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To the Graduate Council:

I am submitting herewith a thesis written by Cristina Elisa Maldonado entitled "Motivation and Support for Regulatory Changes: A Typology of Tennessee Wild Turkey Hunters." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Forestry.

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We have read this thesis and recommend its acceptance:

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Motivation and Support for Regulatory Changes: A Typology of Tennessee Wild Turkey Hunters

A Thesis Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville

Cristina Elisa Maldonado
May 2017

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ABSTRACT

Hunters form a diverse group with multiple motivations for seeking outdoor recreation experiences. A deeper understanding of hunters' motivations may benefit wildlife managers in state agencies to cater services and regulations to meet the needs of this diverse group. To determine the motivations of wild turkey (*Meleagris gallopavo*) hunters in Tennessee, and their attitudes and preferences concerning turkey hunting and management, a self-administered questionnaire was developed and mailed to a sample of licensed Turkey hunters in Tennessee. A multivariate K-means cluster analysis was then applied to identify hunter typologies based on several motivation factors that were derived from the results of running a principal components analysis on motivation questions. The cluster analysis yielded three typologies of respondents: *social harvesters* (44%), *experiential harvesters* (22%), and *social outdoor enthusiasts* (34%). Hunters in these segments were then analyzed to compare the importance of, satisfactions with, and support for various hunting regulations such as season length, bag limits, and preference for management zones. Tennessee wild turkey hunters were overall very satisfied with regulations; however, harvest-oriented hunters were less receptive to regulations that would limit season lengths or bag limits while socially-oriented hunters were more accepting to these restrictive regulations. No significant differences were found between groups in terms of preference for management zones. Findings increase our understanding of typologies as a useful tool for assessing support for management regulations across large populations and may guide wildlife managers in designing effective and socially acceptable regulations for turkey hunting in Tennessee.

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CHAPTER ONE
INTRODUCTION

Background

Turkey hunting is an American tradition with deep cultural and economic significance across the United States and especially in Southeastern states such as Tennessee (Dickson, 2001). Wild turkey (*Meleagris gallopavo*) has been a significant game species in Tennessee since hunting seasons officially opened in the early 1960s, and the state has had a proud heritage of hunting since the early 1800s (TWRA, 2016). This long history of turkey hunting in the state has led to its increased cultural and economic significance over time. Turkey hunting has evolved from merely taking a bird home for dinner to a wide range of experiences that have deep connections in cultural and social practices (Larson, 2014). Hunters now seek to continue family traditions, socialize with community networks such as hunting clubs, escape the urban environment, practice outdoor skills, and achieve goals (Larson, 2014; Manfredo, 1996). This diverse range of outcome experiences continue to motivate turkey hunters in Tennessee as shown by the increasing popularity of the sport as well as the economic impact in the state (TWRA, 2015). As turkey hunting continues to progress, wildlife managers must continue to adapt practices to meet their ever-changing needs.

Over the past several years, shifting management practices from a traditional to an integrative approach has gained momentum in wildlife management literature as well as wildlife agencies (Heberlein & Kuentzel, 2002; Vaske, 2008; Wynveen et al., 2005). Traditional wild turkey management has relied on biological knowledge and expert authority. Effects of harvest regulations in some states have been measured solely through biological methods such as estimates of population parameters, hunting pressure, and harvest (Vangilder & Kurzejeski, 1995), while some states such as Tennessee utilize harvest data alone (TWRA, 2015). Now, however, agencies and wildlife managers are beginning to consider stakeholders' opinions about the resource and satisfactions in the decision process. Hunters and wildlife enthusiasts now seek active roles in managing

wildlife (Chase, Schulser, & Decker, 2000), and it falls on wildlife managers to obtain public input before making critical decisions.

Literature in outdoor recreation suggests that populations of recreationists such as hunters are often diverse in terms of what they want from their recreation experience (Vaske, 2008). In other words, not all hunters have the same preferences or same expectations and therefore, have a variety of needs. A common method for understanding the needs and preferences of a diverse and varied population or user group is to segment them into homogenous subgroups (Floyd & Gramann, 1997; Needham, 2010). Typologies have been proven to help wildlife managers better understand the characteristics of different hunter segments in order to better meet their needs (Andersen et al., 2014; Metcalf et al., 2015; Schroeder et al., 2006; Wam et al., 2013; Ward et al., 2008).

