0.18)$ less of a priority than farmers. As potential future management strategies, forestland owners had $0.95 (\pm 0.32)$ greater support for using toxicants than hunters while hunters had $-0.68 (\pm 0.15)$ less support for using toxicants in wild pig management than farmers. Lastly, forestland owners showed $0.50 (\pm 0.26)$ greater support for stronger enforcement of current wild pig policy and regulations as a potential future management strategy than hunters (Table 1.3).

Discussion

Overall, the majority of stakeholders dislike wild pigs and want to see a drastic reduction of wild pig populations on the landscape. Furthermore, decreasing wild pig population, reducing damage associated with wild pigs, and increasing research to develop more time and cost

effective wild pig management strategies were deemed top priority management objectives by all groups. Stakeholder groups supported the use of both toxicants, with greater support for sodium nitrite than warfarin. All stakeholder groups were generally supportive of the various purchasing and use regulations presented in the survey, however they were least supportive, but not exceedingly unaccepting, of toxicants being unavailable to the public for use. Finally, accidental water contamination, human health impact, and incorrect usage of a toxicant were identified as top concerns for all groups.

Originally, the expectation was that stakeholder groups would differ substantially from one another. Specifically, wild pigs have a direct monetary impact on farmers' livelihoods, suggesting that they would have the strongest negative opinions on wild pigs and support eradication by any means necessary. Likewise, forestland owners were expected to have slightly weaker opinions towards wild pigs and management than farmers, because their livelihoods are less severely impacted. Furthermore, forestland owners tend to be less involved on a daily basis with their property than farmers, and therefore may not notice or be bothered by the wild pig activity on their property. In addition to the literature stating hunters support the presence of wild pigs (Tolleson et al. 1995; Adams et al. 2005; Rollins et al. 2007), feedback from agency personnel during survey development indicated that wild pig hunting was an important cultural pastime that carried with it an extremely vocal and large following of individuals that wanted wild pigs on the landscape and were adamantly against any form of wild pig control. As a result hunters were expected to have fairly positive opinions towards wild pigs and be unsupportive of wild pig management in general.

In actuality, my findings suggest that farmers and forestland owners share similar negative opinions and views on wild pigs and desire improved wild pig management, however

forestland owners tended to have the stronger negative opinions when compared to farmers. Hunters did have the most positive perspectives on wild pigs and wanted less drastic management when compared to the other two groups with ~ 92% of the 51 significant differences found occurring either between hunter and forestland owners or hunters and farmers. Even though numerous significant differences were found between stakeholder groups, these differences in were not significant from a social perspective. Contrary to evidence within the literature (Tolleson et al. 1995; Adams et al. 2005; Rollins et al. 2007) and the opinions of agency personnel depicting hunters as the main hindrance in wild pig management, the overwhelming majority of hunters who participated in the survey had a negative attitude towards wild pigs and were in favor of decreasing wild pig populations and damage and increasing research to develop more cost and time efficient control strategies.

In general, all stakeholders had negative towards wild pigs and wild pig management that were similar to one another in terms of social meaning, despite being significantly different. Similar to the findings of previous research, all groups expressed a general dislike for wild pigs (Adams et al. 2005; Harper et al. 2016; Caplenor et al. 2017). All groups were in agreement that decreasing wild pig populations in Alabama was a high to very high priority management objective, but hunters viewed this objective as a lower priority than the other two groups. Additionally, all groups wanted to see future wild pig populations drastically decreased on the landscape. These findings support previous research stating that stakeholders believed wild pigs should be eradicated whenever possible (Harper et al. 2016; Caplenor et al. 2017), though hunters wanted a less drastic decrease than forestland owners and farmers. Therefore, the idea that hunters overall differ vastly in their views or attitude towards wild pigs and overall management objectives from farmers or forestland owners was not supported. The evidence

suggests that the assumption that hunters want wild pigs on the landscape seems to stem from a very vocal minority of the hunting community as opposed to the majority.

Stakeholders had equally heard of warfarin and sodium nitrite. Because sodium nitrite is a relatively novel toxicant in wildlife management within the US, it was expected that warfarin would be significantly better known among the survey respondents due to the longer history of its use as a toxicant in the US. However, neither toxicant was better known than the other, causing little concern for pre-established biases. Sodium nitrite was found to be acceptable by stakeholders, while warfarin was neutrally to somewhat unacceptable in wild pig management. Acceptability of sodium nitrite was approximately double that found by Koichi et al. (2013) regarding general toxicant use, while acceptability of warfarin was only slightly higher in comparison. Similar surveys assessing stakeholder acceptability of toxicant use in invasive species management had comparable findings. Specifically, Fisher et al. (2006) found that approximately 59%, 35%, and 28% of survey respondents were supportive of the use of cyanide baiting, 1080 baiting, and humane toxins in fox eradication efforts on Tasmania, respectively. Comparatively, Farnworth et al. (2014) found overwhelming acceptance of toxicant use in the control of non-native species to New Zealand by the general public and conservation groups. Furthermore, a study by Wilkinson and Priddel (2011) found that the residents of Lord Howe Island were generally supportive of the use toxicants in island wide rodent eradication efforts.

The information provided regarding both toxicants in the survey was the best information available at the time of the dissemination. Sodium nitrite is a novel toxicant in US wild pig management, and efficacy testing is still underway in preparation for registration submission to the EPA. After survey administration, two incidents where misinformation was presented to survey respondents were identified. First, recent field trials in the US have demonstrated that

several non-target species are affected by the toxicant, including white-crowned sparrows (*Zonotrichia leucophrys*) and red-winged blackbirds (*Agelaius phoeniceus*). Notably, these non-target results were from the first and only field test of the initial prototype of a sodium nitrite bait in the US and therefore may not be representative of the final sodium nitrite bait product. Modifications to the bait are being made to further reduce impact on non-target species (USDA APHIS, 2018). The second issue is that sodium nitrite was stated to be insoluble in water and therefore of minimal concern for water contamination, which was the result of a miscommunication between researchers for this survey. Nitrite is toxic to aquatic organisms and therefore of concern surrounding the use of sodium nitrite as a toxicant (Jensen 2003; Soucek and Dickinson 2012).

Had these points of misinformation been presented correctly, stakeholder acceptability for sodium nitrite may have been lower, while warfarin acceptability may have been greater. What is important to note is that neither of these toxicants were found to be unacceptable by any one stakeholder group. Thus, stakeholders appear relatively accepting of the idea of toxicants for wild pig management so long as their concerns regarding toxicant use are addressed and they are informed about the toxicants in question. Stakeholders have valid concerns regarding toxicant use, and in order for managers and policy makers to make informed decisions about the potential future use of toxicants in wild pig management, those concerns must be acknowledged and addressed before any decisions are made.

Stakeholders were in agreement that water contamination, human health impact, and incorrect usage of a toxicant were top concerns for any toxicant used in wild pig management. Additionally, toxicants impact on non-target species, legal liability for non-target damage, and soil contamination were all indicated as areas of increased concern. All of the above stated

concerns indicate that stakeholders are apprehensive about the overall safety of any wild pig toxicant, not only for human safety but also environmental safety. These findings are consistent with previous research that found stakeholders were concerned about the impact of toxicant use on non-target species, as well as human and environmental health (Fraser 2006; Wilkinson and Priddel 2011; Morzillo and Mertig 2011; Estevez et al. 2015; Koichi et al. 2013). In other words, stakeholders appear unwilling to sacrifice their natural resource or personal health for improved wild pig management techniques with negative secondary effects from toxicants. Additionally, stakeholders were concerned about where the legal liability would fall if negative impacts did occur from toxicant use and how that liability may differ between an individual using a toxicant responsibly and in accordance with the usage guidelines and an individual who may not. Interestingly, stakeholders seem to understand that people are fallible, and are thus concerned about individuals administering or misusing a toxicant and the impact such actions might have. These same concerns have been expressed by wildlife biologists, managers, and researchers, so it seems that all parties involved share similar, legitimate apprehensions.

Purchasing and use regulations are one commonly used method for controlling who has access to a toxicant and how it is used (Deck 1975; Spector 1976). All stakeholder groups showed overwhelming support for the various purchasing and use regulations presented in the survey. Support for requiring that a wild pig specific bait dispenser and a toxicant be sold together to reduce impact on non-target species and requiring the completion of a toxicant use online training course to receive a purchasing and use permit reaffirms that stakeholders want a toxicant to be safe and they want it used correctly to reduce any potential for negative environmental or human health impact. Since the 1960's public concern regarding toxicant use on human health and the environment and proper regulation has been growing (Spector 1976;

Horowitz 1994; Tait 2001), therefore, it is unsurprising that stakeholders would be supportive of wild pig toxicant regulations as well.

Distrust of government involvement in private property rights is a common issue in many landowners (Raedeke et al. 2001; Caplenor et al. 2017). Because of this innate distrust it was surprising that there was a lack of resistance to a toxicant being unavailable to the public for use, and only allowing agency personnel to access and legally use any toxicant for wild pig management. Stakeholders would prefer to be able to buy and use a toxicant on their land. However, the lack of complete resistance to the possibility of only agency personnel or licensed applicators being granted legal access and use of a toxicant indicates that with some outreach and public education, managers and policy makers may receive little push back. Only allowing agency personnel or licensed applicators to apply a wild pig toxicant is the best way to safeguard proper use of a toxicant and minimize undesired impact, much like other commonly used pesticides. Additionally, liability would most likely fall on the licensed applicator, agency, or toxicant company if any unforeseen negative consequences of toxicant use happen to arise and not on the landowner.

Limitations did occur during the project aside from the misinformation presented on sodium nitrite, the low response rates, and inability to perform non-response bias testing. Within the first week of disseminating the survey, the Auburn University main servers experienced a fire, causing the servers to shut down and all associated Auburn networks to go offline for approximately 1 day, including Qualtrics. During this time survey respondents were unable to access the survey. Once Qualtrics was back online, an email was sent out to all potential survey respondents explaining the technical difficulty, encouraging potential respondents to try again and apologizing for the inconvenience.

The findings here are the first attempts to begin understanding the social component of wild pig management through the use of toxicants. The results add to our current understanding of stakeholder's perspectives towards wild pigs, while improving our understanding of future wild pig management, and the use of toxicants. Across the three stakeholder groups there seems to be minimal conflict between them regarding attitudes towards wild pigs, management objectives, and desired future population trends. Toxicant use in particular raises a variety of serious environmental, and human health concerns with all stakeholders, but as long as a toxicant is safe and proper use is regulated, stakeholders would be accepting and supportive of its use in wild pig management. By understanding and incorporating the above mentioned social factors with our current thorough understanding of the economic (Mack et al. 2000; Lodge et al. 2006; Pysek and Richardson 2010; Larson et al. 2011) and environmental impact (Lodge et al. 2006; Pysek and Richardson 2010; Larson et al. 2011) of wild pigs, managers and decision makers gain a holistic understanding of the issue and are able to proceed towards a management solution that has a much higher probability for successful and sustained success (Mack et al. 2000; Veitch and Clout 2001; Larson et al. 2011).

If any wild pig toxicant were to be legalized in the Southeast for agency personnel or licensed professionals only, gaining public support will be key for collaboration in efforts to remove wild pigs from the landscape. Because much of the land in the Southeast is privately owned, any hopes to reduce state or region wide wild pig populations, agencies will have to collaborate with private landowners to gain access to their land (Niemic et al. 2017) and remove wild pigs. Without landowner support, agency personnel will only be able to utilize the toxicant on state or federally owned and managed lands. Furthermore, even if private lands are accessible, it is unlikely that complete eradication of wild pigs from the state will occur using toxicants as

some individuals do enjoy hunting wild pigs for food or cultural purposes or are unwilling to put forth the time, money, or effort required to remove wild pigs from their property.

Toxicants may offer an additional tool that could drastically reduce wild pig densities, and subsequently the negative impacts associated with the species. Because wild pigs are a species of global concern (Lowe et al. 2000), if toxicants were successful in safely reducing wild pig populations and impact in the US, application on an international level could have sizable positive impacts. Reduction in global wild pig populations could benefit the global economy, particularly in the agricultural sector (Hampton et al. 2004; Pimentel et al. 2005; Bengsen et al. 2014), as well as reduce the negative impacts wild pigs have on global biodiversity (Hampton et al. 2004; Spear and Chown 2009), and environmental (Massei and Genov 2004) and human health (Hampton et al. 2004).

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Table 1.1. Summary demographics of survey respondents across all stakeholder groups in Alabama. Data are presented as percent's across different categories with counts in parentheses.

Socio-Demographic Factors	Variable	Grand %	Grand Mean ± SD (n)	Hunter Mean ± SD (n)	Farmer Mean ± SD (n)	Forestland Owner Mean± SD (n)
Gender	Male	91% (1334)	1.1 ± 0.3 (1470)	1.0 ± 0.2 (539)	1.1 ± 0.3 (850)	1.1 ± 0.3 (81)
	Female	9% (136)				
Highest Level of Education	Some high school	1% (19)	4.9 ± 1.9 (1466)	4.3 ± 1.9 (533)	5.2 ± 1.9 (852)	5.9 ± 1.6 (81)
	High School/GED	13% (184)				
	Some college, but no degree	19% (285)				
	Vocational/professional certification	7% (101)				
	Associates	8% (113)				
	Bachelor's Degree	31% (457)				
	Master's degree	15% (222)				
	Doctorate	6% (85)				
Age (years)	20-29	2% (22)	59.1 ± 11.0 (1449)	56.9 ± 5.4 (530)	60.1 ± 13.1 (838)	63.6 ± 11.3 (80)
	30-39	5% (68)				
	40-49	8% (113)				
	50-59	36% (519)				

	60-69	34% (491)				
	70-79	14% (206)				
	80-89	2% (28)				
	90-99	< 1% (2)				
Ethnicity	African American	2% (22)	2.1 ± 0.9 (1457)	2.2 ± 0.9 (531)	2.1 ± 0.9 (845)	2.00 ± 0.00 (81)
	Caucasian	95% (1388)				
	Chinese	< 1% (1)				
	Latino	< 1% (2)				
	Native American	2% (29)				
	Other	1% (15)				
2017 Household Income	< \$14,999	1% (13)	7.2 ± 1.6 (1382)	7.3 ± 1.6 (510)	7.1 ± 1.6 (798)	7.7 ± 1.5 (74)
	\$15000-\$19999	< 1% (6)				
	\$20000-\$24999	1% (20)				
	\$25000-\$34999	3% (44)				
	\$35000-\$49000	7% (96)				
	\$50000-\$74000	19% (260)				
	\$75000-\$99999	19% (263)				
	\$100000-\$149999	27% (372)				
	\$150000 or more	22% (309)				

Community Type	Town/city with many neighbors	29% (499)	2.1 ± 0.8 (1705)	1.9 ± 0.8 (633)	2.3 ± 0.8 (980)	1.7 ± 0.9 (92)
	Outside a town with scattered neighbors	28% (470)				
	Rural area with new neighbors	43% (736)				
Years lived in Alabama	1-10	1 % (9)	53 ± 13.5 (1597)	53.0 ± 8.2 (603)	52.8 ± 15.9 (918)	55.2 ± 15.6 (76)
	11-19	1% (17)				
	20-29	4% (66)				
	30-39	11% (171)				
	40-49	14% (218)				
	50-59	35% (564)				
	60-69	25% (405)				
	70-79	8% (130)				
	≥ 80	1% (17)				

Table 1.2. Descriptive statistics of private property respondents across all stakeholder groups in Alabama. Data are presented percent's across different categories with counts in parentheses.

		Owned Land					Leased Land				
		Grand %	Grand Mean \pm SD (n)	Hunter Mean \pm SD (n)	Farmer Mean \pm SD (n)	Forestland Owner Mean \pm SD (n)	Grand %	Grand Mean \pm SD (n)	Hunter Mean \pm SD (n)	Farmer Mean \pm SD (n)	Forestland Owner Mean \pm SD (n)
Land Rights	Yes	91% (1347)	1.1 \pm 0.3 (1478)	1.2 \pm 0.4 (538)	1.0 \pm 0.2 (859)	1.0 \pm 0.2 (81)	43% (636)	1.6 \pm 0.5 (1477)	1.4 \pm 0.5 (538)	1.7 \pm 0.5 (858)	1.7 \pm 0.5 (81)
	No	9% (131)					57% (841)				
Quantity of Land (acres)	< 50	37% (487)	492.8 \pm 2643.5 (1321)	245.6 \pm 1767.4 (427)	590.4 \pm 3081.4 (815)	822.5 \pm 1249.2 (79)	4% (27)	1200.0 \pm 1566.7 (626)	1490.5 \pm 1768.4 (320)	883.4 \pm 1239.3 (283)	1052.9 \pm 1471.0 (76)
	50 - 200	28% (374)					18% (111)				
	201 - 500	16% (216)					21% (134)				
	501 - 1000	10% (135)					24% (147)				
	1000 - 5000	7% (94)					30% (189)				
	>5000	1% (15)					3% (18)				

Primary Purpose	Farming	30% (402)	3.1 ± 1.7 (1348)	3.7 ± 1.6 (441)	2.8 ± 1.7 (828)	3.5 ± 1.2 (79)	28% (177)	2.0 ± 0.9 (633)	2.3 ± 0.8 (324)	1.6 ± 0.9 (287)	2.3 ± 0.8 (77)
	Hunting	13% (176)					59% (376)				
	Leasing	2% (21)					< 1% (3)				
	Forest Products or Timber	27% (370)					11% (72)				
	Residential	27% (358)					< 1% (5)				
	Other	2% (21)					< 1% (5)				
Freq. of Visitation	I live on my property	66% (885)	1.5 ± 0.9 (1347)	1.5 ± 0.8 (440)	1.5 ± 0.9 (828)	2.2 ± 1.0 (79)	5% (30)	2.3 ± 0.7 (631)	2.4 ± 0.7 (323)	2.2 ± 0.7 (286)	2.6 ± 0.7 (77)
	Once a week	22% (297)					69% (438)				
	Once a month	6% (83)					17% (110)				
	Few times a year	5% (73)					8% (52)				
	Less than once a year	1% (9)					< 1% (1)				

Table 1.3. Summary statistics by stakeholder group of key survey questions.

