Journal of Environmental Management 201 (2017) 45–51

Contents lists available at ScienceDirect

Journal of Environmental Management

journal homepage: www.elsevier.com/locate/jenvman

Research article

# Assessing landowners' attitudes toward wild hogs and support for control options

Carlotta A. Caplenor [a], Neelam C. Poudyal [a, *], Lisa I. Muller [a], Chuck Yoest [b]

[a] Department of Forestry, Wildlife, & Fisheries, University of Tennessee, Knoxville, TN, United States
[b] Tennessee Wildlife Resource Agency, Nashville, TN, United States

ARTICLE INFO

*Article history:*
Received 10 January 2017
Received in revised form
8 June 2017
Accepted 9 June 2017
Available online 20 June 2017

*Keywords:*
Invasive species
Human dimensions
Wildlife management
Norm activation theory
Regulations

ABSTRACT

Wild hogs (*Sus scrofa*) are an invasive species with destructive habits, particularly rooting and wallowing, which can directly impact agricultural crops, pasture land, and water quality. Considering wild hogs are widely dispersed across the landscape, they are extremely difficult to control. Disagreements can arise among different stakeholders over whether and how their populations should be managed. The purpose of this article was to examine Tennessee, United States landowners' attitudes toward wild hogs, to compare acceptability of control methods, and to evaluate factors significantly influencing public support for regulations to control wild hogs. Logistic regression was employed to analyze data collected from a statewide survey of rural landowners in the fall of 2015. Landowners had overwhelmingly negative attitudes towards wild hogs, and were concerned about their impact on the natural environment and rural economy. Although landowners showed support for controlling wild hogs, levels of acceptability for management options varied. Respondents favored active management and supported education and incentive-based control programs to control wild hogs. Cognitive concepts such as social and personal norms and awareness of consequences, as well as demographic characteristics, significantly predicted landowners' support for state regulations to control wild hogs in Tennessee. Findings increase our understanding of the human dimensions of wild hog management and that of other similarly invasive animals, and may guide resource managers in designing effective and socially acceptable management strategies to control wild hog populations in Tennessee and elsewhere.



## 1. Introduction

### 1.1. Wild hog background

Wild hogs (*Sus scrofa*) are a non-native species introduced to the United States by early Spanish explorers in the 16th century (Mayer and Brisbin, 2009). Despite the recreational benefits they provide to hunters in some parts of the country (Centner and Shuman, 2014), wild hogs are widely considered invasive because of their destructive rooting and wallowing behaviors and ability to transmit disease to livestock and humans (Bevins et al., 2014). They cause a variety of damages to row crops, livestock, water quality, forest regeneration, and infrastructure. Nationwide, wild hog damage is conservatively estimated at $1.5 billion per year, which includes an array of agricultural and environmental disturbances (Pimental, 2007; Wild Pig Info, 2013).

Once established, wild hog populations are difficult to eradicate due to their high reproductive capacity and early maturation. Wild hogs can breed year-round and typically have one to two litters a year with an average of five or six pigs per litter (Higginbotham, 2013; Wild Pig Info, 2013). They are highly intelligent and adaptable, eating a variety of plants and animals across many different geographical areas and seasons (Barrios-Garcia and Ballari, 2012). Populations can double in as little as a year, and 90% must be removed to see a significant decline in population growth rate (Wild Pig Info, 2013; Woody, 2015).

During the 1920s, Eurasian wild boar escaped from the Hooper Bald hunting preserve in North Carolina, resulting in their expansion into Tennessee and crossbreeding with free-ranging domestic pigs (Mayer and Brisbin, 2009). In response to growing numbers, Tennessee implemented a statewide year-round hog hunting season in 1999. However, this compounded the problem by motivating the illegal transport of wild hogs to previously uninhabited areas for hunting purposes (Bevins et al., 2014). Over the last two

* Corresponding author.
*E-mail address:* npoudyal@utk.edu (N.C. Poudyal).

http://dx.doi.org/10.1016/j.jenvman.2017.06.022
0301-4797/

decades, the range of wild hogs in Tennessee has expanded from 15 counties to almost 80 out of 95, and hunting has proven to be an ineffective means of control (Tennessee Wildlife Resources Agency and Wild Hog Eradication Action Team (WHEAT), 2012; Wild Hog Regulations, n.d.). A recently completed study reported substantial damage from wild hogs in Tennessee, with estimated damage at approximately $26 million in 2015 (Poudyal et al., 2016). Remarkably higher estimates of damage are reported in nearby states such as Louisiana (Tanger et al., 2015) and Georgia (Mengak, 2016).

Given increased populations and the costly damages they inflict, wild hogs are now forefront on the minds of many natural resource managers and rural property owners in Tennessee. However, landowners in Tennessee may disagree over the best ways to manage wild hogs. Some landowners might view the potential hunting opportunity positively (Adams et al., 2005), while others might be concerned about wild hogs' invasion of wildlife habitats or disease risk to livestock. For example, Mengak (2016) examined public attitudes toward wild hogs in Georgia and found that most respondents felt wild hogs could be a problem for landowners. A similar study in Illinois reported that landowners' beliefs about wild hogs were also highly negative (Harper et al., 2014).