Following these studies, turkey hunters in Tennessee can also be segmented into homogenous subgroups, or typologies. Segments of hunters can then be evaluated and compared in terms of the importance they place on and their satisfaction with regulation features, such as timing of seasons, availability of check-in options, and consistency of regulations across the state. In addition, segments can be evaluated in terms of support for possible regulation changes and dependence on activities. While a number of different criteria have been commonly used in segmenting recreationists, little is known about the relation between recreationists' motivation orientations and support for regulations.

Hunters are motivated to hunt for many reasons other than simply harvesting birds. Some of these motivations range from social aspects like being with friends and teaching young family members to hunt, to solitary aspects such as being out in the woods and enjoying nature (Manfredo, 1996; Decker & Connelly, 1989). Motivations are a key area of interest because they assist in determining why people engage in recreational behavior in the manner that they do (Manfredo, 1996). As these motivations can vary greatly, they are a useful tool for segmentation. Once segmented, support for regulations can be evaluated and compared across segments so wildlife managers can cater regulations to meet the needs of this diverse group.

Wild turkey in Tennessee

The eastern Wild Turkey (*Meleagris gallopavo silvestris*) is a large, gallinaceous game bird most commonly found in the eastern United States and throughout Tennessee. It is a popular symbol of American wildlife as well as a traditional and very important game bird in the eastern United States (Pack et al., 1999). Its photogenic qualities and its reputation as a skillful game bird with excellent palatability have made it one of the most desirable species of native wildlife among hunters (Dickson, 2001).

Wild Turkey are the largest nesting birds in Tennessee (TWRA, 2016). They once had a historic range across Tennessee, and were often reported in numerous and large flocks by early settlers (Dickson, 2001). They began to suffer from a population decline in the early 1900s due to unrestricted hunting, land clearing, and loss of the American Chestnut. By 1920, wild turkeys had been extirpated from 18 of the 39 states that made up their ancestral range, including Tennessee (Dickson, 2001). With habitat reduction and intense hunting pressure, remnant flocks were mostly relegated to remote areas with limited human populations.

Efforts to restore wild turkeys began in the 1940s across Tennessee (Simmons, 2014). Prior to 1949, wildlife managers attempted to release birds raised in captivity, which was not effective as they were ill equipped to live in the wild (Dickson, 2001). The restoration policy changed in 1949 with the creation of the Tennessee Game and Fish Commission, which began to systematically trap and release turkeys into the wild. As a result, eight counties across the state were open for turkey hunting by 1960 (Simmons, 2014). In 1974, the Game and Fish Commission was reorganized as the Tennessee Wildlife Resource Agency (TWRA), which oversees turkey hunting today. Through methods such as using rocket-propelled nets to move turkeys, improved habitat management, population assessments, and harvest regulations, the TWRA restored the population to the point that most counties were open for hunting by the 1980s (Simmons, 2014). Today, there is a balanced population of wild turkeys throughout the state (TWRA, 2015).

While the overall Tennessee wild turkey population has been relatively stable, there has been a perceived decrease in turkey populations in middle Tennessee, particularly in the tri-county area of Giles, Lawrence, and Wayne Counties (Gerhold et al., 2016). Hunters and non-hunters alike have expressed concern about reduced turkey observations in the past several years, which is reflected in TWRA harvest records (TWRA, 2016). These concerns are shared by several eastern states (TWRA, 2016), and indicate that turkey abundance has decreased from a peak that was reached during restoration (Robinson et al., 2017). Accordingly, assessing hunter responses to this potential population decline would be of interest to wildlife managers in Tennessee.

Despite the possible localized population decline, the cultural and economic significance of turkey hunting in Tennessee is strong, as shown by the number of hunters, birds, and hunters' expenditures (U.S Census Bureau, 2011). In Tennessee, wild turkey is considered a big game species, along with white-tailed deer (*Odocoileus virginianus*), elk (*Cervus elaphus*), and black bear (*Ursus americanus*). In order to hunt wild turkey, a hunter must purchase one of several license types that allow for big game hunting, as there is no single license for the exclusive privilege to hunt turkeys. Of the licenses that do allow one to hunt turkeys, roughly 120,000 are sold annually, generating a revenue of about $300 million per year (U.S Census Bureau, 2011). There is an estimate of 120,737 turkey hunters in the state, which makes up about 29% of all hunters in Tennessee (University of Tennessee Human Dimensions Research Lab, 2014). These hunters actively participate in the sport as shown by the fact that over 30,000 wild turkeys were harvested in the spring and fall seasons of 2015 (TWRA Harvest Report, 2015).