Question	Hunter							Farmer				Forestland Owner			
	Grand Mean \pm SD (n)	F _(df)	P-value	Mean \pm SD (n)	Beta _a	CI	Partial p-value	Mean \pm SD (n)	Beta _b	CI	Partial p-value	Mean \pm SD (n)	Beta _c	CI	Partial p-value
Attitude towards wild pigs ^a	1.8 \pm 1.2 (1700)	48.37 _(2, 1697)	0.00 ¹²³	2.1 \pm 1.5 (629)	0.54	0.12	0.000	1.6 \pm 1.0 (979)	0.34	0.26	0.009	1.2 \pm 0.6 (92)	-0.88	0.27	0.000
Expressed future wild pig population trend ^b	1.9 \pm 1.2 (1519)	58.62 _(2, 1516)	0.00 ¹³	2.3 \pm 1.4 (555)	0.62	0.12	0.000	1.7 \pm 1.0 (87)	0.26	0.26	0.041	1.5 \pm 0.8 (85)	-0.88	0.26	0.000
Importance of developing a management plan to meet the above stated future wild pig population trend ^c	3.9 \pm 1.4 (520)	2.51 _(2, 1517)	0.08	3.8 \pm 1.3 (554)	-0.12	0.15	0.093	3.94 \pm 1.4 (879)	-0.18	0.31	0.251	4.1 \pm 1.4 (85)	0.30	0.32	0.058
Have you heard of sodium nitrite? ^d	1.3 \pm 0.5 (1586)	7.95 _(2, 1583)	0.00 ²³	1.3 \pm 0.5 (587)	0.07	0.05	0.005	1.3 \pm 0.4 (912)	-0.17	0.10	0.001	1.4 \pm 0.5 (87)	0.10	0.11	0.054
Acceptability of sodium nitrite as a method of wild pig population control ^e	3.9 \pm 1.4 (1577)	33.23 _(2, 1574)	0.00 ¹²³	3.50 \pm 1.5 (585)	-0.50	0.15	0.000	4.0 \pm 1.3 (906)	-0.49	0.31	0.002	4.5 \pm 1.0 (86)	1.00	0.32	0.000
Have you heard of warfarin? ^d	1.3 \pm 0.4 (1577)	35.59 _(2, 1574)	0.00 ¹³	1.4 \pm 0.5 (584)	0.20	0.05	0.000	1.2 \pm 0.4 (906)	-0.01	0.10	0.794	1.3 \pm 0.4 (87)	-0.19	0.10	0.000
Acceptability of warfarin as a method of wild pig population control ^e	2.8 \pm 1.5	10.58 _(2, 1573)	0.00 ¹³	2.6 \pm 1.6	-0.34	0.16	0.000	2.9 \pm 1.5	-0.19	0.35	0.278	3.1 \pm 1.6	0.53	0.36	0.003

	(1576)			(584)				(905)				(87)			
19 years old to purchase toxicant ^f	4.1 ± 1.4	21.85 _(2, 1557)	0.00 ¹³	3.8 ± 1.58	-0.45	0.15	0.000	4.2 ± 1.3	-0.23	0.31	0.143	4.5 ± 1.1	0.68	0.32	0.000
	(1560)			(577)				(898)				(85)			
Toxic bait and bait dispenser required to be sold together ^f	4.0 ± 1.4	16.75 _(2, 1546)	0.00 ¹³	3.7 ± 1.5	-0.41	0.14	0.000	4.1 ± 1.2	-0.01	0.30	0.932	4.1 ± 1.2	0.42	0.31	0.007
	(1549)			(575)				(889)				(85)			
Only sold by licensed vendors ^f	3.9 ± 1.4	8.96 _(2, 1546)	0.00 ³	3.7 ± 1.5	-0.31	0.15	0.000	4.1 ± 1.3	0.06	0.32	0.679	4.0 ± 1.3	0.25	0.32	0.119
	(1549)			(577)				(887)				(85)			
Required to obtain a purchase and use permit through an online training course ^f	3.9 ± 1.4	4.08 _(2, 1543)	0.02 ³	3.8 ± 1.5	-0.21	0.15	0.005	4.0 ± 1.3	0.12	0.31	0.434	3.9 ± 1.3	0.09	0.32	0.585
	(1546)			(573)				(888)				(85)			
Not available to the public, only agency personnel have access to toxicant and are legally allowed to use it ^f	2.9 ± 1.5	0.80 _(2, 1544)	0.45	2.8 ± 1.5	-0.08	0.16	0.310	2.9 ± 1.5	0.16	0.35	0.354	2.8 ± 1.5	-0.08	0.36	0.661
	(1547)			(574)				(888)				(85)			
Humaneness concern ^g	2.9 ± 1.5	1.89 _(2, 1530)	0.15	3.0 ± 1.5	0.14	0.16	0.071	2.8 ± 1.5	0.06	0.33	0.709	2.8 ± 1.5	-0.21	0.34	0.228
	(1533)			(561)				(886)				(86)			
Impact on non-target species concern ^g	4.2 ± 1.1	0.51 _(2, 1532)	0.60	4.2 ± 1.08	0.05	0.11	0.400	4.2 ± 1.0	0.05	0.24	0.695	4.1 ± 1.1	-0.09	0.24	0.439
	(1535)			(563)				(886)				(86)			
Personal time requirement concern ^g	2.9 ± 1.1	3.14 _(2, 1517)	0.04 ¹	3.0 ± 1.2	0.07	0.12	0.236	2.9 ± 1.1	0.25	0.26	0.051	2.7 ± 1.1	-0.32	0.26	0.014
	(1520)			(563)				(879)				(85)			

Personal financial cost concern ^g	3.4 ±	1.14 _(2, 1519)	0.32	3.3 ±	-0.05	0.12	0.368	3.4 ±	0.17	0.25	0.175	3.2 ±	-0.12	0.26	0.366
	1.1			1.1				1.1				1.2			
	(1522)			(557)				(880)				(85)			
Eradicating wild pigs entirely concern ^g	2.7 ±	9.15 _(2, 1521)	0.00 ¹³	2.9 ±	0.28	0.17	0.001	2.6 ±	0.34	0.35	0.053	2.3 ±	-0.63	0.36	0.001
	1.6			1.5				1.6				1.6			
	(1524)			(558)				(882)				(84)			
Accidental water contamination concern ^g	4.3 ±	2.76 _(2, 1523)	0.06	4.4 ±	0.12	0.10	0.023	4.2 ±	0.02	0.21	0.871	4.2 ±	-0.13	0.22	0.223
	0.9			0.9				0.9				1.0			
	(1526)			(558)				(882)				(86)			
Accidental soil contamination concern ^g	4.1 ±	2.63 _(2, 1524)	0.07	4.2 ±	0.12	0.11	0.034	4.1 ±	0.06	0.24	0.641	4.0 ±	-0.18	0.24	0.150
	1.1			1.1				1.0				1.2			
	(1527)			(560)				(882)				(85)			
Human health impact concern ^g	4.3 ±	1.55 _(2, 1519)	0.21	4.3 ±	0.09	0.11	0.081	4.2 ±	-0.06	0.23	0.583	4.3 ±	-0.03	0.23	0.779
	1.0			1.0				1.0				1.0			
	(1522)			(557)				(879)				(86)			
Ability to regulate use of a toxicant concern ^g	4.0 ±	2.26 _(2, 1522)	0.10	4.0 ±	0.10	0.11	0.076	4.0 ±	0.10	0.23	0.408	3.9 ±	-0.20	0.24	0.102
	1.0			1.0				1.0				1.1			
	(1525)			(556)				(883)				(86)			
Incorrect usage of a toxicant concern ^g	4.2 ±	4.60 _(2, 1521)	0.01 ³	4.3 ±	0.14	0.10	0.005	4.2 ±	0.07	0.21	0.521	4.1 ±	-0.21	0.22	0.054
	1.0			0.9				1.0				1.0			
	(1524)			(557)				(881)				(86)			
Legal liability for non-target damage (e.g. accidental death of livestock) concern ^g	4.2 ±	2.54 _(2, 1518)	0.08	4.2 ±	0.11	0.11	0.034	4.1 ±	0.04	0.22	0.733	4.1 ±	-0.15	0.23	0.187
	1.0			1.0				1.0				1.0			
	(1521)			(556)				(880)				(85)			
Effectiveness of toxicant concern ^g	4.0 ±	2.23 _(2, 1518)	0.11	4.0 ±	-0.11	0.11	0.060	4.1 ±	0.15	0.24	0.196	3.9 ±	-0.05	0.24	0.701
	1.0			1.1				1.00				1.1			

	(1521)			(556)				(879)				(86)			
Public opinion concern ^g	2.8 ±	6.71 _(2, 1501)	0.00 ³	3.0 ±	0.26	0.15	0.001	2.8 ±	0.09	0.31	0.557	2.7 ±	-0.35	0.32	0.029
	1.4			1.4				1.3				1.3			
	(1504)			(548)				(871)				(85)			
Wild pig toxicant as a potential future management strategy ^h	3.6 ±	47.37 _(2, 1482)	0.00 ¹³	3.1 ±	-0.68	0.15	0.000	3.8 ±	-0.26	0.32	0.095	4.1 ±	0.95	0.32	0.000
	1.4			1.5				1.3				1.2			
	(1485)			(544)				(859)				(82)			
Increase wild pig management cooperatives as a potential future management strategy ^h	3.6 ±	3.12 _(2, 1478)	0.04 [*]	3.6 ±	-0.10	0.11	0.089	3.7 ±	0.26	0.24	0.035	3.4 ±	-0.16	0.25	0.202
	1.1			1.0				1.1				1.0			
	(1481)			(540)				(860)				(81)			
Stronger enforcement of current regulations and policy as a potential future management strategy ^h	3.9 ±	28.76 _(2, 1475)	0.00 ¹³	3.6 ±	-0.44	0.12	0.000	4.0 ±	-0.06	0.25	0.647	4.1 ±	0.50	0.26	0.000
	1.1			1.1				1.1				1.1			
	(1478)			(541)				(856)				(81)			
Alter wild pig policy to better reflect those being negatively impacted by wild pigs as a potential future management strategy ^h	4.2 ±	30.73 _(2, 1479)	0.00 ¹³	4.0 ±	-0.35	0.09	0.000	4.4 ±	-0.09	0.20	0.344	4.5 ±	0.44	0.20	0.000
	0.9			1.0				0.8				0.7			
	(1482)			(542)				(858)				(82)			
Increase agency assistance in wild pig removal as a potential future management strategy ^h	4.1 ±	34.67 _(2, 1477)	0.00 ¹³	3.8 ±	-0.44	0.11	0.000	4.3 ±	0.01	0.23	0.942	4.2 ±	0.43	0.23	0.00
	1.0			1.1				0.9				1.0			
	(1480)			(541)				(857)				(82)			
Reimbursement for money lost to wild pig damage as a potential future management strategy ^h	3.2 ±	21.27 _(2, 1472)	0.00 ³	3.0 ±	-0.42	0.13	0.000	3.4 ±	0.31	0.27	0.025	3.1 ±	0.11	0.28	0.431
	1.2			1.2				1.2				1.1			
	(1475)			(538)				(856)				(81)			
Priority level of reducing wild pig damage ⁱ	5.8 ±	42.31 _(2, 1467)	0.00 ¹³	5.5 ±	-0.50	0.12	0.000	6.0 ±	-0.33	0.26	0.011	6.3 ±	0.83	0.26	0.000
	1.1			1.3				1.0				0.9			

	(1470)			(538)				(851)				(81)			
Priority level of increasing wild pig populations within the state ⁱ	1.5 ± 1.2	18.64 _(2,1465)	0.00 ¹³	1.7 ± 1.3	0.36	0.13	0.000	1.4 ± 1.1	0.19	0.27	0.155	1.2 ± 0.9	-0.55	0.28	0.000
	(1468)			(536)				(851)				(81)			
Priority level of decreasing wild pig populations within the state ⁱ	6.2 ± 1.3	41.46 _(2,1464)	0.00 ¹²³	5.8 ± 1.4	-0.53	0.13	0.000	6.4 ± 1.1	-0.41	0.28	0.004	6.8 ± 0.6	0.94	0.29	0.000
	(1467)			(537)				(849)				(81)			
Priority level of stronger enforcement of current regulation and policy ⁱ	5.1 ± 1.8	31.52 _(2,1466)	0.00 ¹³	4.6 ± 1.8	-0.74	0.19	0.000	5.3 ± 1.7	-0.07	0.40	0.735	5.4 ± 1.8	0.81	0.41	0.000
	(1469)			(536)				(852)				(81)			
Priority level of restoring damaged ecosystems ⁱ	5.1 ± 1.3	2.50 _(2,1458)	0.08	5.0 ± 1.4	-0.17	0.15	0.025	5.1 ± 1.3	0.07	0.31	0.665	5.1 ± 1.3	0.10	0.32	0.538
	(1461)			(532)				(848)				(81)			
Priority level of creating wild pig management cooperatives to reduce individual cost and labor demands in order to remove wild pigs from larger areas of land ⁱ	5.0 ± 1.4	6.97 _(2,1462)	0.00 ³	4.8 ± 1.5	-0.28	0.15	0.000	5.1 ± 1.3	0.26	0.33	0.111	4.9 ± 1.4	0.02	0.33	0.908
	(1465)			(535)				(849)				(81)			
Priority level of increasing research to develop more cost and time effective control strategies ⁱ	5.4 ± 1.5	18.63 _(2,1464)	0.00 ¹³	5.1 ± 1.5	-0.42	0.16	0.000	5.5 ± 1.4	-0.33	0.22	0.052	5.9 ± 1.3	0.75	0.34	0.000
	(1467)			(536)				(850)				(81)			
Priority level of creating a financial assistance program that aims to compensate individuals for economic loss associated with wild pig damage ⁱ	4.4 ± 1.7	9.13 _(2,1459)	0.00 ³	4.1 ± 1.8	-0.40	0.19	0.000	4.5 ± 1.7	0.05	0.39	0.814	4.5 ± 1.5	0.35	0.40	0.083
	(1462)			(534)				(847)				(81)			

Priority level of increasing funding to better facilitate state management ⁱ	4.9 ± 1.5 (1459)	12.13 _(2, 1456)	0.00 ³	4.6 ± 1.6 (533)	-0.41	0.17	0.000	5.0 ± 1.5 (846)	-0.02	0.36	0.908	5.1 ± 1.4 (80)	0.43	0.36	0.020
Priority level of making high tech equipment (e.g. cell phone monitored trapping equipment) available to rent to land owners at a reasonable cost ⁱ	5.2 ± 1.5 (1459)	14.43 _(2, 1956)	0.00 ¹³	5.0 ± 1.6 (533)	-0.40	0.16	0.000	5.4 ± 1.3 (847)	-0.15	0.34	0.369	5.5 ± 1.4 (79)	0.56	0.35	0.001
Priority level of making recreational wild pig hunting illegal ⁱ	1.9 ± 1.7 (1456)	15.23 _(2, 1453)	0.00 ³	1.6 ± 1.5 (533)	-0.5	0.18	0.000	2.1 ± 1.7 (844)	0.28	0.38	0.147	1.8 ± 1.6 (79)	0.22	0.39	0.267

^a = 7 point Likert scale (1 = I dislike wild pigs, 4 = Neutral, 7 = I like wild pigs), ^b = 8 point Likert scale (1 = Completely eradicate, 5 = Stay the same, 8 = Increase drastically), ^c = 5 point Likert scale (1 = Extremely unimportant, 3 = Neutral, 5 = Extremely important), ^d = polar question (1 = yes, 2 = no), ^e = 5 point Likert scale (1 = Completely unacceptable, 3 = Neutral, 5 = Completely acceptable), ^f = 5 point Likert scale (1 = Do not support at all, 3 = Neutral, 5 = Completely support), ^g = 5 point Likert Scale (1 = Totally unconcerned, 3 = Neutral, 5 = Extremely concerned), ^h = 5 point Likert scale (1 = Do not prefer at all, 3 = Neutral, 5 = Completely prefer), ⁱ = 7 point Likert scale (1 = Very low priority, 4 = Neutral, 7 = Very high priority), ¹ = hunters and forestland owners significantly differ, ² = forestland owners and farmers significantly differ, ³ = farmers and hunters significantly differ, * = ANOVA identified a significant difference, but Tukey Post Hoc did not find any significant differences between groups, Beta _a = Farmers are the reference variable, Beta _b = Forestland owners are the reference variable, Beta _c = Hunters are the reference variable.

Chapter 2

Perceptions of Wild Pig Impact, Management, and Policy in Alabama

Abstract

Successful management of invasive species often requires working across public and private landownerships. A prime example of an invasive species that commonly occurs on privately and publically owned and managed lands is the wild pig (*Sus scrofa*). Because of the multitude of negative impacts associated with wild pigs, management must occur across both private and public lands in order to achieve widespread control and sustained success. However, managing wild pigs across property boundaries is challenging as we know very little about differing management practices and landowner perspectives. To address this knowledge gap, I sought to understand wild pig management efforts on privately owned lands, the perceived economic, ecological, and human health impact of wild pigs, and beliefs related to policy. Generally my findings suggest stakeholders believe wild pigs have negative impacts on wildlife, the economy, and ecological and public health, however less than half of landowners participate in wild pig control. In general, stakeholders believe that the responsibility of managing and paying for damages associated with wild pigs' lies with individual landowners. Findings from this research suggest that increased efficacy of wild pig control and collaboration between private and public landowners is not only possible but also necessary if wild pig population control is to be regionally successful.

Keywords: Alabama, feral pig, human dimensions, wild hog, wild boar, land use

Introduction

Invasive species are responsible for decreases in global biodiversity (Wilcove et al. 1998; Simberloff et al. 2005; Pysek and Richardson 2010), economic loss (Pimentel et al. 2005; Simberloff et al. 2005; Pejchar and Mooney 2009), ecological degradation (Mack et al. 2000; Pejchar and Mooney 2009; Pysek and Richardson 2010; Barrios-Garcia and Ballari 2012), diminishing ecosystem services (Mack et al. 2000; Pimentel et al. 2005; Pejchar and Mooney 2009; Pysek and Richardson 2010), and deteriorating human health (Mack et al. 2000; Pejchar and Mooney 2009; Pysek and Richardson 2010; Barrios-Garcia and Ballari 2012). Given these negative impacts, a great deal of effort has been expended on managing invasive species. In general, philosophies surrounding invasive species management takes one of three approaches, top-down (e.g., command and control), bottom-up (e.g., grassroots), or middle-out (e.g., civic environmentalism) management, specifically tailored to the species of concern (John et al. 2006; Epanchin-Niell et al. 2010). Individually, each of these approaches has its own set of strengths and weaknesses, but collectively, each philosophy and associated management methods uniquely contributes at different levels of management for more effective regional control of biological invasions (John et al. 2006; Epanchin-Niell et al. 2010).