Most published studies on wild hogs have focused on biological and economic research, with little attention on their social impacts (Adams et al., 2005). As far as we know, the only published research in the past couple of decades was a study comparing the attitudes of Georgia and Illinois farmers toward wild hogs (Harper et al., 2016). However, results from elsewhere may not be applicable to Tennessee, as social and cultural contexts could vary by region (Lieske, 2010). This is particularly true since some of the surveys regarding wild hog damage in neighboring states have relied on non-random (i.e., convenience or purposive) sampling (Tanger et al., 2015; Mengak, 2012). The level of damage could also vary, affecting perceptions of consequences for lack of wild hog management. It could also be helpful to employ theoretically grounded methods to a random sample of landowners so the results could be more generalizable in predicting public support for wild hog management.

### 1.2. Theoretical background

Over the past several decades, research pertaining to the human dimensions of wildlife management has been continually expanding on social psychology theories. Understanding psychological models of human thoughts and behavior can help researchers explain why people think and behave the way do, and can assist natural resource managers as they work with diverse individuals and communities by allowing them to predict behaviors and attitudes toward future management strategies.

The Cognitive Hierarchy Theory is one such behavioral model, and is based on the idea that human thought processes can be arranged into a hierarchy of cognitive states. Each build upon one another in what can visually be observed as an inverted pyramid, and often include values, value orientations, norms, attitudes, and behavior (Fig. 1). Values tend to be fewer in number, not specific to objects or situations, and slow to change. Elements higher up the hierarchy are more numerous and subject to change, such as attitudes and norms. These are also more dynamic, and therefore, more likely to account for variability in a given population. Natural resource managers often strive to measure them in order to predict concepts at the top of the pyramid, such as behavior. For example, if one can detect a correlation, or even causation, between norms and behavior, they then have vital information that can be helpful in predicting stakeholders' acceptance of various management strategies (Vaske, 2008).

Christine Horne postulated, "No concept is invoked more often

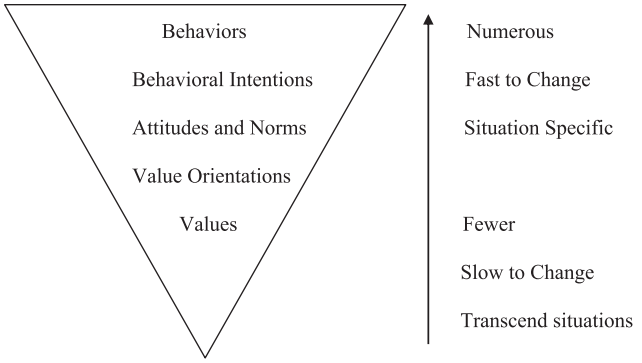


**Fig. 1.** The cognitive hierarchy model of human behavior. (Source: Vaske, 2008, pg. 24).

by social scientists in the explanation of human behavior than the 'norm'" (2001). *Norms* are tied to a sense of internal obligation, an element that separates them from attitudes (Vaske, 2008). They can indicate how most people are behaving (a descriptive norm), or how most people perceive they "should" behave (an injunctive norm) in a particular circumstance (Vaske and Manfredo, 2012). Additionally, *social norms* are shared by a group whose members all agree on what is acceptable behavior or conduct (Vaske, 2008). Therefore, the interaction of the group members is a crucial component, as group approval tends to motivate adherence to the norm. These characteristics make norms an especially useful cognitive construct for identifying public acceptability, recognizing and mitigating any potential conflict among stakeholders, and predicting support for wildlife management.

Researchers tend to define and measure norms differently (see Vaske and Whittaker, 2004), and use different theoretical approaches depending on the situation. Some researchers focus on the variables focusing or activating the norm, which in turn can influence behavior. Schwartz (1977) first developed the norm activation theory in the context of altruistic behavior using three key components (Fig. 2). He described the *personal norm* (PN) as a feeling of moral obligation to behave a certain way. However, norms by themselves are not always enough to guide behavior. Instead, they are often activated by situational factors such as one's *awareness of consequences* (AC), or an individual's recognition of the negative effects that their behavior or lack thereof may cause, and *ascription of responsibility* (AR), which refers to the idea of accepting responsibility for the consequences of these actions (Vaske, 2008). This theory has been successfully used to explain a variety of general pro-environmental behaviors such as carbon footprint mitigation (Vaske et al., 2015) and electricity saving behavior (Zhang et al., 2013). It is also common for Schwartz's model to be adapted to include only a portion of the original variables or to measure them in a different way (Vaske, 2008). For example, Bratt (1999) did not measure ascription of responsibility in his study on recycling behavior, and social norms were instead used as an

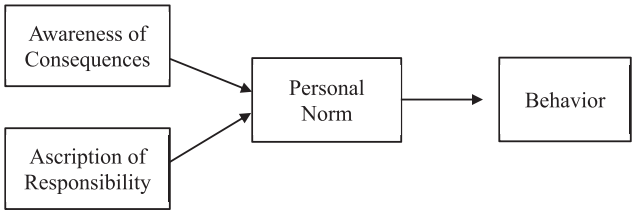


**Fig. 2.** Schwartz's original Norm Activation Model.