Turkey hunting regulations

Regulations for turkey hunting are established by the Tennessee Wildlife Resources Agency and are statewide. While some regulations can vary by county, the majority are statewide and not divided into management zones based on populations as they are in other states such as Wisconsin and Kansas. Hunting seasons are split into spring and fall seasons, the spring being much longer and more popular than the fall. In

2015, the spring season started on April 4th and ended on May 15th, lasting a total of 44 days. There was a season bag limit of 4 birds and a daily bag limit of one, meaning that a hunter could harvest four birds throughout the season, but only one per day. The fall season began on October 17th and ended 13 days later, on October 30th. Rather than instituting statewide bag limits, the bag limit is set by county in the fall season. Hunters in the fall season are allowed to harvest up to six birds per season in some counties. On the other hand, some counties have closed the fall season entirely, for the time being.

As seen by the rise and fall of turkey populations across the state, wildlife management plays a critical role in securing steady population numbers. Hunting regulations are put into place to ensure steady populations and to allow for quality hunting experiences. In the past, wildlife management decisions have relied on biological knowledge and professional opinion (Riley et al., 2002). However, over the last several decades, wildlife management has been shifting from an expert-authority model to a more collaborative model, where the agency and stakeholder groups work in conjunction to find win-win solutions (i.e. achieving population management goals, and satisfying hunter expectations) (Cornicelli & Grund, 2011). As stakeholders expect a significant role in managing wildlife, it is becoming increasingly important for wildlife management agencies to assess the opinions of their constituents prior to making decisions. Additionally, it is important for agencies to periodically assess users' satisfaction with and the value they put on the provisioning of specific regulation features. For this reason, many wildlife agencies employ surveys to assess the opinions and attitudes of various groups such as bird watchers, anglers, and wild turkey hunters.

Statement of the problem and justification

Given the cultural and economic impact of wild turkey hunting in the state of Tennessee, assessing management tools and regulations is forefront in the minds of natural resource managers and wildlife agencies. Over the years, several states have conducted surveys to assess the attitudes and opinions of wild turkey hunters (Dhuey & Rees, 2004; Harmel-Garza et al., 1999; Pennsylvania Game Commission Bureau of

Wildlife Management, 2010; Van Why et al., 2000). Many of these studies, however, may not necessarily be applicable to Tennessee because of the uniqueness of sample selection and underlying differences between Tennessee and the areas previously studied. Many recreational studies additionally involve convenience samples of hunters either encountered onsite or who report their harvest, which are subjective and prone to researcher bias (Vaske, 2008). This study differs in terms of the systematic sampling approach taken, which is based on big game hunting licenses. Accordingly, this sample includes hunters of all kinds, regardless of whether they actively hunted in the previous season or successfully harvested a bird.

Additionally, literature on outdoor recreation has many publications on motivation and satisfaction, but the recreational activities being studied vary in terms of activity and hunting type. For example, studies have examined motivations for general hunters in Texas, for waterfowl hunters in Minnesota, and for deer hunters in New York (Decker & Connelly, 1989; Floyd & Gramann, 1997; Schroeder, et al., 2006). Accordingly, many studies do not necessarily explain the motivations for turkey hunting specifically. The proposed study intends to fill this research gap by applying a motivational approach to study Tennessee wild turkey hunters.

In addition, these previous studies have explored motivations within hunter populations, but have used limited motivation scales. For example, Floyd & Gramann (1997) looked at only experiential factors such as nature enjoyment and hunting factors such as trophy harvesting as motivating factors, excluding social aspects of motivation. Another study separated hunters strictly by three categories of motivation orientations and did not allow for variations (Decker & Connelly,1989). For example, their analysis did not allow for groupings of hunters who were both highly harvest and socially motivated while relatively unmotivated by experiential factors. This study intends to fill this research gap by including a more comprehensive set of motivation scales to explore motivation heterogeneity in turkey hunters.

It is vital for wildlife managers to not only understand the motivations of Tennessee turkey hunters, but also to understand how those motivations correlate with

support for various wildlife management regulations and responses to population declines. Many of the previous studies have primarily focused on overall experiences, turkey populations, and management issues, but few have studied how turkey hunting motivations can relate to support for specific management actions (Hendee, 1974; Manfredo, 1996; Wynveen et al., 2005). In addition, few have been able to group hunters by motivations in order to assess demographic characteristics as well as management preferences and population decline responses of each group.