One invasive species of high global concern is the wild pig (*Sus scrofa*, Lowe et al 2000). Particularly in the US, the wild pig has earned the reputation as one of the most economically costly (Pimentel 2007; Anderson et al. 2016; Holderieath 2016) and ecologically destructive (Siemann et al. 2009; Jolley et al. 2010; Barrios-Garcia and Ballari 2012; Bevins et al. 2014) invasive species to be introduced. Because much of the wild pig population in the continental US is concentrated in the southeastern portion of the country (McClure et al. 2015) where the majority of land is privately owned (US Census Bureau 1991), wild pigs frequently inhabit

privately owned land. As a result, private landowners directly experience much of the negative environmental, economic, human health, and wildlife impacts associated with wild pigs.

Furthermore, the burden of controlling the wild pig falls heavily on private landowners, as agency personnel and other wild pig removal services are unable to access private property for population control without consent.

Previous research on the human dimensions of wild pigs has focused on quantifying their economic impact. Specifically, multiple studies have each concluded that wild pigs are monetarily costly to landowners and the economy (Adams et al. 2005; Pimentel et al. 2005; Higginbotham et al. 2008; Mengak 2012; Anderson et al. 2016; Poudyal et al. 2017). One Tennessee study found that wild pigs cost landowners collectively \$28.31 million in damages and control costs (Poudyal et al. 2017), while a separate study in Texas found that the average landowner experienced an economic loss of approximately \$10,146 in damages and management effort (Adams et al. 2005). Furthermore, Mengak (2012) found that the average respondent lost \$12,646 in crop associated damages and loss, in addition to an average loss of \$5,381 to non-crop related items. Contrastingly, a small number of individuals do benefit from monies earned via wild pig hunting opportunities (Rollins 1993; Tolleson et al. 1995; Adams et al. 2005).

Previous research has attempted to understand stakeholders' perspectives on the wild pig impacts on the environment, human health, and other wildlife species (Rollins et al. 1993; Adams et al. 2005; Mengak 2012; Harper et al. 2014; Harper et al. 2016; Caplenor et al. 2017). Specific to environmental impacts, previous research asked broadly if respondents believed wild pigs had an impact on the environment, of which the majority agreed they were environmentally harmful. Respondents were not asked to identify specific details on the exact type of effect (Adams et al. 2005; Mengak 2012; Harper et al. 2014; Harper et al. 2016; Caplenor et al. 2017).

In regards to the impact wild pigs have on human health, few studies asked stakeholders if they believed wild pigs were a source of disease and found varying levels of agreement. Studies in Georgia and Illinois found that 61% (Mengak 2012) and 73% (Harper et al. 2016), of respondents believed wild pigs were a source of disease, respectively. Contrastingly a study in Texas found that only 34% of respondents believed wild pigs to be a disease hazard (Adams et al. 2005). Additionally, Mengak (2012) and Harper et al. (2016) asked respondents if they believed wild pigs threatened public safety, of which 67% and 77% agreed, correspondingly. Conflicting results and a small number of studies suggest more research is necessary. In relation to the impact wild pigs have on other species, previous studies had predominately addressed preferred game species (e.g., white-tailed deer, turkey, and bobwhite quail) and found a perceived negative association with wild pigs (Rollins 1993; Adams et al. 2005; Mengak 2012; Harper et al. 2014). With the exception of Mengak (2012), these studies overlooked wild pig impact on non-game species. Mengak (2012) found that less than 20% of respondents believed wild pigs negatively impacted the gopher tortoise (*Gopherus polyphemus*), and less than 10% believed wild pigs negatively affected waterfowl (*Anseriformes* spp.) and songbirds (*Passeri* spp.).

Additionally, previous studies have broadly assessed wild pig management on private property (Adams et al. 2005; Higginbotham et al. 2008; Mengak 2012; Harper et al. 2014; Anderson et al. 2016; Caplenor et al. 2017) and found that stakeholders were accepting of and largely engage in lethal removal techniques, such as hunting and trapping (Adams et al. 2005; Higginbotham et al. 2008; Mengak 2012; Harper et al. 2014; Anderson et al. 2016; Caplenor et al. 2017). However, stakeholders view current method of wild pig population control to be ineffective (Mengak 2012).

Despite the multiple studies assessing the human dimensions of wild pig damage, impact, and management, large gaps still exist within the literature. Much of the previous wild pig human dimensions work has been broad in scope, and lacks specificity. By gaining a more thorough understanding of stakeholders' perspectives on wild pig populations and trends on private lands, efficacy of general wild pig management, perceived impacts of wild pigs, and attitudes towards current policy, managers can gain a more holistic view of the issues surrounding wild pigs and wild pig population control. With such information, managers would be able to improve overall wild pig management effort and effectiveness.

To address this knowledge gap, the main goal of this research project was to better understand stakeholder's perspectives on wild pig impact on private land, general wild pig management, and wild pig related policy in Alabama. Specifically, the main objectives were to: 1) determine stakeholder perceptions on wild pig populations and trends across landownerships; 2) gain a detailed understanding of private land management of wild pigs; 3) determine stakeholder beliefs regarding the impact wild pigs have on the environment, economy, human health, and wildlife; 4) quantify stakeholders' perspectives towards current wild pig related policy; and, 5) determine if perspectives differed between stakeholder group (hunter, farmer, and forestland owner).

Methods

To address the research objectives, I created a social survey instrument consisting of 58 questions, 14 of which pertained to wild pig population trends, management, impact, or policy (Appendix 2). Survey questions regarding respondents' perceptions of wild pig population trends addressed questions such as perceived current population level of wild pigs on respondents'

property, population trends over time, and perceived reasons for observed population trends. Additionally, survey questions pertaining to wild pig management on private property addressed the types of management methods that were being utilized, and perceived effectiveness of such methods. Questions relating to the impact of wild pigs addressed stakeholder beliefs on the economic, environmental and human health impact of wild pigs in addition to the impact on other wildlife species. Finally, survey questions relating to wild pig policy addressed respondents' beliefs on who should ultimately be responsible for managing wild pigs and paying for associated damages, and satisfaction with current legal repercussions for the transportation of live wild pigs (Appendix 2). Previous surveys on stakeholder perspectives towards wild pigs provided insight basis for survey questions and design (Mengak 2012, Harper et al. 2014; Mississippi State University, Wild Hog Public Attitude Survey, unpublished).

The survey instrument was designed to be disseminated to three key stakeholder groups, hunters, farmers, and forestland owners throughout Alabama. These three groups were selected because they own the majority of private land within Alabama (US Census Bureau 1991; Hartsell and Johnson, 2005; USDA NASS, 2018) and therefore are the most likely to interact with and be affected by wild pigs in the state. The draft survey was peer-reviewed in a pilot study of 10 volunteers from the School of Forestry and Wildlife Sciences at Auburn University, and reviewed by the Alabama Farmers Federation (ALFA), and Alabama Forest Owners Association (AFOA) to improve the quality of the survey instrument which was subsequently revised. The final survey was approved by the Auburn University Institutional Review Board (IRB) (Protocol #17-397 EX 1710), prior to administration.

Following the Tailored Design Method (Dillman et al. 2009), I administered the survey via the Internet in January 2018, using Qualtrics. An invitation email with the link to the survey

was disseminated to each of the three stakeholder groups using email addresses of the group members followed by two reminder emails at two and four weeks after the initial email. Specifically, emails were sent by ALFA to all Alabama row crop, produce, hay, cattle, domestic pig, poultry, and sheep farmers within the ALFA membership list, which equated to approximately 10,700 individual farmers. To survey hunters, I purchased 5,000 email addresses of individuals who had purchased an Alabama hunting license for the 2017-2018 season from the Alabama Department of Conservation and Natural Resources (ADCNR). However only 4,621 of the 5,000 email addresses were valid due to duplicates and obsolete email addresses. Finally, the AFOA distributed the email to all members who owned forestland in Alabama, approximately 4,000 individuals. In total approximately 19,321 people received invitation to participate in the survey. To differentiate between stakeholders each group received a separate and unique online link to the survey.

Unfortunately, testing for non-response bias was not possible based on the invitation and data collection requirements of both the software and human subjects' requirements. Specifically, IP addresses of respondents were not collected in order to protect respondent anonymity in accordance with the Auburn University IRB. Therefore I was unable use that information for non-response bias testing. Additionally, because ALFA and AFOA did not want to release the contact information of their members, each organization sent the survey in an email directly to their members. Again, because I lacked access to member email addresses in addition to IP addresses, there was no way to identify specifically who participated in the survey and who did not. Therefore non-response bias testing was not possible.

All survey respondents were required to provide consent in order to gain access to the survey, thereby acknowledging that they had read the consent letter, verifying that they were at

least 19 years of age and agreeing to participate in the research project. At the end of the survey individuals were given the opportunity to provide their email address if they wanted to receive a summary of the survey results. To increase response rates, the survey was incentivized. At the completion of the survey, individuals were given the option to submit their name and mailing address in a prize drawing to win 1 of 5 Amazon gift cards, each valued at \$100. The survey was closed at the beginning of March 2018.

The format of survey included binary, fill in the blank, multiple choice, select all that apply, and five point Likert scale questions. Variation between question formatting occurred in accordance with the specifics of the question being asked. “Unsure” responses were excluded from analyses and treated as missing data. “Other” responses that survey participants provided were reviewed by me, of which the mass majority of those responses were already encompassed by the participant’s previous answers in the corresponding question. The small percentage of answers that were not encompassed by the options provided in the survey question were excluded from analysis and treated as missing. When survey respondents were asked to identify how much they agreed with the statements: “I believe that wild pigs.... a) have a positive ecological impact, b) improve soil quality by rooting, and c) improve wildlife habitat” the scale was reversed in order to achieve uniform directionality within the question and reduce confusion when discussing the results.

Initial statistical analysis consisted of descriptive statistics of all questions. An important note, not all respondents were required to answer all questions in the survey therefore response rate varied by question. Since one of the objective of the survey was to determine whether or not perspectives towards wild pigs, wild pig management, and policy differed between hunters, forestland owners and farmers, a one-way ANOVA was used to test for significant differences

between the means of those stakeholder groups. Any significant differences determined by the one-way ANOVA were then tested using the Turkey's post-hoc comparison. A total of 14 questions were analyzed, of which an ANOVA was used on 10 questions to determine significant differences between stakeholder groups. The 4 remaining questions were analyzed with descriptive statistics including count data and percentages. ANOVA results are presented as means \pm standard deviation. All statistical analysis were conducted in accordance with Vaske (2008) and run in SPSS 24 (IBM Corp. 2016) with p-value ≤ 0.05 considered significant.

Results

Response Rate

The overall response rate was approximately 9% (n = 1,822) and varied by stakeholder group. Specifically, farmer response rate was approximately 10% (1,055 total responses), while hunter response rate was approximately 14% (668 total responses), and forest landowner response was approximately 2% (99 total responses). Not all participants were required to answer all questions in the survey, therefore, response rate varied by question. The low response rate of forestland owners is likely due to a break in survey method by AFOA. Specifically, AFOA did not send a specific email inviting members to participate in the survey over concerns of spamming and instead included the survey invitation as part of a general email that also contained additional information associated with the AFOA. Therefore AFOA members likely did not notice the survey option within the body of the email. However, despite the low sample size, forestland owner responses were similar to the other two groups in any one instance, therefore they are included in the analyses.

Demographics

The average respondent was in their late 50's, Caucasian, male, had a household income between \$75,000 and \$99,999 in 2017, and had lived in Alabama for roughly 53 years. The majority of respondents had some form of higher education and most owned land in Alabama. Respondents lived in urban, suburban, and rural communities, with ~29% living in a town or city with many neighbors, ~28% living in an area outside of a town with scattered neighbors, and ~43% living in a rural area with few neighbors (n = 1705). Respondents were from every county in Alabama, with Baldwin, Mobile, Jefferson, and Tuscaloosa County having the greatest number of respondents. (See Chapter 1 for full description of stakeholders' demographics).

Population Trend on Private Lands

Survey respondents were asked a series of questions pertaining to the current wild pig population level on their property(ies), wild pig population trends over time, and perceived reasons for such trends. On average hunters, forestland owners, and farmers indicated that they sometimes saw wild pigs on their property(ies), and therefore, believed they had approximately medium wild pig population levels across their properties (1.8 ± 0.8 ; Table 2.1). However, the mean Likert scale score for wild pig population level on properties owned by forestland owners (2.2 ± 0.8) was significantly greater than both farmers and hunters (Table 2.1). When participants were asked if they believed the wild pig populations across all of their land had increased, decreased, or stayed the same over the past 5 years, forestland owners indicated that they had noticed a significantly greater increase in wild pigs on their property(ies) (4.0 ± 1.1) than both hunters (3.6 ± 1.1) and farmers (3.6 ± 1.0 , Table 2.1).

Individuals who stated that they believed wild pig populations had generally decreased on their property(ies) over the past five years were then asked to identify the reasons for this observed population trend. Hunting (~71%), trapping (~48%), and the neighboring property's management actions (33%) were identified as top reasons for decreased wild pig populations (n = 131; Figure 2.1). Comparatively, individuals who stated that they had observed an increase in wild pig population on their property(ies) over the past five years were also asked to identify the perceived reasons why. Lack of hunting pressure (~58%), natural causes such as increased food or water availability or natural dispersal (~56%), and ineffective action taken by state and/or federal agencies to remove wild pigs (~50%) were selected as the principal reasons for increased wild pig populations (n = 747; Figure 2.2).

Wild Pig Management

Survey respondents were then asked a series of questions pertaining to wild pig management occurring on their land and the perceived effectiveness. When asked if they had engaged in any wild pig management within the last 5 years, ~59% (n=1599) of all survey participants said “no” with a combined mean Likert scale score of 1.6 ± 0.5 (Table 2.1). Furthermore, a greater percentage of forestland owners participated in wild pig management than hunters and farmers. The ~ 41% (n = 1599) of survey participants who stated that they had participated in wild pig management over the past 5 years were then asked to identify the methods they had utilized. Opportunistic shooting of wild pigs to control for damage or to control populations was the most commonly selected management strategy by all three stakeholder groups (~ 89%, n = 650) (Figure 2.3). Hunting for recreation or subsistence (~ 68%, n = 650), and trapping (~ 59%, n = 650) were, respectively, the second and third most commonly selected management strategy (Table 2.4). A follow up question then asked stakeholders to

identify their perceived level of effectiveness for “current legal wild pig management options” at reducing wild pig populations. Trapping and lethal removal (4.1 ± 1.0), hunting/shooting over bait (4.1 ± 1.1), and night shooting (3.8 ± 1.1) received the highest combined mean Likert scale scores, indicating that the above stated management options were generally “somewhat effective” (Table 2.1). Hunters differed from farmers and forestland owners regarding the overall effectiveness of night shooting and hunting/shooting over bait with significantly greater perceived effectiveness (Table 2.1). Hunters also differed significantly with greater perceived effectiveness of trapping and lethal removal as a wild pig management technique than farmers (Table 2.1).

Wild Pig Impact

Additionally, survey respondents were asked a series of questions pertaining to the economic, environmental, and human health impact of wild pigs as well as the impact on other wildlife species. Specific to the economic impact of wild pigs, all three stakeholder groups agreed with the statement “wild pigs are an issue because they are economically costly to the state” (4.3 ± 1.1), however hunters differed from forestland owners and farmers with a significantly lower mean Likert scale score in comparison (Table 2.1). In regards to human health, stakeholders “somewhat agree” that “wild pigs are an issue because they threaten human health (e.g., disease, water contamination)” (4.0 ± 1.1), and again hunters were significantly lower in agreement than forestland owners and farmers (Table 2.1).

Overall, stakeholders believed wild pigs have negative ecological impacts (Table 2.1), with decreased wildlife habitat (4.4 ± 1.1) and soil quality (4.2 ± 1.2) receiving the highest overall combined mean Likert scale scores (Table 2.1). Hunters had significantly lower levels of agreement than farmers and forestland owners regarding wild pigs’ ability to reduce water

quality and negatively impact trees. Additionally, forestland owners had significantly greater levels of agreement than hunters and farmers in that wild pigs have a negative ecological impact and reduce the quality of wildlife habitat (Table 2.1).

Specific to the impact wild pigs have on wildlife, survey participants were asked to identify whether or not they believed that wild pigs have a positive or negative impact on various wildlife species or groupings of wildlife. In no instance did any stakeholder group identify a species or grouping of species that was positively impacted by wild pigs (Table 2.1). Wild turkey (*Meleagris gallapavo silvertris*) (1.7 ± 1.1), white-tailed deer (*Odocoileus virginianus*) (1.8 ± 1.0), and game birds (e.g., mourning dove [*Zenaida macroura*], bobwhite quail [*Colinus virginianus*]) (1.9 ± 1.1) received the lowest combined mean Likert scale scores of between “slight negative impact” and “strong negative impact” respectively (Table 2.1). Interestingly, hunters differed from forestland owners and farmers with significantly greater mean Likert scale scores in the wild turkey and game bird categories (Table 2.1).

Wild Pig Regulations and Policy

Survey participants were then asked a series of questions pertaining to various wild pig policy and regulation topics. All stakeholder groups were in agreement in their belief that individual landowners should be responsible for managing wild pig populations throughout Alabama (4.5 ± 0.8), while hunters (4.0 ± 1.14), and state agencies (3.6 ± 1.2) received the subsequent greatest mean Likert scale score (Table 2.1). Hunters had significantly greater belief that hunters should be responsible for managing wild pigs than farmers and forestland owners (4.4 ± 0.9) (Table 2.1). Interestingly, federal agencies overall received a neutral opinion on whether or not they should manage wild pigs in Alabama (3.0 ± 1.4), however hunters (2.9 ± 1.4)

and forestland owners (2.6 ± 1.5) were significantly lower in their agreeance than farmers (3.1 ± 1.1) (Table 2.1).

Along with the responsibility of wild pigs management comes the cost of damages associated with wild pigs, and who is responsible for such costs. Therefore, stakeholders were asked to identify who they believed should be responsible for paying for the damages caused by wild pigs. Of the total number of survey participants who answered this question, ~ 69% (n = 1,492) believed that the individuals responsible for the release of wild pigs should also be responsible for paying for said damages. Interestingly, individual landowners (~ 40%) and insurance companies (~38%) were the second and third most selected answers while the state of Alabama and the federal government only received ~21% and ~19% of the vote correspondingly (n = 1,492; Figure 2.4).

In addition, stakeholders were asked to identify how sufficient or insufficient the current legal repercussions are for individuals caught transporting or releasing live wild pigs anywhere in Alabama. As it stands, an individual(s) caught transporting live or releasing wild pigs will be charged with a “Class B misdemeanor, mandatory fine of \$2,500 per wild pig, and up to 180 days in jail.” Farmers, forestland owners and hunters on average believed that a “Class B misdemeanor” (1.6 ± 0.6), and “mandatory fine” (1.7 ± 0.6) to be between “yes, this is a sufficient penalty” and” “no, the penalty needs to be stronger” (Table 2.1). Hunters differed significantly from forestland owners and farmers on both accounts, believing the penalties to be sufficiently severe (Table 2.1). All three stakeholder groups were in agreeance that the penalty of “up to 180 days in jail” was sufficient with a combined mean Likert scale score of 1.9 ± 0.7 (Table 2.1).

Finally, survey participants were asked to identify how important they believed it is for authorities like the Alabama Department of Conservation and Natural Resources to address the concerns of various groups of people regarding wild pig management in Alabama. In descending order, “Land owners” (4.6 ± 0.8), “farmers and agricultural professionals” (4.6 ± 0.8), “forestland owners” (4.6 ± 0.8), “biologist, scientists, wildlife and land managers” (4.1 ± 1.0) and “hunters” (4.0 ± 1.1) each received a combined mean Likert scale score between “somewhat important” to “extremely important” (Table 2.1). Hunters differed from farmers with significantly greater level of importance for authorities to address the concerns of “biologists, scientists, and wildlife or land managers” regarding wild pig management. Additionally, hunters placed significantly more importance on authorities addressing the concerns of hunters in wild pig management than both farmers and forestland owners (Table 2.1).

Discussion

Overall, the majority of stakeholders believed they had medium levels of wild pigs on their property(ies), which had been slightly increasing over the past five years. Of the small number of respondents who stated wild pig population levels on their property(ies) had been decreasing, hunting, trapping and the neighboring properties management actions were believed to be the main causes. Contrastingly, of the large number of respondents who believed wild pig populations had been increasing on their property(ies), lack of hunting pressure, natural causes (e.g., increased food or water supply, dispersal from surrounding area), and ineffective state and/or federal management action was identified as the foremost reasons. Engagement in wild pig management was much lower than expected with less than half of survey respondents (~41%) stating that they had engaged in wild pig management within the last five years. Of those respondents that had participated management, opportunistic shooting, hunting, and trapping

were the three most commonly utilized management techniques and deemed as neutrally to somewhat effective at reducing wild pig populations.

When asked who should manage wild pigs in Alabama, stakeholders believed individual landowners, hunters, and state agencies were most responsible. Additionally, the individuals responsible for the illegal release of wild pigs, individual land owners, and insurance companies were most often selected as those responsible for paying for damages associated with wild pigs. The concerns of animal welfare groups (e.g., PETA), wild pig related businesses (e.g., guided pig hunts, removal companies, wild game meat processors), and the general public were deemed to be of neutral to slight unimportance for authorities to take into consideration when addressing wild pig management questions. All groups found the current legal penalties for transporting or releasing live wild pigs in Alabama to be of sufficient severity. Lastly, respondents strongly believed that wild pigs are an issue because they are economically costly, threaten public health and safety, decrease wildlife habitat, reduce soil quality via rooting activities, and have negative impacts on all species of wildlife, predominantly white-tailed deer, turkey, and other game bird species (e.g. bobwhite quail, mourning dove).

Based on previous human dimensions literature (Messmer et al. 1997; Daigle et al. 2002; Lohr et al. 2014) that found that stakeholder perspectives significantly differ by the group they belong to, I had expected these groups to be considerably dissimilar from one another, due to the variability in their interactions and experiences with wild pigs. However, farmers and forestland owners' opinions on wild pig management, policy, and impact were quite similar, whereas hunters' perspectives differed the most frequently from the other groups. In regards to the impact of wild pigs, all groups were very similar in believing that wild pigs have negative economic, human and ecological health impacts. Of the 70 statistically significant differences found

between groups, only ~13% occurred between farmers and forestland owners. The remaining ~87% occurred between hunters and farmers (~46%) or hunters and forestland owners (~41%). Similarly to Chapter 1, despite having a high quantity of significant differences between groups, in practice these differences were minimally dissimilar. In no instance did one group's perspective drastically conflict with another's.

Interestingly, even though all groups indicated that they had seen a general increase in wild pig populations on their property(ies), less than half of respondents had actively participated in management efforts within the past five years. Stakeholders in Texas (Rollins 1993; Adams et al. 2005), Georgia (Mengak 2012), and Tennessee (Jerrols et al. 2014) also perceived increases in wild pig populations on private property. In Georgia, the lack of hunting pressure and natural causes were the primary reasons for such increasing trends (Mengak et al. 2012), which matches this study. Despite the perceived increase in wild pig populations on private land in Alabama, stakeholder participation in wild pig management was much lower compared to Texas and Illinois with 84% and 65% management participation, respectively (Adams et al. 2005; Harper et al. 2014). Of those that had participated in wild pig management, opportunistic shooting, hunting and trapping were used most often, which is consistent with previous research (Adams et al. 2005; Higginbotham et al. 2008; Mengak 2012; Anderson et al. 2016).

As the primary method of management, hunting and opportunistic shooting have been shown to be ineffective at reducing wild pig populations (Jerrols et al. 2014; Summers et al. 2017). While whole sounder removal via trapping is the most effective when executed property (Sparklin et al. 2009; Smith et al. 2014), it can be initially daunting and costly, as well as extremely labor and time intensive, which could be why less than 60% of respondents who participated in wild pig management used it as a technique within the past five years.

Additionally, simply because respondents are participating in trapping on their property does not signify trapping efforts are being done properly to achieve the greatest level of success.

Collectively, however, the groups believed hunting and shooting over bait to be equally effective at as trapping. Current wild pig management options were considered somewhat ineffective to somewhat effective by survey respondents, which are consistent with findings from Georgia (Mengak 2012), where respondents perceived that most management techniques were ineffective at reducing wild pig populations.

All groups agreed that individual landowners should be responsible for managing wild pigs. While landowners agreed they should be responsible for management on their land, no specifics were provided on what that management actually entailed. My interpretation is that landowners feel they are responsible for what happens on their land, and therefore, are responsible for determining the management actions, whether that be by personally controlling wild pig populations or outsourcing and allowing access for management purposes. Local and state government action and agency removal efforts were thought to be the least responsible for decreasing wild pig populations in the state by all groups. Such perspectives most likely have to do with the fact that these organizations are only able to operate on state and federally owned and managed lands, unless granted access by private landowners. Therefore, private landowners are unaware of current control efforts and are much less likely to experience a benefit from such efforts on their property, unless it borders public lands. A similar study in Georgia found supporting evidence that approximately 50% of respondents sought outside assistance to address wild pig damage on their property, of which roughly 83% enlisted the help of private wild pig control and removal companies. Georgia Wildlife Resource Division and the USDA Wildlife

Service were asked to assist by only approximately 20% and 5% of survey respondents, correspondingly (Mengak 2012).

The majority of respondents believed the individuals responsible for the introduction of wild pigs on their property(ies) should be responsible for compensation of associated damages. Because it is extremely difficult to prove who is responsible for releasing wild pigs without catching the perpetrators in the act, even though most logical and just, it is impractical. Additionally, of the legal penalties associated with being found guilty of releasing wild pigs, all groups found the mandatory fine and jail time to be sufficient in severity. Forestland owners were generally split between believing the Class B misdemeanor was either too weak or a sufficient penalty. Interestingly, all groups were more supportive of individual landowners and insurance companies being responsible for paying for wild pig related damages on their property than the state or federal government. Such views may stem from stakeholders believing that they are responsible for their land and land management as well as a general lack of trust in the government as seen in other research (Raedeke et al. 2001; Gray et al. 2012; Caplenor et al. 2017).

Stakeholders only viewed animal welfare group concerns about wild pig management as unimportant to agency and policy decisions. As to be expected, hunters, farmers, forestland owners and landowners concerns were thought to be somewhat to very important. All groups thought that scientists, biologist, wildlife and land manager concerns to be somewhat important, indicating an overall support for science based management and policy decisions. Concerns of the general public and wild pig related businesses were considered to be of neutral importance to authorities by all groups. Because wild pigs do not impact individuals in urban areas in the same manner as rural areas, nor do urban residents actively participate in management of wild pigs on

their property, their concerns were considered less important compared to groups whom are directly affected by the species. Additionally, because a relatively small group of individuals are profiting off of wild pig related businesses (e.g., guided hunts, Rollins 1993; Tolleson et al. 1995; Adams et al. 2005), their concerns surrounding wild pig management are seen as less important by all groups than the majority of individuals who are being negatively impacted by wild pigs.

By asking stakeholders their perspectives on the economic, human health, and ecological impact wild pigs have, we are able to gauge the level of knowledge respondents have about the negative impacts associated with wild pigs, and better understand what specifically about wild pigs may motivate people to participate in management activities. Remarkably, in no instance did any group believe wild pigs had a positive impact. All groups believed wild pigs were costly to individuals and the state, which supports the findings of previous research (Adams et al. 2005; Higginbotham et al. 2008; Mengak 2012; Jerrolds et al. 2014; Anderson et al. 2016; Poudyal et al. 2017). This awareness comes as no surprise as wild pigs are well known for being costly agricultural pests, destroying crops, rooting up fields and subsequently breaking field equipment, etc. (Pimentel et al. 2005; Higginbotham et al. 2008; Anderson et al. 2016; Holderieath 2016).

Similar to previous studies in Texas (Adams et al. 2005), Georgia (Mengak 2012; Harper et al. 2016), and Illinois (Harper et al. 2014; Harper et al. 2016), respondents believed wild pigs were vectors of disease to livestock, and a threat to public health (e.g., disease, water contamination) and safety (e.g., vehicle collisions). Interestingly though, hunters were least believing of wild pigs being vectors of disease to humans (e.g., swine brucellosis) than the other groups. This lack of knowledge is quit concerning considering that hunters are most likely to become infected due to their increased exposure to blood and other bodily fluids during the field

dressings and butchering process (Harder and Basta 2007; Giurgiutiu et al. 2009; Jack et al. 2012). The lack of concern surrounding wild pigs transmitting disease to humans may be due to a lack of education and awareness within the hunting community.

All groups believed wild pigs were negatively impacting ecological health, which supports previous research indicating that stakeholders considered wild pigs to be environmentally harmful (Adams et al. 2005; Mengak 2012; Harper et al. 2014; Harper et al. 2016; Caplenor et al. 2017). Such a unified opinion is encouraging from a management and policy perspective as it indicates stakeholder beliefs are congruent with scientific evidence stating that wild pigs have negative impacts on water (Barrios-Garcia and Ballari 2012) and soil quality and processes (Siemann et al. 2009; Barrios-Garcia and Ballari 2012), tree health (Hopkins 1947; Lipscomb 1989; Eckhardt et al. 2016), wildlife, and habitat (Engeman et al. 2003; Jolley et al. 2010; Barrios-Garcia and Ballari 2012; Cole et al. 2012).

Lastly, of the ten species and categories of wildlife survey respondents were presented with, respondents believed that wild pigs had a negative impact on all of them. Predators and carnivores (e.g., coyote [*Canis latrans*], bobcat [*Lynx rufus*], and fox [*Urocyon cinereargenteus*, and *Vulpes vulpes*]) were believed to be the least impacted, but still viewed as experiencing neutral to slight negative impacts associated with wild pigs. Interestingly, wild pigs were believed to have slight negative impacts on the non-primary game species and categories of wildlife (e.g., amphibians, endangered species, reptiles, small mammals) by all groups. The level of perceived negative impact on non-game species by respondents was much higher than that found by Mengak (2012). Because private landowners are generally more attune to the populations of preferred game species (e.g., white-tailed deer, turkey, bobwhite quail) on their property, the perspectives of wild pig impact on non-game species were encouraging.

Wild turkey, white-tailed deer, and other game birds (e.g., bobwhite quail and mourning dove) were believed to be the most severely impacted by wild pigs by all groups. Similar studies also identified these species as being negatively impacted by wild pigs (Rollins et al. 1993; Tolleson et al. 1995; Adams et al. 2005; Mengak 2012; Harper et al. 2014). Again, this is not surprising considering these are highly publicized, preferred game species of many stakeholders and are actively management for on private and public lands. Therefore, stakeholders are more likely to be sensitive to any perceived negative associations between those species and wild pigs. The lack of perceived positive wildlife impacts associated with wild pigs is another advantage for managers and policy makers. Because game species such as the white-tailed deer, wild turkey and bobwhite quail are such an economic powerhouses and culturally significant species in the Southeast (Burger et al. 1999; Grado et al. 2007; Munn et al. 2010), the perspective that wild pigs are negatively impacting those species could have major implications from a policy standpoint.

Limitations did occur during the project aside from the low response rates and lack of non-response bias testing. Within the first week of disseminating the survey, the Auburn University main servers experienced a fire, causing the servers to shut down and all associated Auburn networks to go offline for approximately 1 day, including Qualtrics. During this time survey respondents were unable to access the survey. Once Qualtrics was back online, an email was sent out to all potential survey respondents explaining the technical difficulty, encouraging potential respondents to try again and apologizing for the inconvenience.

The findings of this research provide a more detailed comprehension of our current understand of stakeholders' perspectives on wild pig policy, population trends, management occurring on privately owned land, and stakeholder beliefs on the economic, human health, and

ecological impact of wild pigs. From a policy stand point, the overall agreement amongst and between groups on the negative economic, ecological and human health impacts associated with wild pigs indicates that stakeholders and science are non-conflicting, and therefore, of minimal hindrance to management. Varying levels of management engagement, effort, control efficacy, and a haphazard patchwork of concentrated removal efforts between privately and publically owned or managed lands does not facilitate sustainable and effective wide spread wild pig management (Epanchin-Niell et al. 2010).

In order for pervasive and sustainable management to happen, agency, NGOs, academia, and private landowners need to collaborate and work towards improving management by effectively removing wild pigs systematically and monitoring for reinvasions on private lands (Epanchin-Niell et al. 2010; Glen et al. 2017; Pepin et al. 2017). Regional wild pig control could be obtainable by engaging landowners in management cooperatives and sharing in the cost and labor associated in removal efforts. Wild pig management cooperatives could be more appealing to landowners if they were provided access to rentable equipment or equipment at reduced costs, and provided with technical assistance on how to effectively remove wild pigs over time and monitor for reinvasions. Finally, incentivizing continued absence or extremely low quantities of wild pigs on private property could help to increase the longevity of management efforts. One thing is for certain, without management collaboration between public land managers and private landowners, wild pigs will continue to be economic costly, ecological disastrous and threaten public health and safety into the foreseeable future on a global scale.

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Table 2.1. Mean Likert scores with ANOVA comparisons and Turkey's post hoc tests by stakeholder group.

Question		Grand Mean ± SD (n)	F _(df)	p-value	Hunter	Farmer	Forestland Owner
Stakeholders perspective on wild pig population trends across their property(ies)	Current wild pig population level across all properties ^a	1.8 ± 0.8 (n = 1420)	11.50 _(2,1417)	0.000 ¹²	1.8 ± 0.8 (n = 520)	1.8 ± 0.8 (n = 817)	2.2 ± 0.8 (n = 85)
	Wild pig population trend over the past 5 years ^b	3.6 ± 1.0 (n = 1502)	5.43 _(2,1499)	0.004 ¹²	3.6 ± 1.1 (n = 554)	3.6 ± 1.0 (n = 863)	4.0 ± 1.1 (n = 83)
Stakeholders choice to partake in wild pig management ^c and the perceived effectiveness of current legal wild pig management options ^d aimed at reducing populations	Engaged in wild pig management within the past 5 years	1.6 ± 0.5 (n = 1599)	13.38 _(2,1596)	0.00 ¹²	1.6 ± 0.5 (n = 591)	1.6 ± 0.5 (n = 919)	1.3 ± 0.5 (n = 89)
	Nuisance permit for hunting	3.4 ± 1.3 (n = 1481)	14.89 _(2,1478)	0.000 ¹²³	3.6 ± 1.2 (n = 543)	3.3 ± 1.3 (n = 857)	2.8 ± 1.3 (n = 81)
	Night shooting	3.8 ± 1.1 (n = 1484)	19.12 _(2,1481)	0.000 ¹³	4.0 ± 1.1 (n = 543)	3.7 ± 1.1 (n = 860)	3.4 ± 1.3 (n = 81)
	Trapping and lethal removal (e.g., corral traps)	4.1 ± 1.0 (n = 1481)	4.42 _(2,1478)	0.012 ³	4.2 ± 0.9 (n = 541)	4.0 ± 1.0 (n = 859)	3.9 ± 1.0 (n = 81)
	Opportunistic shooting (not actively seeking out wild pigs but shooting them if the opportunity presents itself)	3.3 ± 1.4 (n = 1483)	11.84 _(2,1480)	0.000 ¹³	3.5 ± 1.3 (n = 544)	3.2 ± 1.3 (n = 859)	2.9 ± 1.5 (n = 80)
Management cooperatives (groups of land owners who come together and	3.6 ± 1.0 (n = 1479)	2.73 _(2,1476)	0.066	3.6 ± 1.1 (n = 542)	3.6 ± 1.0 (n = 857)	3.3 ± 1.1 (n = 80)	

share in the costs and labor of removing wild pigs from their collective land)							
	For hire private removal service	3.4 ± 1.0 (n = 1475)	0.99 _(2,1472)	0.373	3.4 ± 1.1 (n = 539)	3.4 ± 1.0 (n = 855)	3.3 ± 1.1 (n = 81)
	Hunting/shooting over bait	4.1 ± 1.1 (n = 1480)	25.24 _(2,1477)	0.000 ¹³	4.3 ± 1.0 (n = 543)	3.9 ± 1.1 (n = 857)	3.7 ± 1.3 (n = 80)
	Aerial shooting by helicopter	3.5 ± 1.2 (n = 1471)	11.42 _(2,1468)	0.000 ¹³	3.7 ± 1.2 (n = 538)	3.4 ± 1.2 (n = 853)	3.3 ± 1.2 (n = 80)
	Fencing (including electric)	3.0 ± 1.2 (n = 1467)	2.90 _(2,1464)	0.056	3.1 ± 1.2 (n = 536)	3.0 ± 1.2 (n = 851)	2.9 ± 1.3 (n = 80)
	Scare tactics (e.g., motion activated scarecrows, scents to deter wild pigs)	2.3 ± 1.1 (n = 1472)	0.84 _(2,1469)	0.432	2.3 ± 1.2 (n = 539)	2.3 ± 1.1 (n = 852)	2.2 ± 1.1 (n = 81)
	Habitat alteration (e.g., burning to remove understory)	2.9 ± 1.1 (n = 1470)	0.16 _(2,1467)	0.855	2.9 ± 1.1 (n = 537)	2.9 ± 1.1 (n = 853)	2.9 ± 1.1 (n = 80)
Belief in who should be responsible for managing wild pig populations throughout Alabama ^e	The extension service	3.1 ± 1.3 (n = 1509)	1.05 _(2,1506)	0.349	3.1 ± 1.3 (n = 549)	3.2 ± 1.3 (n = 875)	3.0 ± 1.2 (n = 85)
	Federal agencies (e.g., USDA, Fish and Wildlife Service)	3.0 ± 1.4 (n = 1509)	7.11 _(2,1506)	0.001 ²³	2.9 ± 1.4 (n = 549)	3.1 ± 1.4 (n = 874)	2.6 ± 1.5 (n = 86)
	Hunters	4.0 ± 1.1 (n = 1507)	57.41 _(2,1504)	0.000 ¹³	4.4 ± 0.9 (n = 556)	3.8 ± 1.2 (n = 865)	3.8 ± 1.1 (n = 86)