Because hunters form such diverse groups, managing recreation resources for their needs can be challenging. Hence, developing and applying a quantitative classification system is an important step in improving an agency's ability to identify the preferences and needs among a diverse population (Schroeder et al., 2006). Cluster analyses are a widely accepted method to do this by creating typologies (Vaske, 2008). Hunter typologies are usually developed to better understand the characteristics and motivations of different hunter segments (Andersen et al., 2014; Metcalf et al., 2015; Schroeder et al., 2006; Wam et al., 2013; Ward et al., 2008). Once these segments (sub-groups of hunter populations with similar motivation and interests) are created, expectations, importance, and satisfactions can be evaluated and compared across segments.

By assessing hunters as a heterogeneous group with diverse motivations, wildlife managers can create regulations and management plans that better meet their diverse needs. For example, understanding the proportion of hunters that are more socially motivated rather than harvest driven will help agencies anticipate relative changes in expected hunting pressure. Similarly, if a large proportion of hunters belong to a group of isolative experience seekers, agencies may seek to address hunter crowding issues in public hunting areas. Overall, the proposed study intends to utilize a segmentation approach to explore the diversity of the turkey hunter population in Tennessee in terms of their motivation to see who they are, what they want, and whether and to what extent each segment supports regulatory changes.

Objectives

The overall goal of this project is to determine the motivations of wild turkey hunters in Tennessee, and their attitudes and preferences concerning turkey hunting and management.

The specific objectives are to:

1. Assess the motivation orientations of wild turkey hunters in Tennessee
2. Identify the typology of wild turkey hunters in Tennessee based on their motivations for hunting
3. Compare support for hunting regulations and activity dependence among segments of wild turkey hunters in Tennessee

CHAPTER TWO
LITERATURE REVIEW

Turkey hunting in wildlife management

Wild turkey management is complex and involves teamwork from wildlife managers, biologists, and hunters alike to manage habitats and populations. Turkeys are a flexible and adaptable non-migratory species that are found in a variety of eastern habitats. Common management of wild turkeys from a wildlife agency's perspective involves a landscape scale management plan as turkeys have been known to use anywhere from a few hundred to a few thousand acres of range annually across a variety of habitats (Dickson, 2001).

Turkey hunting also plays a crucial role in wildlife management. Because wild turkeys do not prosper in areas of intense unrestricted hunting, limiting hunting seasons is important. Hunting hens and poults in the fall can suppress populations (Dickson, 2001; Pack et al., 1999). For this reason, wildlife management agencies often have a shorter fall season, if they permit one at all. In areas with lower populations, the fall turkey hunting season is closed altogether (Pack et al., 1999). The spring season, however, typically lasts several weeks and begins in March or April. Spring turkey seasons and bag limits in the South are generally liberal, with bag limits for states ranging from 1 to 5 or 6 in some states (TWRA, 2016). Hunting wild turkey over bait is illegal in many states while other hunting practices such as using decoys and hunting with dogs is legal in some states (Dickson, 2001).

The timing of the spring hunting season coincides with the breeding season for wild turkeys. The goal for managing the spring season is to give hunters the greatest opportunity to go into the field and harvest a bird while minimizing the risk to nesting hens, disruption to breeding behavior, and the risk of overharvest (NY Department of Environmental Conservation, 2017). To achieve this objective, spring hunting seasons in some states open near the median date for the onset of incubation (when hens are on nests) (Miller et al., 1997).

Spring gobbler hunting is presumed to have a minimal effect on population growth due to the polygamous nature of the species (Kurzejeski & Vanglider, 1992). Accordingly, spring harvest strategies can be designed to facilitate a high proportion of adults in the population by limiting harvest and harvest opportunity. Conversely, liberal spring bag limits and harvest opportunity could reduce the adult male segment of the population (Kurzejeski & Vangilder, 1992).

Fall harvests, however, do have a potential to affect wild turkey populations (Pack et al., 1999). Accordingly, regulations and management strategies for the fall season are more formally considered as population regulation mechanisms. Fall harvests exceeding 10% of the population can result in population declines (Vangilder & Kurzejeski, 1995). Furthermore, spring gobbler-only hunting is optimal for maximum growth in a wild turkey population, and a conservative fall season is suggested for sustainable populations (Pack et al., 1999).

It is also important to note that state and federal wildlife agencies are mandated by law to consider the conservation of wildlife the foremost priority. Therefore, a balance must be struck between the desires of hunters and the goals of wildlife agencies. As hunters feel they play a crucial role as wildlife stewards and managers (Harper et al., 2012; Kaltenborn et al., 2013), and hunters are more prone than non-hunters to take part in conservation behaviors (Cooper et al., 2015), managers must engage their hunter populations and view them as having active roles in wildlife management. As management practices continue to evolve to better meet the needs of wild turkey populations, it is becoming increasingly more important to get input from hunters. Determining their satisfactions from hunting and their motivations for hunting can be important steps in this process. These inclusive management approaches are vital for the success of turkey populations and hunters alike.