	Individual land owners	4.5 ± 0.8 (n = 1523)	2.69 _(2,1520)	0.068	4.5 ± 0.8 (n = 556)	4.4 ± 0.9 (n = 881)	4.4 ± 1.0 (n = 86)
	The private industry (e.g., for hire wild pig removal companies)	3.1 ± 1.3 (n = 1503)	0.98 _(2,1500)	0.375	3.1 ± 1.3 (n = 547)	3.1 ± 1.3 (n = 870)	2.9 ± 1.4 (n = 86)
	State agencies (e.g., Alabama Department of Conservation and Natural Resources)	3.6 ± 1.2 (n = 1516)	1.68 _(2,1513)	0.187	3.6 ± 1.3 (n = 554)	3.6 ± 1.3 (n = 85)	3.6 ± 1.3 (n = 85)
	The general public	2.9 ± 1.4 (n = 1501)	26.85 _(2,1548)	0.000 ¹³	3.2 ± 1.4 (n = 548)	2.7 ± 1.5 (n = 84)	2.7 ± 1.5 (n = 84)
Stakeholders perceived level of importance that authorities address the concerns of the following groups of people regarding wild pig management in Alabama ^f	Animal welfare groups (e.g., The Humane Society, PETA)	2.1 ± 1.4 (n = 1493)	6.58 _(2,1490)	0.001 ³	1.9 ± 1.3 (n = 546)	2.2 ± 1.4 (n = 867)	2.0 ± 1.3 (n = 80)
	Biologists, wildlife/land managers, scientists	4.1 ± 1.0 (n = 1495)	4.25 _(2,1492)	0.014 ³	4.2 ± 0.9 (n = 548)	4.0 ± 1.1 (n = 865)	4.1 ± 1.0 (n = 82)
	Farmers/agricultural professionals	4.6 ± 0.8 (n = 1491)	1.19 _(2,1488)	0.151	4.5 ± 0.8 (n = 544)	4.6 ± 0.8 (n = 865)	4.7 ± 0.7 (n = 82)
	Forestland owners	4.6 ± 0.8 (n = 1490)	2.55 _(2,1487)	0.079	4.5 ± 0.8 (n = 544)	4.6 ± 0.8 (n = 864)	4.7 ± 0.7 (n = 82)
	Hunters	4.0 ± 1.1 (n = 1491)	50.72 _(2,1488)	0.000 ¹³	4.4 ± 0.9 (n = 548)	3.8 ± 1.2 (n = 861)	3.9 ± 1.2 (n = 82)
	Land owners	4.6 ± 0.8 (n = 1490)	0.65 _(2,1487)	0.523	4.6 ± 0.7 (n = 545)	4.6 ± 0.8 (n = 863)	4.7 ± 0.8 (n = 82)

	The general public	3.2 ± 1.2 (n = 1478)	2.55 _(2,1475)	0.078	3.2 ± 1.2 (n = 540)	3.1 ± 1.3 (n = 857)	3.1 ± 1.2 (n = 81)
	Public land recreational users (e.g., hikers, birders, horseback riders)	3.4 ± 1.2 (n = 1484)	0.83 _(2,1481)	0.437	3.5 ± 1.2 (n = 541)	3.4 ± 1.2 (n = 862)	3.5 ± 1.3 (n = 81)
	Wild pig related businesses (e.g. guided pig hunts, removal companies, wild game meat processors)	3.1 ± 1.4 (n = 1491)	12.27 _(2,1488)	0.000 ¹³	3.3 ± 1.3 (n = 543)	3.0 ± 1.3 (n = 866)	2.7 ± 1.4 (n = 82)
Stakeholders belief on whether or not the penalties for individuals caught transporting or releasing live wild pigs in Alabama are sufficient or insufficient ^g	Class B misdemeanor	1.6 ± 0.6 (n = 1474)	6.98 _(2,1471)	0.001 ¹³	1.7 ± 0.6 (n = 535)	1.6 ± 0.6 (n = 859)	1.5 ± 0.6 (n = 80)
	Mandatory fine of \$2,500 per wild pig	1.7 ± 0.6 (n = 1481)	4.87 _(2,1478)	0.008 ¹³	1.8 ± 0.6 (n = 538)	1.7 ± 0.6 (n = 861)	1.6 ± 0.6 (n = 82)
	Up to 180 days in jail	1.9 ± 0.7 (n = 1463)	1.00 _(2,1460)	0.369	2.0 ± 0.7 (n = 526)	1.9 ± 0.7 (n = 856)	1.9 ± 0.7 (n = 81)
Stakeholders beliefs on why wild pigs are an	Cost individuals money	3.8 ± 1.2 (n = 1680)	18.46 _(2,1677)	0.000 ¹²³	3.6 ± 1.2 (n = 621)	3.9 ± 1.0 (n = 967)	4.2 ± 1.0 (n = 92)
	Kill newborn livestock	3.5 ± 1.1 (n = 1675)	2.97 _(2,1672)	0.051 ³	3.4 ± 1.1 (n = 620)	3.6 ± 1.0 (n = 965)	3.6 ± 0.9 (n = 90)

economic issue in Alabama ^h	Economically costly to the state	4.3 ± 1.1 (n = 1672)	16.15 _(2,1669)	0.000 ¹³	4.2 ± 1.2 (n = 614)	4.4 ± 1.1 (n = 965)	4.6 ± 0.8 (n = 93)
Stakeholders beliefs on why wild pigs are a human health issue in Alabama ^h	Threaten human health	4.0 ± 1.1 (n = 1675)	33.50 _(2,1672)	0.000 ¹³	3.7 ± 1.2 (n = 618)	4.1 ± 1.0 (n = 967)	4.3 ± 0.8 (n = 90)
	Transmit disease to humans	3.5 ± 1.0 (n = 1673)	12.06 _(2,1670)	0.000 ¹³	3.3 ± 1.0 (n = 620)	3.6 ± 1.0 (n = 964)	3.7 ± 0.9 (n = 89)
	Threaten public safety	3.9 ± 1.1 (n = 1670)	29.61 _(2,1667)	0.000 ¹³	3.6 ± 1.2 (n = 615)	4.0 ± 1.1 (n = 964)	4.0 ± 0.9 (n = 91)
	Transmit disease to domestic livestock	3.8 ± 1.0 (n = 1677)	22.46 _(2,1664)	0.000 ³	3.6 ± 1.0 (n = 620)	3.9 ± 1.0 (n = 966)	3.8 ± 0.9 (n = 91)
Stakeholders beliefs on why wild pigs are an ecological issue in Alabama ^h	Negative ecological impact	4.0 ± 1.4 (n = 1667)	10.40 _(2,1665)	0.000 ¹²	3.9 ± 1.4 (n = 615)	4.1 ± 1.4 (n = 961)	4.6 ± 1.0 (n = 91)
	Reduce quality of water sources	4.1 ± 1.1 (n = 1674)	13.29 _(2,1671)	0.000 ¹³	3.9 ± 1.2 (n = 616)	4.2 ± 1.1 (n = 968)	4.4 ± 0.9 (n = 90)
	Decreased soil quality by rooting	4.2 ± 1.2 (n = 1667)	2.80 _(2,1665)	0.061	4.1 ± 1.2 (n = 612)	4.2 ± 1.2 (n = 964)	4.3 ± 1.1 (n = 91)
	Cause tree loss and damage	4.0 ± 1.2 (n=1670)	8.17 _(2,1668)	0.000 ¹³	3.9 ± 1.2 (n = 612)	4.1 ± 1.1 (n = 966)	4.3 ± 1.1 (n = 92)
	Decreased wildlife habitat	4.4 ± 1.1 (n=1667)	4.48 _(2,1665)	0.011 ¹²	4.4 ± 1.1 (n = 612)	4.4 ± 1.1 (n = 963)	4.7 ± 0.8 (n = 92)
Stakeholders beliefs on whether or not wild pigs have a positive or	Amphibians	2.1 ± 1.0 (n = 1266)	12.00 _(2,1263)	0.000 ¹³	2.3 ± 1.1 (n = 477)	2.0 ± 1.0 (n = 706)	1.9 ± 0.9 (n = 83)
	Endangered species	2.2 ± 1.0 (n = 1220)	13.08 _(2,1217)	0.000 ¹³	2.3 ± 1.0 (n = 451)	2.1 ± 1.0 (n = 696)	2.0 ± 1.0 (n = 73)

negative impact on native wildlife in Alabama ⁱ	Fish	2.4 ± 0.9 (n = 1244)	7.60 _(2,1241)	0.001 ³	2.5 ± 0.8 (n = 461)	2.3 ± 0.9 (n = 706)	2.3 ± 0.8 (n = 77)
	Game birds	1.9 ± 1.1 (n = 1409)	11.31 _(2,1406)	0.000 ¹³	2.1 ± 1.1 (n = 520)	1.8 ± 1.1 (n = 802)	1.6 ± 0.9 (n = 87)
	Predators/carnivores	2.7 ± 0.9 (n = 1281)	2.00 _(2,1278)	0.141	2.7 ± 0.9 (n = 472)	2.6 ± 0.9 (n = 731)	2.6 ± 0.8 (n = 78)
	Reptiles	2.2 ± 1.1 (n=1346)	11.91 _(2,1343)	0.000 ¹²³	2.4 ± 1.1 (n=507)	2.2 ± 1.1 (n=755)	1.9 ± 0.8 (n = 84)
	Small mammals	2.2 ± 0.9 (n = 1361)	9.77 _(2,1358)	0.000 ¹³	2.3 ± 1.0 (n = 500)	2.1 ± 0.9 (n = 779)	2.0 ± 0.9 (n = 82)
	Waterfowl	2.3 ± 0.9 (n = 1316)	3.20 _(2,1313)	0.041 ³	2.4 ± 0.9 (n = 487)	2.3 ± 0.9 (n = 752)	2.2 ± 0.9 (n = 77)
	White-tailed deer	1.8 ± 1.0 (n = 1463)	2.28 _(2,1461)	0.10	1.9 ± 1.2 (n = 553)	1.8 ± 1.0 (n = 823)	1.6 ± 0.9 (n = 87)
	Wild Turkey	1.7 ± 1.1 (n = 1486)	7.04 _(2,1483)	0.00 ¹³	1.8 ± 1.2 (n = 559)	1.6 ± 1.1 (n = 838)	1.4 ± 0.8 (n = 89)

¹ = hunters and forestland owners significantly differ, ² = forestland owners and farmers significantly differ, ³ = farmers and hunters significantly differ ^a = Multiple choice, 1 = low (I rarely see wild pigs on my property), 2 = medium (I sometimes see wild pigs on my property), 3 = high (I see wild pigs on my property frequently), ^b = 5 point Likert scale (1 = largely decreased, 3 = stayed the same, 5 = largely increased), ^c = polar scale (1 = yes, 2 = no), ^d = 5 point Likert scale (1 = very ineffective, 3 = neutral, 5 = very effective), ^e = 5 point Likert scale (1 = strongly disagree, 3 = neutral, 5 = strongly agree), ^f = 5 point Likert scale, (1 = extremely unimportant, 3 = neutral, 5 = extremely important), ^g = multiple choice (1 = no, the penalty needs to be stronger, 2 = yes, this is a sufficient penalty, 3 = no, the penalty is too strong), ^h = 5 point Likert scale (1 = strongly disagree, 3 = neutral, 5 = strongly agree), ⁱ = 5 point Likert scale (1 = strong negative impact, 3 = neutral/no impact, 5 = strong positive impact).

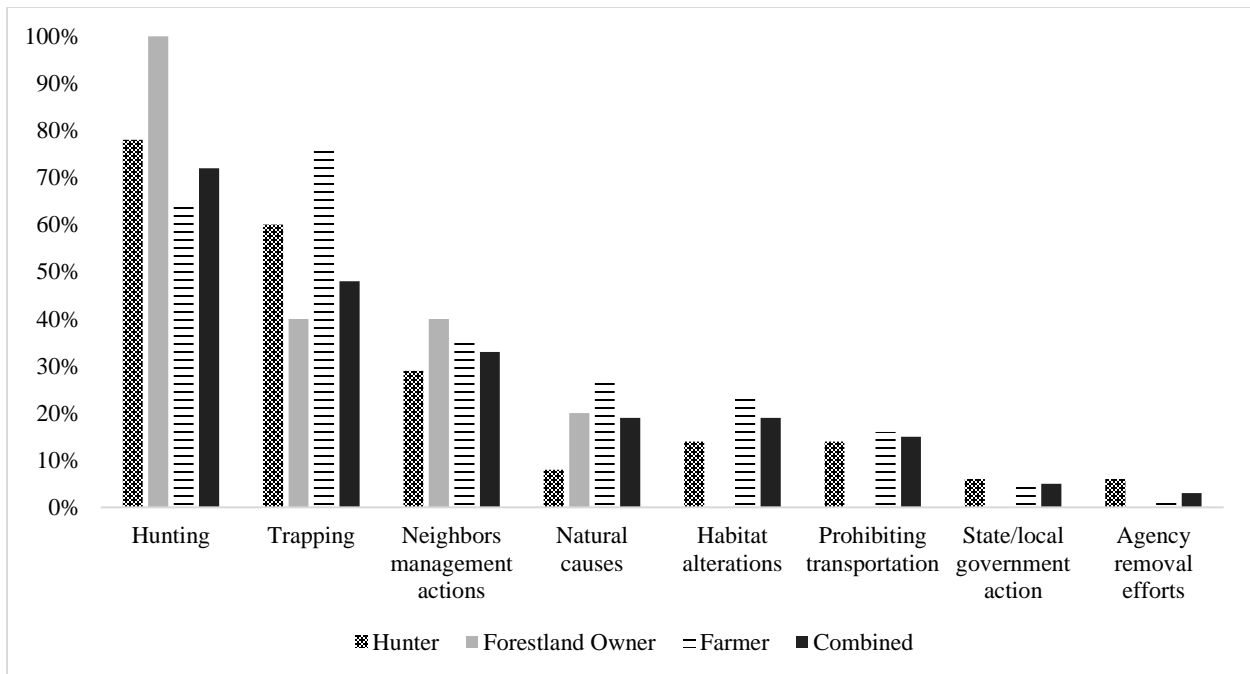


Figure 2.1. Property owners perceived reasons for decreasing wild pig populations on their property by stakeholder group. Sample size for each group is as follows, hunter n = 51, forestland owner n = 5, farmers n = 75, combined n = 131.

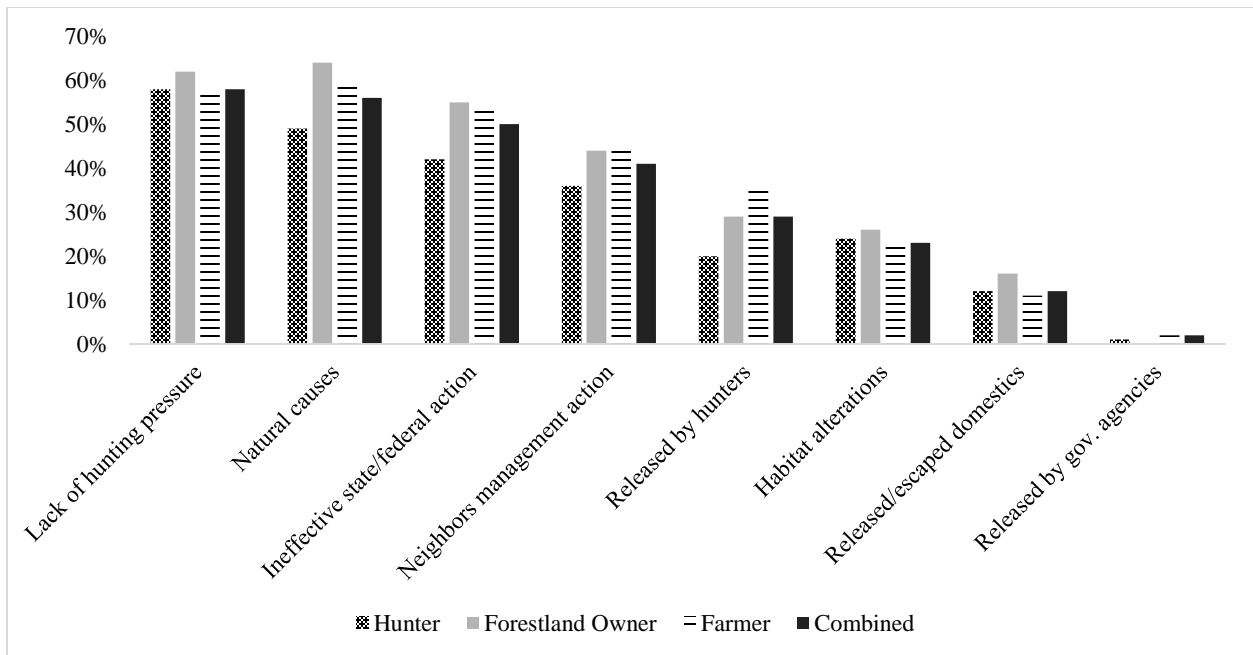


Figure 2.2. Property owners perceived reasons for increasing wild pig populations on their property by stakeholder group. Sample size for each group is as follows, hunter n = 277, forestland owner n = 55, farmer n = 415, combined n = 747.

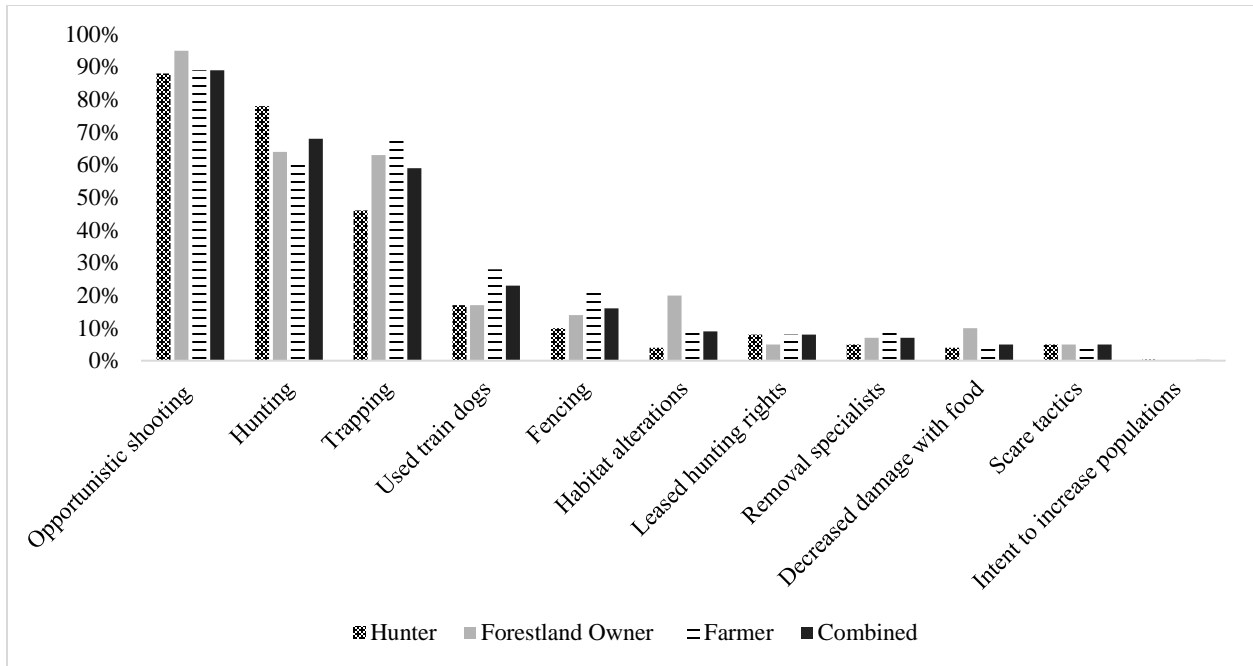


Figure 2.3. Wild pig management techniques utilized by stakeholders their privately owned or leased property within the last 5 years. Sample size is as follows, hunter n = 239, forestland owner n = 59, farmer n = 352, and combined groups n = 650.

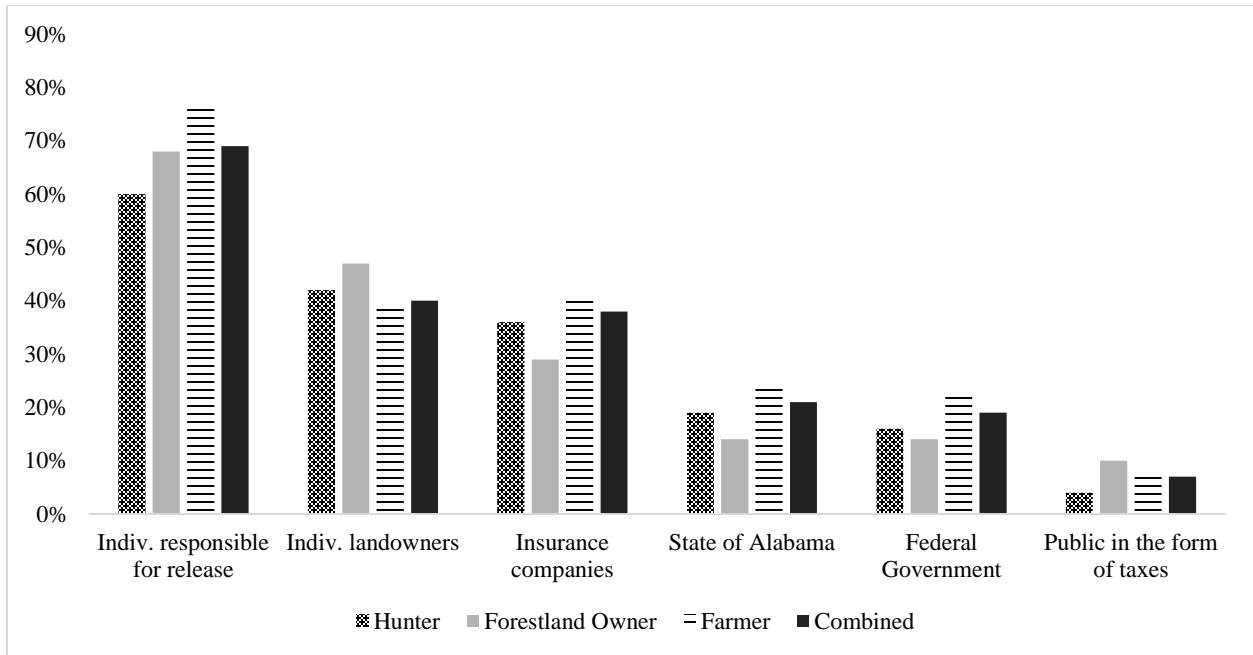


Figure 2.4. Percentage of respondents indicating who should be responsible for paying for wild pig damages they have experienced on their private property by stakeholder group. Sample size for each group is as follows, hunter n = 549, forestland owner n = 87, farmer n = 836, total n = 1492.

Appendix 1. Survey questions pertaining to stakeholders perspectives on wild pig management in Alabama. Answer options are presented within parentheses with associated coding.

- 1) What is your general attitude towards wild pigs? (1 = I dislike them a lot, 2 = I dislike them, 3 = I somewhat dislike them, 4 = I am neutral towards them, 5 = I somewhat like them, 6: I like them, 7: I like them a lot)
- 2) Complete the following sentence: In the future, you would like to see Alabama wild pig populations... (1 = completely eradicated, 2 = decreased drastically, 3 = decreased moderately, 4 = decreased slightly, 5 = stay the same, 6 = increased slightly, 7 = increased moderately, 8 = increased drastically)
- 3) How important is it to you that a management plan be developed by the Alabama Department of Conservation and Natural Resources to meet your preferred wild pig population trend as stated in the previous question? (1 = extremely unimportant, 2 = slightly important, 3 = neutral, 4 = slightly important, 5 = extremely important)
- 4) Have you hear of sodium nitrite? (1 = yes, 2 = no)
- 5) Name of the chemical compound- Sodium nitrite; Common uses- Meat preservative; Wild pig specific- Yes, wild pigs lack necessary enzyme to reverse the effects of the toxicant; Mortality rate- Approximately 95% in pen trials; Time of death- Within 4 hours of bait consumption; Symptoms occurring leading to death- 20-30 mins of labored breathing, loss of control of bodily movements, unconsciousness then death; Cause of death- Lack of oxygen reaching brain and vital organs; Meat- Safe for human consumption after death, excluding stomach contents; Non-target species impact- Concerns surrounding black bears accessing the toxicant; Aquatic impact- Insoluble in water, minimal threat to aquatic organisms; Scavenger impact (e.g., vultures)- Minimal

concern. Please indicate how acceptable it would be to you if sodium nitrite was used to control wild pig populations in Alabama. (1 = completely unacceptable, 2 = somewhat unacceptable, 3 = neutral, 4 = somewhat acceptable, 5 = completely acceptable)

- 6) Have you hear of warfarin? (1 = yes, 2 = no)
- 7) Name of the chemical compound- Warfarin; Common uses- Blood thinning medication and rodenticide; Wild pig specific- Yes, due to low concentrations, wild pigs are unique in that they have the ability to consume the necessary quantities of bait over the required period of time to cause death (e.g., a 44 lb. dog would need to consume 13.2 lbs. of bait a day for 5 days to be fatal); Mortality rate- Approximately 98% in pen trials; Time of death- With daily exposure and adequate amounts of bait consumed, death occurs after approximately 5 days; Symptoms occurring leading to death- Lethargy, slowing of movement, bleeding then death; Cause of death- Internal hemorrhaging , Meat- Not safe for human consumption, fat tissue is dyed blue to alert people to the contamination; Non-target species impact- Concerns surrounding black bears accessing the toxicant and exposure to other predatory animals; Aquatic impact- May be toxic to fish, do not apply toxicant directly in water or in areas with surface water or flooding potential; Scavenger impact (e.g., vultures)- May be toxic. Please indicate how acceptable it would be to you if warfarin were used to control wild pig populations in Alabama. (1 = completely unacceptable, 2 = somewhat unacceptable, 3 = neutral, 4 = somewhat acceptable, 5 = completely acceptable)
- 8) If a wild pig toxicant were to be legalized in Alabama, please indicate your level of preference for the following purchasing and use regulations; “must be 19 years of age or older to purchase a toxicant, toxic bait and wild pig specific bait dispenser are required to

be sold together to reduce exposure to non-target species (e.g., black bears), toxicant is only sold by licensed vendors, a use permit obtained by completing an online training in toxicant application and safety is required to purchase toxicant, toxicant is not available to the public, only trained and licensed agency personnel have access to the toxicant and are legally allowed to use it.” (1 = do not prefer at all, 2 = somewhat do not prefer, 3 = neutral, 4 = somewhat prefer, 5 = completely prefer)

9) Please select the option that represents the extent to which you are concerned about the following topics in relation to ANY toxicant use as a method of wild pig population control in Alabama; “humaneness of the toxicant, impact on non-target species (e.g., livestock, black bear, raccoon), personal time requirement, personal financial cost, eradicating wild pigs entirely, accidental water contamination, accidental soil contamination, human health impact, ability to regulate the toxicant use, incorrect usage of the toxicant, legal liability for non-target damage (e.g., accidental death of other animals due to toxicant), effectiveness of toxicant, public opinion.” (1 = totally unconcerned, 2 = somewhat unconcerned, 3 = neutral, 4 = somewhat concerned, 5 = extremely concerned)

10) Of the following legal or potentially legal future management strategies for wild pigs in Alabama, please indicate which management options you would prefer and which ones you would not prefer as a management strategy; “wild pig toxicant, increased wild pig management cooperatives (groups of land owners/lessees that come together and share in the cost and labor of removing wild pigs from their collective land), stronger enforcement of current wild pig regulations and policy, change in wild pig policy to better reflect the input of those being negatively impacted by wild pigs, increased agency assistance in

removing wild pigs (e.g., trapping effort, financial), reimbursement for money lost to wild pig damage.” (1 = do not prefer at all, 2 = somewhat do not prefer, 3 = neutral, 4 = somewhat prefer, 5 = completely prefer)

11) Please indicate the level of priority you would assign to the following hypothetical

Alabama wild pig management objectives; “reduce wild pig damage, increase wild pig populations in the state, decrease wild pig populations in the state, stronger enforcement of current wild pig regulation and policy, restore damaged ecosystems, create wild pig management cooperatives to reduce individual costs and labor demands in order to remove wild pigs from larger areas of land, increase research to develop more cost and time effective wild pig control strategies, create a financial assistance program that aims to compensate individuals for economic loss associated with wild pig damage, increase funding to better facilitate state management, make high tech equipment (e.g., cell phone monitored trapping equipment) available for rent to land owners at a reasonable cost, make recreational wild pig hunting illegal.” (1 = very low priority, 2 = low priority, 3 = somewhat low priority, 4 = neutral, 5 = somewhat high priority, 6 = high priority, 7 = very high priority)

12) What year were you born? (open ended)

13) What is your gender? (1 = male, 2 = female, 3 = other)

14) What is your highest completed level of education? (1 = some high school, 2 = high school / GED, 3 = some college, but no degree, 4 = vocational/professional certification, 5 = associate degree, 6 = bachelor’s degree, 7 = master’s degree, 8 = doctorate)

- 15) What is your ethnicity? (1 = African American, 2 = Caucasian, 3 = Chinese, 4 = Japanese, 5 = Latino, 6 = Native American, 7 = Other Asian, 8 = Pacific Islander, 9 = Other [fill in the blank])
- 16) What was your total household income before taxes last year? (1 = Less than \$14999, 2 = \$15000-\$19999, 3 = \$20000-\$24999, 4 = \$25000-\$34999, 5 = \$35000-\$49999, 6 = \$50000-\$74999, 7 = \$75000-\$99999, 8 = \$100000-\$149999, 9 = \$150000 or more)
- 17) How long have you lived in Alabama? (1 = [open ended] years, 2 = I live out of state, but I own/lease land in Alabama. I do not live or own/lease land in Alabama)
- 18) In what type of community do you currently live? (1 = town/city with many neighbors, 2 = outside town with scattered neighbors, 3 = rural area with few neighbors)
- 19) Do you own land in Alabama? (1 = yes, 2 = no)
- 20) Approximately how much total land do you own (acres)? (open ended)
- 21) In general, what is the primary purpose of your land? (1 = farming, 2 = hunting, 3 = leasing, 4 = forest products/timber, 5 = residential, 6 = other [open ended])
- 22) On average, how often do you visit your land? (1 = I live on my property, 2 = once a week, 3 = once a month, 4 = a few times a year, 5 = less than once a year)
- 23) Do you lease someone else's land in Alabama? (1 = yes, 2 = no)
- 24) Approximately how much total land do you lease from someone else (acres)? (open ended)
- 25) In general, what is the primary purpose of the land you lease from someone else? (1 = farming, 2 = hunting, 3 = leasing, 4 = forest products/timber, 5 = residential, 6 = other [open ended])

26) On average, how often do you visit your lease(s)? (1 = I live on my lease, 2 = once a week, 3 = once a month, 4 = a few times a year, 5 = less than once a year)

Appendix 2.

1. In your opinion, the wild pig population in general across all of your properties is _____ (fill in the blank). (1= low [I rarely see wild pigs on my property], 2 = medium [I sometimes see wild pigs on my property], 3 = high [I see wild pigs on my property frequently], treated as missing data = unsure)
2. In general over the past 5 years, the size of the wild pig population across all of your land has in your opinion... (1 = largely decreased, 2 = slightly decreased, 3 = stayed the same, 4 = slightly increased, 5 = largely increased)
3. Why do you think wild pig populations across all of your properties has generally decreased? (select all that apply) “hunting has reduced the population, trapping, agency removal efforts, state/local government action, neighboring properties management practices (e.g., burning, trapping), state regulations prohibiting the transportation of wild pigs, natural causes (e.g., decreased food sources, decreased water availability, dispersal of wild pigs from your area into other areas), habitat alterations (e.g., decreased density of forest understory, decreased vegetation alongside water sources), other (please specify)”
4. Why do you think the wild pig population across all of your properties has increased? (select all that apply) “Released/escaped from domestic pig producers, released by hunters to increase wild pig hunting opportunities, released by government agencies, neighboring property’s management practices (e.g., lack of removal efforts, lack of burning to reduce understory vegetation), lack of hunting pressure, natural causes (e.g., increased food sources, increased water supply, dispersal of wild pigs from surrounding area into your area), habitat alteration (e.g., increased density of forest understory,

increased vegetation alongside water sources), lack of effective action taken by the state and/or federal agencies, other (please specify)

5. Have you engaged in any wild pig management within the last 5 years? (1 = yes, 2 = no)

6. Within the last 5 years, how have you managed for wild pigs? (select all that apply)

“Hunting wild pigs (recreational or subsistence), shooting wild pigs (opportunistically, to control for damage, to manage populations), leased hunting rights to increase hunting pressure, trapped wild pigs (e.g., corral trap, box trap), fencing to exclude pigs from certain areas, including electric fences, scare tactics (e.g., motion activated scarecrows scents to deter wild pigs), habitat alterations (reducing habitat to make property less appealing to wild pigs, such as removing understory), used trained dogs to hunt or harass wild pigs, hire wild pig removal specialists (paying money for a business to remove the wild pigs from the property), fed wild pigs to reduce damage to profitable items (e.g., row crops), provided resources with the intent to increase wild pig populations on any of your properties.”