Human dimensions of hunting

Wildlife decision-making has traditionally relied on biological science and expert opinions (Cornicelli & Grund, 2011; Riley, et al., 2002; Vaske & Manfredo, 2012).

However, managers are beginning to consider the incorporation of both biological information and human dimensions' information such as hunter concerns, hunting pressure, management objectives, and political influence to better manage populations and to formulate harvest regulations (Decker & Chase, 1997; Vangilder & Kurzejeski, 1995). In this way, wildlife management has begun to shift from a strong emphasis in natural science to becoming a "meta discipline" that increasingly integrates the social sciences of sociology and psychology (Moon & Blackman, 2014).

Human dimensions research aids wildlife managers by assessing the public's thoughts and actions towards wildlife. This is essential for accomplishing management goals such as encouraging participation in wildlife activities, reducing conflicts among stakeholders, educating the public about management practices, and predicting stakeholder positions on emerging issues (Vaske & Manfredo, 2012). Research in human dimensions has evolved from mostly descriptive empirical studies of characteristics and recreation use patterns to more analytical studies. Human dimensions research is now based on the theory of behavior and examines the underlying concepts of outdoor recreation (Vaske, 2008). For example, studies have been conducted on theoretical concepts such as satisfaction (Vaske, 2008), motivation (Manfredo, et al., 1996), crowding (Shelby, Vaske, & Heberlein, 1989), and norms (Hrubs, et al., 2001; Vaske & Donnelly, 2002). These research studies attempt to examine the psychological experience surrounding wildlife recreation to better understand recreational behavior.

Pertaining to wildlife managers specifically, incorporating data from social science surveys regarding hunters' motivations, satisfactions, and the trade-offs they make, in addition to biological population data can be a valuable tool. It allows managers to create regulations and management plans that strike a balance between wildlife populations and hunter satisfaction. It also allows managers to see what factors of current regulations hunters find most important, such as having several weekend opportunities to hunt and a season that does not overlap with other game hunting seasons.

There has been an extensive amount of research on the human dimensions of wildlife management, particularly in North America. Many studies have examined the

factors determining hunter satisfaction to improve overall hunting experiences. For example, Frey et al. (2003) examined factors that lead to improved satisfaction for pheasant hunters and found the number of roosters seen and pheasants harvested, along with the relative hunter density positively influenced hunter satisfaction. Another study explored hunter density, perceived crowding, and interactions with others to determine how they relate to biological dimensions of deer management to promote high quality hunts and hunter satisfaction (Heberlein and Kuentzel, 2002). Increased crowding decreased satisfaction, but this was often offset by the association between greater density and seeing, shooting, and bagging more deer. A meta-analysis on perceived crowding among hunter populations found that when managers actively address the crowding situation through regulations that restrict hunter numbers and decrease hunter density, overall hunting experiences were improved (Shelby & Vaske, 2007). Management actions have the potential to make a large impact on crowding, and therefore, overall hunter satisfaction.

Several studies have been conducted on the human dimensions surrounding hunter recruitment and retention. For example, Brunke and Hunt (2008), found that a misalignment of expectations and actual harvest opportunities may affect hunters' intentions to hunt in the future. This study highlighted the importance of surveying opinions and showed that hunter retention may be dependent on meeting the expectations of hunter populations. Another study examined hunters within a social context and found that hunter recruitment and retention was affected by a broad range of social factors such as family members, mentors, community support networks, and hunters' societal environment (Larson, et al., 2014). This study highlighted the importance of looking at hunters, not as individuals, but as individuals within a larger socio-cultural context. Examining the larger framework surrounding an individual hunter will allow researchers to better understand their needs and managers to better address those needs.

Other studies have identified differences between stakeholder perceptions and support for management actions. For example, Cornicelli and Grund (2011) surveyed deer hunters to assess their attitudes towards proposed regulatory changes that would

increase the amount of mature bucks in the deer population. They developed a survey using self-selected respondents and found that a majority of hunters were in favor of these regulation changes. Miller and Graefe (2001) also examined deer hunters and found that harvest success was a significant predicting factor in hunters' support for management actions. A study on duck hunters looked at uncertainty in regulations and how that uncertainty affected hunter behavior and participation (Haugen et al., 2015). Harvest success was lower in more restrictive seasons and greater under moderate restrictions, while liberal seasons fell in the middle. Managers with information of hunter experience, conservation concern, and persistence and dedication may be better equipped to fulfill stakeholder requests and improve harvest management.