7. Of the following current legal wild pig management options, please indicate how effective at reducing wild pig populations you believe them to be. “Nuisance permit for hunting, night shooting, trapping and lethal removal (e.g., corral traps), opportunistic shooting (not actively seeking out wild pigs but shooting them if the opportunity presents itself), wild pig management cooperatives (groups of landowners come together and share in the cost and labor of removing wild pigs from their collective land), for hire removal service, hunting/shooting over bait, aerial shooting by helicopter, fencing (including electric), scare tactics (e.g., motion activated scarecrows, scents to deter wild

pigs), habitat alteration (e.g., burning to remove understory” (1 = very ineffective, 2 = somewhat ineffective, 3 = neutral, 4 = somewhat effective, 5 = very effective)

8. Please select the circle that represents the extent to which you agree or disagree with each of the following statements. “I believe that wild pigs... are an issue because they cost me money, are economically costly to the state, threaten human health (e.g., disease, water contamination), threaten public safety (e.g., vehicle collisions), have a positive ecological impact, reduce quality of water sources (e.g., stream bank erosion, reduce water quality), improve soil quality by rooting, cause tree loss/damage, improve wildlife habitat, other (please specify)” (1 = strongly disagree, 2 = somewhat disagree, 3 = neutral, 4 = somewhat agree, 5 = strongly agree)
9. The following statements are about the potential for disease or death due to wild pigs. Select the response that represents the extent to which you agree or disagree with each statement. “ I believe wild pigs.... kill newborn livestock, transmit disease to domestic livestock, transmit disease to humans” (1 = strongly disagree, 2 = somewhat disagree, 3 = neutral, 4 = somewhat agree, 5 = strongly agree)
10. Please select the option that represents the extent to which you believe the following wildlife species are positively or negatively affected by wild pigs. “amphibians (e.g., salamanders, frogs), endangered species, fish, game birds (e.g., mourning dove, bobwhite quail), predators/carnivores (e.g., coyote, fox, bobcat, raccoon), reptiles (e.g., snakes, lizards, turtles), small mammals (e.g., squirrel, rabbit), waterfowl (e.g., ducks, geese), white-tailed deer, wild turkey, other (please specify)” (1 = strong negative impact 2 = slight negative impact, 3 = neutral/no impact, 4 = slight positive impact, 5 = strong positive impact, treated as missing data = unsure of impact)

11. Please indicate how strongly you agree or disagree with the following statements... “I believe wild pig populations throughout Alabama should be managed by... the Extension Service, federal agencies (e.g., USDA, Fish and Wildlife Service, hunters, individual land owners, the private industry (e.g., for hire wild pig removal companies), state agencies (e.g., Alabama Department of Conservation and Natural Resources), the general public, (1 = strongly disagree, 2 = somewhat disagree, 3 = neutral, 4 = somewhat agree, 5 = strongly agree)
12. Who do you believe should be responsible for paying for damages caused by wild pigs? (select all that apply) “The state of Alabama, the federal government, individual land owners who receive the damage, insurance companies (e.g., crop insurance, property insurance), public in the form of taxes.”
13. Please state how important you believe it is for authorities (e.g., Alabama Department of Conservation and Natural Resources) to address the concerns of the following groups of people regarding wild pig management in Alabama. “Animal welfare groups (e.g., The Humane Society, PETA), biologists, wildlife/land managers, scientists, farmers/agriculture professionals, forestland owners, hunters, land owners, the general public, public land recreational uses (e.g., hikers, birders, horseback riders), wild pig related businesses (e.g., guided pig hunts, removal companies, wild game meat processors)” (1 = extremely unimportant, 2 = somewhat unimportant, 3 = neutral, 4 = somewhat important, 5 = extremely important)
14. Currently it is illegal to transport or release live wild pigs anywhere in Alabama due to their destructive nature and potential to transmit disease. If caught, an individual will be charged with a Class B misdemeanor, mandatory fine of \$2500 per wild pig, and up to

180 days in jail. Please tell us how sufficient or insufficient you feel each of these components are for penalizing individuals caught transporting or releasing live wild pigs in Alabama. “Class B misdemeanor, mandatory fine of \$2500 per wild pig, up to 180 days in jail” (1 = no, the penalty needs to be stronger, 2 = yes, this is a sufficient penalty, 3 = no, the penalty needs to be stronger)

Appendix 3.

Stakeholders Perspectives on Wild Pig Management in Alabama - master copy

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i INFORMATION LETTER for a Research Study entitled “*Stakeholders Perspectives on Wild Pig Management in Alabama*”

You are invited to participate in a research study to better understand variation in stakeholder perceptions, beliefs, knowledge and attitudes towards wild pigs and wild pig management in Alabama. Our goal is to take a multi-stakeholder approach to holistically evaluate the various conflicts associated with wild pigs and stakeholder groups impacted by wild pigs. The specific research objectives are to (1) determine stakeholders’ attitudes, beliefs and acceptability towards the legal use of pesticides for managing wild pig populations, (2) determine the barriers to wild pig management consensus among stakeholders, (3) determine what the desired management preferences are for wild pigs, and (4) measure the variation in knowledge of and attitudes towards wild pigs between stakeholder groups in reference to perceptions of wild pig abundance. The study is being conducted by Ellary TuckerWilliams, graduate research assistant, under the direction of Dr. Christopher Lepczyk, Professor in the Auburn University School of Forestry and Wildlife Sciences. **You are invited to participate because you are a registered member of either the Alabama Farmers Federation, Alabama Forest Owners Association, Alabama Forest Treasure Association, bought an Alabama hunting license within the last three years. You must be at least 19 years old to participate in this research project.** *The Auburn University Institutional Review Board has approved this document for use from October 28, 2017 to October 27, 2020. Protocol #17-397 EX 1710.*

What will be involved if you participate? If you decide to participate in this research study, you will be asked to fill out an online survey questionnaire through Qualtrics, an online survey software program. Your total time commitment will be approximately 25 minutes.

Are there any risks or discomforts? The risks associated with participating in this study is loss of anonymity. To minimize these risks, the collected data will be kept on a secure, password protected Auburn University computer inside a locked office. Completed surveys will be submitted to Qualtrics, which is also password protected. IP addresses will not be collected with survey submission.

Are there any benefits to yourself or others? If you participate in this study, your opinion will be taken into account for future wild pig management considerations in Alabama. The

information obtained from this study will help guide future wild pig management and policy to be more representative of the expressed needs and desires of the people of Alabama. By participating you will be contributing to and improving the growing body of knowledge pertaining to human-wildlife interaction, conflict and resolution. We cannot promise you that you will receive any or all of the benefits described.

Will you receive compensation for participating? To thank you for your time, once you have completed the survey you will be offered the opportunity to enter your name and mailing address into a prize drawing. Again, contact information submitted for the prize drawing will be kept separate from survey questionnaires. 5 individuals will be randomly selected to each win a \$100.00 gift card to Amazon. Once the survey has been concluded, the 5 randomly selected winners will receive their Amazon gift card in the mail. Chances of participants winning a gift card is dependent upon how many individuals complete the survey and subsequently choose to participate in the prize drawing. Your chances of winning are approximately 1 in 5,000, depending on the actual response rate and entry into the prize drawing.

Are there any costs? If you decide to participate, it will be at no cost to you other than the time required to complete the survey questionnaire.

If you change your mind about participating, you can withdraw at any time during the study. Your participation is completely voluntary. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, the School of Forestry and Wildlife Sciences or the researchers.

Any data obtained in connection with this study will remain anonymous. We will protect your privacy and the data you provide by keeping it on a secure, password protected Auburn University computer in a locked office, or on a password protected Qualtrics account. Completed surveys will first be submitted to Qualtrics without any identifying markers such as IP addresses. The anonymous data will then be downloaded by the researchers, maintaining participant anonymity. Information collected through your participation may be used to fulfill an

educational requirement, published in a professional journal, and/or presented at a professional meeting.

If you have questions about this study, please contact Ellary TuckerWilliams at (334) 844 – 8060, ezt0019@auburn.edu or Dr. Christopher Lepczyk at (334) 844 – 9254, cal0044@auburn.edu.

If you have questions about your rights as a research participant, you may contact the Auburn University Office of Research Compliance or the Institutional Review Board by phone (334)-844-5966 or e-mail at IRBadmin@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE IF YOU WANT TO PARTICIPATE IN THIS RESEARCH PROJECT. IF YOU DECIDE TO PARTICIPATE, THE DATA YOU PROVIDE WILL SERVE AS YOUR AGREEMENT TO DO SO.

I have read the above stated information and consent letter and I am agreeing to participate in the research project. I am also certifying that I am 19 years of age or older. (1)

ii For the purpose of this survey, a wild pig, also known as a wild hog, feral pig, feral swine, feral hog, or wild boar, refers to a free-ranging pig that successfully reproduces in the wild and is several generations removed from domestication. Domestic pigs are different from wild pigs as they are tamed, kept by humans as a food source or pet, and are notably different from their wild ancestors due to selective breeding.

iii Section 1 of 4: You, your thoughts, and your wild pig experiences

Q1 How long have you lived in Alabama?

I have lived in Alabama for ____ year(s) (fill in the blank) (1)

I live out of state, but I own/lease land in Alabama (2)

I do not live or own/lease land in Alabama (3)

Q2 In what type of community do you currently live?

Town/city with many neighbors (1)

Outside a town with scattered neighbors (2)

Rural area with few neighbors (3)

Q3 Please tell us how strongly you identify with the following statement.

I consider myself a hunter.

	Strongly Identify (1)	Identify (2)	Do Not Identify (3)
Hunter (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Skip To: Q5 If Q3 = Do Not Identify

Q4 What species do you hunt in Alabama? (select all that apply)

- Bobwhite quail (1)
 - Mourning dove (2)
 - Predators (e.g., bobcat, coyote, fox) (3)
 - Rabbit (4)
 - Raccoon (5)
 - Squirrel (6)
 - Waterfowl (e.g., ducks, geese, coot) (7)
 - White-tailed deer (8)
 - Wild pig (9)
 - Wild turkey (10)
 - Other game birds (e.g., snipe, woodcock) (11)
 - Other (please specify) (12) _____
-

Q5 Please tell us how strongly you identify with the following statement.

I consider myself a farmer.

	Strongly Identify (1)	Identify (2)	Do Not Identify (3)
Farmer (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q6 What do you farm in Alabama? (select all that apply)

- Row crops (1)
 - Produce (e.g., fruit, vegetables) (2)
 - Hay (3)
 - Cattle (4)
 - Domestic pig (5)
 - Poultry (6)
 - Sheep (7)
 - Other (please specify) (8) _____
-

Q7 Please tell us how strongly you identify with the following statement.

I consider myself a forest landowner.

	Strongly Identify (1)	Identify (2)	Do Not Identify (3)
Forest landowner (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q8 What is your general attitude towards wild pigs?

	I dislike them a lot (1)	I dislike them (2)	I somewhat dislike them (3)	I am neutral towards them (4)	I somewhat like them (5)	I like them (6)	I like them a lot (7)
My attitude towards wild pigs (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q9 Please select the circle that represents the extent to which you agree or disagree with each of the following statements.

I believe that wild pigs...

	Strongly disagree (1)	Somewhat disagree (2)	Neutral (3)	Somewhat agree (4)	Strongly agree (5)
... are an issue because they cost me money (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... are economically costly to the state (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... threaten human health (e.g., disease, water contamination) (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... threaten public safety (e.g., vehicle collisions) (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... have a positive ecological impact (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... reduce quality of water sources (e.g., stream bank erosion, reduce water quality) (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... improve soil quality by rooting (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... cause tree loss/damage (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... improve wildlife habitat (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

... other
(please
specify) (10)

Q10 The following statements are about the potential for disease or death due to wild pigs. Select the response that represents the extent to which you agree or disagree with each statement.

I believe wild pigs...

	Strongly disagree (1)	Somewhat disagree (2)	Neutral (3)	Somewhat agree (4)	Strongly agree (5)
... kill newborn livestock (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... transmit disease to domestic livestock (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... transmit disease to humans (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q11 Please state your level of agreement with each of the following statements regarding wild pig hunting.

In my opinion...

	Strongly disagree (1)	Somewhat disagree (2)	Neutral (3)	Somewhat agree (4)	Strongly agree (5)
... wild pig hunting is an important cultural pastime in Alabama (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... wild pig hunting is an important family activity in Alabama (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... wild pig hunting should be illegal except for those with nuisance permits (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... wild pigs are a necessary food source for people (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q12 Below are a number of interactions one could have with wild pigs. Please identify the different experiences you have had with wild pigs, if any, within the past 5 years. (select all that apply)

- Hunting/shooting wild pigs, either for recreation, subsistence, damage control, or population control (1)
- Lease the wild pig hunting rights on your property to other individuals (2)
- Lease the wild pig hunting rights of someone else's property (3)
- Trapped wild pigs (e.g., corral trap, box trap, etc. in which you live trap the wild pigs and then euthanize them) (4)
- Used trained dogs to track, bay and catch wild pigs until the handlers arrive to euthanize the wild pig (5)
- Seeing/experiencing damage to your property/lease caused by wild pigs (e.g., agricultural damage, food plots, rooting) (6)
- Environmental damage (e.g., increased stream erosion, altered vegetation composition) (7)
- Health impact to you or your livestock (e.g., contracted swine brucellosis, E. coli from wild pig fecal matter contamination) (8)
- Word of mouth (only heard from others of their presence and/or impact) (9)
- No experience (never heard of wild pigs before this survey) (10)

Skip To: Q15 If Q12 != Health impact to you or your livestock (e.g., contracted swine brucellosis, E. coli from wild pig fecal matter contamination)

Q13 Please select the response that represents the extent to which you agree or disagree with each of the following statements.

I hunt/shoot wild pigs...

	Strongly disagree (1)	Somewhat disagree (2)	Neutral (3)	Somewhat agree (4)	Strongly agree (5)
...because they are a challenging and enjoyable animal to hunt (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...opportunistically (not actively pursuing wild pigs but will shoot one if the opportunity presents itself) (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...to train/work my dogs (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...to eat/provide food (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...as a form of population control (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...because I believe they reduce the hunting opportunities of my preferred game species (e.g., deer, turkey) (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...as a way to reduce economic loss and control for damage to crops, property or equipment (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...because I believe they affect the health of native habitat (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

...because I believe they are a public health hazard (e.g., swine brucellosis, E. coli)
(9)



Q14 In which Alabama county or counties do you **most commonly** hunt/shoot wild pigs? (select all that apply)

- Autauga (1)
- Baldwin (2)
- Barbour (3)
- Bibb (4)
- Blount (5)
- Bullock (6)
- Butler (7)
- Calhoun (8)
- Chambers (9)
- Cherokee (10)
- Chilton (11)
- Choctaw (12)
- Clarke (13)
- Clay (14)
- Cleburne (15)
- Coffee (16)
- Colbert (17)

- Conecuh (18)
- Coosa (19)
- Covington (20)
- Crenshaw (21)
- Cullman (22)
- Dale (23)
- Dallas (24)
- DeKalb (25)
- Elmore (26)
- Escambia (27)
- Etowah (28)
- Fayette (29)
- Franklin (30)
- Geneva (31)
- Greene (32)
- Hale (33)
- Henry (34)
- Houston (35)

- Jackson (36)
- Jefferson (37)
- Lamar (38)
- Lauderdale (39)
- Lawrence (40)
- Lee (41)
- Limestone (42)
- Lowndes (43)
- Macon (44)
- Madison (45)
- Marengo (46)
- Marion (47)
- Marshall (48)
- Mobile (49)
- Monroe (50)
- Montgomery (51)
- Morgan (52)
- Perry (53)

- Pickens (54)
 - Pike (55)
 - Randolph (56)
 - Russell (57)
 - St. Clair (58)
 - Shelby (59)
 - Sumter (60)
 - Talladega (61)
 - Tallapoosa (62)
 - Tuscaloosa (63)
 - Walker (64)
 - Washington (65)
 - Wilcox (66)
 - Winston (67)
-

Q15 Do you think wild pigs affect any other wildlife species?

- Yes (1)
- No (2)

Q16 Please select the option that represents the extent to which you believe the following wildlife species are positively or negatively affected by wild pigs.

	Strong negative impact (1)	Slight negative impact (2)	Neutral/no impact (3)	Slight positive impact (4)	Strong positive impact (5)	Unsure of impact (6)
Amphibians (e.g., salamanders, frogs) (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Endangered species (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fish (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Game birds (e.g., mourning dove, bobwhite quail) (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Predators/carnivores (e.g., coyote, fox, bobcat, raccoon) (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reptiles (e.g., snakes, lizards, turtles) (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Small mammals (e.g., squirrel, rabbit) (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Waterfowl (e.g., ducks, geese) (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
White-tailed deer (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wild turkey (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please specify) (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q17 Have you experienced any damage by wild pigs during the past 5 years?

Yes (1)

No (2)

Skip To: Q19 If Q17 = No

Q18 In the following question, first indicate the severity of the **AVERAGE YEARLY** wild pig damage **over the past 5 years**. Second, please estimate your **AVERAGE YEARLY** economic loss **over the past 5 years** in each of the following categories.

Degree of wild pig damage						Estimated average yearly economic loss, if any, over the past 5 years
Not applicable to my property (1)	No damage (2)	Slight damage (3)	Moderate damage (4)	Severe damage (5)		\$_____/year (fill in the blank below) (1)

Cash crops (e.g., corn, soybean, peanut) (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Timber/timber products (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Pasture land (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Machinery (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Food plots (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Livestock (e.g., depredation, injury, disease) (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Water sources (e.g., streams, ponds) (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

Orchards (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Fencing (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Personal landscape (e.g., yard, garden, flowerbed) (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Lease value (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Land value (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Roads (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Personal health (e.g., swine brucellosis) (14)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

Other (please specify) (15)

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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Q19 On **average** over the past **5 years**, approximately how much money did you gain, if any, due to wild pigs **per year**? (e.g., hunting leases, guided hunts, removal services)

\$____/year (fill in the blank) (1)

I did not gain any money (2)

Q20 Have you engaged in any wild pig management within the last 5 years?

Yes (1)

No (2)

Skip To: iv If Q20 = No

Q21 Within the last 5 years, how have you managed for wild pigs? (select all that apply)

- Hunting wild pigs (recreational or subsistence) (1)
 - Shooting wild pigs (opportunistically, to control for damage, to manage populations) (2)
 - Leased the hunting rights to increase hunting pressure (3)
 - Trapped wild pigs (e.g., corral trap, box trap) (4)
 - Fencing to exclude pigs from certain areas, including electric fences (5)
 - Scare tactics (e.g., motion activated scarecrows, scents to deter wild pigs) (6)
 - Habitat alterations (reducing habitat to make property less appealing to wild pigs, such as removing understory) (7)
 - Used trained dogs to hunt or harass wild pigs (8)
 - Hire wild pig removal specialists (paying money for a business to remove the wild pigs from the property) (9)
 - Fed wild pigs to reduce damage to profitable items (e.g., row crops) (10)
 - Provided resources with the intent to increase the wild pig population on any of your properties (11)
-

Q22 On **average** over the **past 5 years**, approximately how much money did you spend on wild pig management **per year**?

- \$____/year (1) _____
 - I did not spend any money (2)
-

Q23 Have you heard of sodium nitrite?