Lastly, several studies have been conducted on hunters and their perceived roles within wildlife management regimes. Cooper et al. (2015) found that hunters were four to five times more likely than non-hunters to engage in conservation behaviors such as developing and maintaining wildlife habitat on public lands, contributing in local environmental groups, and supporting local conservation efforts. Another study found that hunters see themselves as stewards of the environment and as being vital components to wildlife management (Kaltenborn, et al., 2013). Hunter populations have the potential to be important stewards for wildlife and can take vital roles in wildlife management. Another study on deer hunters assessed their attitudes towards big game management practices (i.e. Quality Deer Management (QDM)) that were newly put into effect and relied on hunters taking the responsibility of an active management role (Harper et al., 2012). Several groups of hunters were supportive of the plan but were unclear about their roles and responsibilities within it. This study showed wildlife managers that they needed to expand efforts in providing QDM opportunities where appropriate and in offering hunter-focused educational programs to expand understanding of deer management strategies. It also highlighted the fact that because hunters have this potential to be stewards of wildlife, education on proper management techniques is vital to managing wildlife populations and increasing hunter satisfaction.

Research in human dimensions continues to have an influential role in expanding the perspective of wildlife managers. It allows managers to learn more about their constituents and provide for better hunting experiences. Studying hunter behavior and attitudes allows managers to take active roles in management and cater regulations to fit the needs of their diverse hunter groups. Human dimensions research is continuing to expand and is of particular importance in terms of hunter motivations.

Hunter motivations and satisfactions

Human dimension research in wildlife-based recreation such as hunting are grounded on cognitive, motivation, and satisfaction theories. These theoretical frameworks form the basis for managers to learn more about their constituents to provide better overall experiences (Vaske & Manfredo, 2012). While cognitive approaches examine the values, attitudes, and norms that lead from human thoughts to actions towards wildlife, motivational and satisfaction-based approaches center on emotions (Vaske & Manfredo, 2012). Motivational approaches seek to explain the reason people do the things that they do, and satisfaction theories examine why people evaluate their experiences in a certain way.

Satisfaction studies focus on the outcomes received from recreation experiences and refer to a feeling of joy or pleasure derived from those experiences (Decker, 2004). The feeling of satisfaction from those outcomes can also depend on expectations. One study on waterfowl hunters in Mississippi found that the disconfirmation of expectations has a significantly strong relationship with satisfaction (Brunke & Hunt, 2008). Brunke and Hunt furthered research on the theory that satisfaction is the congruence between expectations and outcomes so that low levels of satisfaction are achieved when expectations are not met and vice versa. This feeling of joy, however, does not necessarily remain consistent across a hunter population. One study in Wisconsin measured perceived crowding and its effect on deer hunter satisfaction and found that their deer hunters differed in terms of satisfaction based on crowding depending on the type of deer they hunt (Heberlein & Kuentzel, 2002). Lastly, a meta-analysis of

recreational satisfactions found that non-consumptive recreationists (e.g., hikers, bird watchers) reported significantly greater levels of satisfaction overall than consumptive recreationists (e.g., hunters) (Vaske & Roemer, 2013). Given the disparity in results, these studies highlight the importance of assessing hunter expectations and motivations for participating in outdoor recreation activities in addition to assessing satisfactions.

Understanding recreationists' motivations for participation is critical in assessing demand for outdoor recreation experiences (Vaske, 2008). Motivations drive recreationists' interest in activities prior to participation and are important for understanding why they participate in the activities that they do (Decker et al., 1980). It also helps in understanding the effects of recreational activities, such as increased socialization and well-being (Larson et al., 2014). It can also help recreation managers develop programs that have the most potential to minimize conflicts between user groups and increase overall net benefits (Vaske, 2008). The motivational approach of describing behavior suggests that people are driven to take actions to achieve particular goals (i.e., they seek certain outcomes from their experiences) (Vaske, 2008).

Motivation research stems from the multiple satisfactions approach, which states that recreationists seek a variety of benefits and outcomes, and they are motivated to act for these diverse reasons (Hendee, 1974). Hendee utilized this theory to confront the traditional game management theories that hunting benefits are adequately measured by determining the amount of game bagged, and that benefits can be maximized by increasing the number of hunting days. He stated that for game managers to increase net benefits for all hunters, hunting should be broken down according to the different kinds of experiences that it provides. In this way, managers can tailor their strategies to meet those specific needs, as different types of hunters derive satisfaction, and are thusly motivated, by different aspects of the sport. For example, a backcountry single-party deer hunter has different motivations than a general-season party deer hunter. Wildlife managers can benefit from understanding these motivations, how they relate to each groups' satisfaction levels, and what percentage of their constituents make up each group.

While Hendee used this theory to demonstrate that hunters are motivated by more than the harvest alone, it has also been used for a variety of experiences. Hendee (1974)'s research on multiple motivations was furthered by Driver et al. (1991)'s studies on desired psychological outcomes, which states that recreation is a way for achieving certain outcomes such as achievement, stress relief, or family togetherness. They suggested that recreation can be thought of as a "psychophysiological experience" that is self-rewarding, occurs during free time, and is the result of free choice. Driver et al. (1991) also created the Recreation Experience Preference (REP) scales, which can be utilized to measure the scope of a person's recreation experience. They selected the scales along with the variables (survey items) used to measure these outcomes based on an assessment of personality traits and motivation literature.

A meta-analysis of over 30 studies that utilized REP scales, found that these concepts and variables have demonstrated their usefulness in understanding the nature of recreation experiences and recreationists themselves (Manfredo et al., 1996). In terms of motivations, this meta-analysis found several motivations studied in natural resource contexts such as seeking solitude, learning, socializing with friends and family, and nostalgia (Manfredo et al., 1996). They furthered the theory that recreationists are motivated by multiple experiences.

Recent studies have continued exploring hunter motivations and found different types of motivations, including experiences, are associated with aspects such as being in nature, harvesting game, and interacting with friends and family (Vaske & Roemer, 2013; Wam et al., 2013). Other studies have explored hunter motivation in terms of supporting particular management strategies (Harper et al., 2012; Ward et al., 2008). Metcalf et al. (2015) examined the motivations of female hunters in Oregon, and found that women have unique motivations, which include constraints with family life. In addition, several studies on hunter motivation have been conducted on specific hunter groups such as mourning dove hunters, grouse hunters, deer hunters, pheasant hunters, and anglers (Andersen et al., 2014; Connelly, et al., 2011; Frey et al., 2003; Hayslette et al., 2001;

Wam et al., 2013). However, few studies have examined motivations in the context of wild turkey hunters.

Hunter typologies

Researchers have created hunter typologies based on several factors. Satisfaction with hunting regulations and harvest success have been commonly used as a basis of identifying typology (Faye-Schjoll, 2008; Wam et al., 2012). These studies have measured hunters' satisfaction with the number of animals harvested or importance placed on favorable bag limits. Other studies have utilized hunter specialization, such as skill level and money spent on equipment, as a basis of segmentation (Norton, 2008; Ward et al., 2008). Some have created typologies based on preferred recreation experiences such as affiliation with family, appreciation of nature in waterfowl hunters, and desire for catch and skill development in anglers (Connelly et al., 2011; Schroeder et al., 2006). Lastly, the most commonly used basis for segmenting hunter populations is motivation (Crompton, 1979; Légaré & Haider, 2008; Manfredo et al. 1996; Vaske, 2008). This method is based on the idea that motivation is composed of a multitude of diverse single motives, and by identifying specific motivations, one can better understand hunter preferences, goals, and behaviors.

Decker & Connelly (1989) created typologies based on motivations for deer hunters in Minnesota. They assessed several motivation variables and found that the majority of specific motivations for recreational hunting can be combined into three categories: affiliative orientation, achievement orientation, and appreciative orientation. According to this theory, hunters with affiliative orientation participate in wildlife recreation for the enjoyment of being with others and strengthening relationships. Those with an achievement orientation participate with specific goals in mind such as harvesting the bag limit, and those with appreciative orientation participate to experience peace in the outdoors and desire to be acquainted with the environment. They also argued that each of these motivations have varying degrees of saliency and importance among different hunters. Therefore, by assessing these motivations within particular hunter

groups, wildlife managers can more effectively develop actions to improve satisfaction within these groups.