- Yes (1)
- No (2)
-

Q24 Description of potential wild pig toxicant:

Name of the chemical compound: Sodium nitrite **Common uses:** Meat preservative **Wild pig specific:** Yes, wild pigs lack necessary enzyme to reverse the effects of the toxicant **Mortality rate:** Approximately 95% in pen trials **Time of death:** Within 4 hours of bait consumption **Symptoms occurring leading to death:** 20-30 mins of labored breathing, loss of control of bodily movements, unconsciousness then death **Cause of death:** Lack of oxygen reaching brain and vital organs **Meat:** Safe for human consumption after death, excluding stomach contents **Non-target species impact:** Concerns surrounding black bears accessing the toxicant. **Aquatic impact:** Insoluble in water, minimal threat to aquatic organisms **Scavenger impact (e.g., vultures):** Minimal concern

Please indicate how **acceptable** it would be to you if sodium nitrite was used to control wild pig populations in Alabama.

- Completely unacceptable (1)
- Somewhat unacceptable (2)
- Neutral (3)
- Somewhat acceptable (4)
- Completely acceptable (5)
-

Q25 Have you heard of Warfarin?

- Yes (1)
 - No (2)
-

Q26 Description of potential wild pig toxicant:

Name of the chemical compound: Warfarin **Common uses:** Blood thinning medication and rodenticide **Wild pig specific:** Yes, due to low concentrations, wild pigs are unique in that they have the ability to consume the necessary quantities of bait over the required period of time to cause death (e.g., a 44 lb. dog would need to consume 13.2 lbs. of bait a day for 5 days to be fatal) **Mortality rate:** Approximately 98% in pen trials **Time of death:** With daily exposure and adequate amounts of bait consumed, death occurs after approximately 5 days. **Symptoms occurring leading to death:** Lethargy, slowing of movement, bleeding then death **Cause of death:** Internal bleeding **Meat:** Not safe for human consumption, fat tissue is dyed blue to alert people to the contamination **Non-target species impact:** Concerns surrounding black bears accessing the toxicant and exposure to other predatory animals **Aquatic impact:** May be toxic to fish, do not apply toxicant directly in water or in areas with surface water or flooding potential **Scavenger impact (e.g., vultures):** May be toxic

Please indicate how **acceptable** it would be to you if Warfarin were used to control wild pig populations in Alabama.

- Completely unacceptable (1)
 - Somewhat unacceptable (2)
 - Neutral (3)
 - Somewhat acceptable (4)
 - Completely acceptable (5)
-

Q27 If a wild pig toxicant were to be legalized in Alabama, please indicate your level of support for the following purchasing and use regulations.

	Do not support at all (1)	Somewhat do not support (2)	Neutral (3)	Somewhat support (4)	Completely support (5)
Must be 19 years of age or older to purchase a toxicant (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Toxic bait and wild pig specific bait dispenser are required to be sold together to reduce exposure to non-target species (e.g., black bears) (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Toxicant is only sold by licensed vendors (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A use permit obtained by completing an online training in toxicant application and safety is required to purchase toxicant (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Toxicant is not available to the public. Only trained and licensed agency personnel have access to the toxicant and are legally allowed to use it (5)



Q28 Please select the option that represents the extent to which you are concerned about the following topics in relation to **ANY** toxicant use as a method of wild pig population control in Alabama.

	Totally unconcerned (1)	Somewhat unconcerned (2)	Neutral (3)	Somewhat concerned (4)	Extremely concerned (5)
Humaneness of the toxicant (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Impact on non-target species (e.g., livestock, black bear, raccoon) (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personal time requirement (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personal financial cost (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eradicating wild pigs entirely (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Accidental water contamination (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Soil contamination (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Human health impact (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ability to regulate use of the toxicant (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Incorrect usage of the toxicant (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Legal liability
for non-target
damage (e.g.,
accidental
death of other
animals due
to toxicant)
(11)

Effectiveness
of the
toxicant (12)

Public
opinion (13)

v Section 3 of 4: Past, present and future wild pig management considerations

Q29 Please indicate how strongly you agree or disagree with the following statements.

I believe wild pig populations throughout Alabama should be managed by...

	Strongly disagree (1)	Somewhat disagree (2)	Neutral (3)	Somewhat agree (4)	Strongly agree (5)
...the Extension Service (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...federal agencies (e.g., USDA, Fish and Wildlife Service) (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...hunters (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...individual land owners (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... the private industry (e.g., for hire wild pig removal companies) (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
...state agencies (e.g., Alabama Department of Conservation and Natural Resources) (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
... the general public (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q30 Who do you believe **SHOULD BE** responsible for paying for the damages caused by wild pigs? (select all that apply)

- The state of Alabama (1)
 - The federal government (2)
 - Individual landowners who receive the damage (3)
 - Individuals responsible for the release of wild pigs (4)
 - Insurance companies (e.g., crop insurance, property insurance) (5)
 - Public in the form of taxes (6)
-

Q31 In your opinion, the wild pig population in general across all of your properties is_____ (fill in the blank).

- Low (I rarely see wild pigs on my property) (1)
 - Medium (I sometimes see wild pigs on my property) (2)
 - High (I see wild pigs on my property frequently) (3)
 - Unsure (4)
-

Q33 Why do you think wild pig population across all of your properties has generally decreased?
(select all that apply)

- Hunting has reduced the population (1)
- Trapping (2)
- Agency removal efforts (3)
- State/local government action (4)
- Neighboring property's management practices (e.g., burning, trapping) (5)
- State regulations prohibiting the transportation of live wild pigs (6)
- Natural causes (e.g., decreased food sources, decreased water availability, dispersal of wild pigs from your area into other areas) (7)
- Habitat alterations (e.g., decreased density of forest understory, decreased vegetation alongside water sources) (8)
- Other (please specify) (9) _____

Skip To: Q35 If Q33 = Hunting has reduced the population

Skip To: Q35 If Q33 = Trapping

Skip To: Q35 If Q33 = Agency removal efforts

Skip To: Q35 If Q33 = State/local government action

Skip To: Q35 If Q33 = Neighboring property's management practices (e.g., burning, trapping)

Skip To: Q35 If Q33 = State regulations prohibiting the transportation of live wild pigs

Skip To: Q35 If Q33 = Natural causes (e.g., decreased food sources, decreased water availability, dispersal of wild pigs from your area into other areas)

Skip To: Q35 If Q33 = Habitat alterations (e.g., decreased density of forest understory, decreased vegetation alongside water sources)

Skip To: Q35 If Q33 = Other (please specify)

Skip To: Q35 If Q33(Other (please specify)) Is Not Empty

Q34 Why do you think the wild pig population across all your properties has generally increased? (select all that apply)

- Released/escaped from domestic pig producers (1)
 - Released by hunters to increase wild pig hunting opportunities (2)
 - Released by government agencies (3)
 - Neighboring property's management practices (e.g., lack of removal efforts, lack of burning to reduce understory vegetation) (4)
 - Lack of hunting pressure (5)
 - Natural causes (e.g., increase food sources, increased water supply, dispersal of wild pigs from surrounding areas into your area) (6)
 - Habitat alteration (e.g., increased density of forest understory, increased vegetation alongside water sources) (7)
 - Lack of effective action taken by state and/or federal agencies (8)
 - Other (please specify) (9) _____
-

Q35 Complete the following sentence.

In the future, you would like to see Alabama wild pig populations ...

- Completely eradicated (1)
 - Decreased drastically (2)
 - Decrease moderately (3)
 - Decrease slightly (4)
 - Stay the same (5)
 - Increase slightly (6)
 - Increase moderately (7)
 - Increase drastically (8)
-

Q36 How important is it to you that a management plan be developed by the Alabama Department of Conservation and Natural Resources to meet your preferred wild pig population trend as stated in the previous questions?

- Extremely unimportant (1)
 - Slightly unimportant (2)
 - Neutral (3)
 - Slightly important (4)
 - Extremely important (5)
-

Q37 Please state how important you believe it is for authorities (e.g., Alabama Department of Conservation and Natural Resources) to **address the concerns** of the following groups of people regarding wild pig management in Alabama.

	Extremely unimportant (1)	Somewhat unimportant (2)	Neutral (3)	Somewhat important (4)	Extremely important (5)
Animal welfare groups (e.g., The Humane Society, PETA) (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Biologists, wildlife/land managers, scientists (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Farmers/agricultural professionals (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Forest landowners (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hunters (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Land owners (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The general public (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Public land recreational users (e.g., hikers, birders, horseback riders) (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wild pig related businesses (e.g., guided pig hunts, removal companies, wild game meat processors) (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q38 Currently it is illegal to transport or release live wild pigs anywhere in Alabama due to their destructive nature and potential to transmit disease. If caught, an individual will be charged with a Class B misdemeanor, mandatory fine of \$2,500 per wild pig, and up to 180 days in jail. Please tell us how sufficient or insufficient you feel each of these components are for penalizing individuals caught transporting or releasing live wild pigs in Alabama.

	No, the penalty needs to be stronger (1)	Yes, this is a sufficient penalty (2)	No, the penalty is too strong (3)
Class B misdemeanor (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mandatory fine of \$2,500 per wild pig (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Up to 180 days in jail (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q39 Of the following legal or potentially legal **future management strategies** for wild pigs in Alabama, please indicate which management options you would prefer and which ones you would not prefer as a **management strategy**.

	Do not prefer at all (1)	Somewhat do not prefer (2)	Neutral (3)	Somewhat prefer (4)	Completely prefer (5)
Wild pig toxicant (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increased wild pig management cooperatives (groups of land owners/lessees that come together and share in the cost and labor of removing wild pigs from their collective land) (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stronger enforcement of current wild pig regulations and policy (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Change in wild pig policy to better reflect the input of those being negatively impacted by wild pigs (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increased agency assistance in removing wild pigs (e.g., trapping effort, financial) (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Reimbursement
for money lost
to wild pig
damage (6)

Q40 Of the following **current legal wild pig management options**, please indicate how **effective** at reducing wild pig populations you believe them to be.

	Very ineffective (1)	Somewhat ineffective (2)	Neutral (3)	Somewhat effective (4)	Very effective (5)
Nuisance permit for hunting (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Night shooting (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Trapping and lethal removal (e.g., corral traps) (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Opportunistic shooting (not actively seeking out wild pigs but shooting them if the opportunity presents itself) (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wild pig management cooperatives (groups of land owners come together and share in the cost and labor of removing wild pigs from their collective land) (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For hire private removal service (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hunting/shooting over bait (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aerial shooting by helicopter (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Fencing
(including
electric) (9)

Scare tactics
(e.g., motion
activated scare
crows, scents to
deter wild pigs)
(10)

Habitat alteration
(e.g., burning to
remove
understory) (11)

Q41 Please indicate the level of priority you would assign to the following **hypothetical** Alabama wild pig management objectives.

	Very low priority (1)	Low priority (2)	Somewhat low priority (3)	Neutral (4)	Somewhat high priority (5)	High priority (6)	Very high priority (7)
Reduce wild pig damage (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increase wild pig populations in the state (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Decrease wild pig populations in the state (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stronger enforcement of current wild pig regulation and policy (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Restore damaged ecosystems (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Create wild pig management cooperatives to reduce individual costs and labor demands in order to remove wild pigs from larger areas of land (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Increase research to develop more cost and time effective wild pig control strategies (7)

Create a financial assistance program that aims to compensate individuals for economic loss associated with wild pig damage (8)

Increase funding to better facilitate state management (9)

Make high tech equipment (e.g., cell phone monitored trapping equipment) available for rent to land owners at a reasonable cost (10)

Make
recreational
wild pig
hunting
illegal (11)

vi Section 4 of 4: Social Demographics

Q42 Do you own land in Alabama?

Yes (1)

No (2)

Skip To: Q47 If Q42 = No

Q43 Approximately how much total land do you own? (acres)

Q44 Does any portion of your land fall into the following classifications across all of your properties?

	Yes (1)	No (2)
Bottomland/swamp (1)	<input type="radio"/>	<input type="radio"/>
Farming (2)	<input type="radio"/>	<input type="radio"/>
Food plots (3)	<input type="radio"/>	<input type="radio"/>
Forested (4)	<input type="radio"/>	<input type="radio"/>
Residential (5)	<input type="radio"/>	<input type="radio"/>
Other (please specify) (6)	<input type="radio"/>	<input type="radio"/>

Q45 In general, what is the primary purpose of your land?

- Farming (1)
- Hunting (2)
- Leasing (3)
- Forest products/timber (4)
- Residential (5)
- Other (please specify) (6) _____

Q46 On average, how often do you visit your land?

- I live on my property (1)
 - Once a week (2)
 - Once a month (3)
 - Few times a year (4)
 - Less than once a year (5)
-

Q47 Do you lease someone else's land in Alabama?

- Yes (1)
- No (2)

Skip To: Q53 If Q47 = No

Q48 Approximately how much total land do you lease from someone else? (acres)

Q49 Does any portion of the land you lease from someone else fall into the following classifications across all of your leases?

	Yes (1)	No (2)
Bottomland/swamp (1)	<input type="radio"/>	<input type="radio"/>
Farming (2)	<input type="radio"/>	<input type="radio"/>
Food plots (3)	<input type="radio"/>	<input type="radio"/>
Forested (4)	<input type="radio"/>	<input type="radio"/>
Residential (5)	<input type="radio"/>	<input type="radio"/>
Other (please specify) (6)	<input type="radio"/>	<input type="radio"/>

Q50 In general, what is the primary purpose of the land you lease from someone else?

- Farming (1)
- Hunting (2)
- Leasing (3)
- Forest products/timber (4)
- Residential (5)
- Other (please specify) (6) _____

Q51 On average, how often do you visit your lease(s)?

- I live on my lease (1)
 - Once a week (2)
 - Once a month (3)
 - Few times a year (4)
 - Less than once a year (5)
-

Q52 In which Alabama county or counties do you own/lease property? (select all that apply)

- Autauga (1)
- Baldwin (2)
- Barbour (3)
- Bibb (4)
- Blount (5)
- Bullock (6)
- Butler (7)
- Calhoun (8)
- Chambers (9)
- Cherokee (10)
- Chilton (11)
- Choctaw (12)
- Clarke (13)
- Clay (14)
- Cleburne (15)
- Coffee (16)
- Colbert (17)
- Conecuh (18)

- Coosa (19)
- Covington (20)
- Crenshaw (21)
- Cullman (22)
- Dale (23)
- Dallas (24)
- DeKalb (25)
- Elmore (26)
- Escambia (27)
- Etowah (28)
- Fayette (29)
- Franklin (30)
- Geneva (31)
- Greene (32)
- Hale (33)
- Henry (34)
- Houston (35)
- Jackson (36)

- Jefferson (37)
- Lamar (38)
- Lauderdale (39)
- Lawrence (40)
- Lee (41)
- Limestone (42)
- Lowndes (43)
- Macon (44)
- Madison (45)
- Marengo (46)
- Marion (47)
- Marshall (48)
- Mobile (49)
- Monroe (50)
- Montgomery (51)
- Morgan (52)
- Perry (53)
- Pickens (54)

- Pike (55)
 - Randolph (56)
 - Russell (57)
 - St. Clair (58)
 - Shelby (59)
 - Sumter (60)
 - Talladega (61)
 - Tallapoosa (62)
 - Tuscaloosa (63)
 - Walker (64)
 - Washington (65)
 - Wilcox (66)
 - Winston (67)
-

Q53 In which Alabama county do you live?

- Autauga (1)
- Baldwin (2)
- Barbour (3)
- Bibb (4)
- Blount (5)
- Bullock (6)
- Butler (7)
- Calhoun (8)
- Chambers (9)
- Cherokee (10)
- Chilton (11)
- Choctaw (12)
- Clarke (13)
- Clay (14)
- Cleburne (15)
- Coffee (16)
- Colbert (17)
- Conecuh (18)
- Coosa (19)

- Covington (20)
- Crenshaw (21)
- Cullman (22)
- Dale (23)
- Dallas (24)
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- Escambia (27)
- Etowah (28)
- Fayette (29)
- Franklin (30)
- Geneva (31)
- Greene (32)
- Hale (33)
- Henry (34)
- Houston (35)
- Jackson (36)
- Jefferson (37)
- Lamar (38)

- Lauderdale (39)
- Lawrence (40)
- Lee (41)
- Limestone (42)
- Lowndes (43)
- Macon (44)
- Madison (45)
- Marengo (46)
- Marion (47)
- Marshall (48)
- Mobile (49)
- Monroe (50)
- Montgomery (51)
- Morgan (52)
- Perry (53)
- Pickens (54)
- Pike (55)
- Randolph (56)
- Russell (57)

- St. Clair (58)
 - Shelby (59)
 - Sumter (60)
 - Talladega (61)
 - Tallapoosa (62)
 - Tuscaloosa (63)
 - Walker (64)
 - Washington (65)
 - Wilcox (66)
 - Winston (67)
 - I do not live in Alabama (68)
-

Q54 What is your total household income before taxes last year?

- Less than \$14,999 (1)
 - \$15,000-\$19,999 (2)
 - \$20,000-\$24,999 (3)
 - \$25,000-\$34,999 (4)
 - \$35,000-\$49,999 (5)
 - \$50,000-\$74,999 (6)
 - \$75,000-\$99,999 (7)
 - \$100,000-\$149,999 (8)
 - \$150,000 or more (9)
-

Q55 What is your gender?

- Male (1)
 - Female (2)
 - Other (3)
-

Q56 What **year** were you born? (fill in the blank)

- 19__ (1) _____
-

Q57 What is your ethnicity?

African American (1)

Caucasian (2)

Chinese (3)

Japanese (4)

Latino (5)

Native American (6)

Other Asian (7)

Pacific Islander (8)

Other (please specify) (9) _____

Q58 What is your highest completed level of education?

- Some high school (1)
- High school/GED (2)
- Some college, but no degree (3)
- Vocational/professional certification (4)
- Associates degree (5)
- Bachelor's degree (6)
- Master's degree (7)
- Doctorate (8)

vii If you would like to be entered into the **prize drawing** for one of five **Amazon gift cards** each valued at **\$100**, please enter your **name and mailing address** below.

viii

If you would like to receive a **summary of the results** of this survey, please enter you **email address** below. We will send the findings to you once they have been analyzed.

ix That's it! Thank you for completing the survey and assisting with this research. Please feel free to comment in the space below on anything else regarding wild pigs or wild pig management in Alabama.

MAKE SURE TO CLICK THE NEXT ARROW ONE LAST TIME TO SUBMIT YOUR SURVEY RESPONSES.

End of Block: Default Question Block