Other studies have created typologies based on the three motivation orientations identified by Decker and Connelly (1989) for their specific recreational groups. For example, Schroeder et al., (2006) studied waterfowl hunters in Minnesota and found five subgroups that significantly differed in terms of affiliation, achievement, and appreciative motivations: recreational-casual participants, social enthusiasts, longtime participants, less-engaged participants, and individualist enthusiasts. Floyd & Gramann (1997) studied active hunters in Texas and found four subgroups based on Decker and Connelly's motivation orientations: high-challenge harvesters, low-challenge harvesters, non-harvesters, and outdoor enthusiasts. Lastly, Légaré & Haider (2008) studied outdoor recreationists in Canada and found three subgroups based on those motivation orientations: the soft adventure cluster, nature appreciation cluster, and heritage tourism cluster.

These subgroups from each study had members rate Decker and Connelly's three motivation orientations with varying levels of importance. For example, the "social enthusiasts" from the Minnesota study rated affiliative aspects of hunting like "hunting with family and friends" to be more motivating than achievement or appreciative aspects. Meanwhile, the "recreational-casual participants" were more motivated by appreciative aspects of hunting such as "seeing a lot of ducks and geese" rather than affiliative or achievement aspects (Schroeder et al., 2006). Likewise, the "high-challenge harvesters" from the Texas study rated achievement and appreciative aspects of hunting to be more motivating, while the "outdoor enthusiasts" rated appreciative aspects of hunting to be more motivating (Floyd & Gramann, 1997).

In addition to simply creating subgroups based on motivations, typologies can aid agencies in understanding levels of support for management actions and creating tailored programs (Andersen et al., 2014; Metcalf et al., 2015; Schroeder et al., 2006; Wam et al., 2013). For example, Andersen et al. (2014) identified typologies in terms of active and inactive deer hunters in order to implement targeted management plans and improve

declining hunter numbers. Metcalf et al. (2015) found typologies for female hunters to understand their constraints and negotiation strategies. Schroeder et al. (2006) found differences among types of waterfowl hunters and their opinions on several management actions, such as restrictions on open-water hunting and starting shooting hours at noon on the opening day of the season, as well as their reported satisfaction with their experiences. Wam et al. (2013) created typologies based on the importance placed on bag size and crowding tolerance, and found that different groups of hunters supported bag limits and permit restrictions differently. For example, bag-oriented hunters were more willing to pay for larger bags than experience-oriented hunters, and 85% of their hunter population was tolerant of crowding, while only 4% strongly supported permit restrictions.

CHAPTER THREE
MATERIALS AND METHODS

Research design and survey instrument

Data on motivations, satisfactions, and attitudes towards regulations were collected from a mail survey of wild turkey hunters in Tennessee. Based on the issues and comments raised during a half-day workshop with Tennessee Wildlife Resource Agency (TWRA) regional turkey biologists and managers, a 9-page questionnaire was developed to assess hunters' opinions and attitudes towards various aspects of the spring and fall turkey hunting seasons in Tennessee (Appendix I). A number of questions recently tested and used for similar surveys in nearby states were used to develop a preliminary instrument (Cornicelli et al., 2011; Harmel-Garza et al., 1999; Van Why et al., 2001). Feedback on the questionnaire was collected from survey experts, social psychologists, and wildlife biologists with knowledge of big game hunting.

The questions on the survey were organized into five sections. The first section included questions about current and past turkey hunting in Tennessee, whereas the second section included questions regarding their experiences with fall turkey hunting. The third section asked about hunters' opinions on spring turkey hunting in the state, and the fourth section included questions about their perceptions of turkey populations and the importance of regulation features. The final section contained questions about respondents' demographics such as age, sex, employment, annual income, and whether they hunt for turkey outside of Tennessee.

Perception and attitude questions utilized appropriately labeled 5-point Likert scales, (i.e. 1-Strongly disagree ↔ 5-Strongly agree or 1-Not important ↔ 5-Very important). Likert scales are a widely used fixed choice response format in survey design, and are well known for measuring attitudes and other cognitive constructs (Vaske, 2008). This also allows for responses to be easily entered and coded for data analysis. Other questions were either structured (multiple choice, Yes or No) or open-ended where applicable.

The constructs for this study were defined using multiple item indicators in order to reflect a full understanding of the underlying concepts (Vaske, 2008). For example, hunter motivation was assessed with the question, "How important are each of the following reasons for why you hunt turkeys in Tennessee?" Participants were then presented with a list of motivations such as shooting birds, being with family, and being outdoors, importance of each of which could be indicated on a 5-point importance scale (very unimportant=1, very important=5). This allows the researcher to test the extent to which each motivation reflects the underlying concept of hunter motivation using Cronbach's alpha to measure reliability (Vaske, 2008).

The survey was printed and mailed to 5,000 participants. Because the research goals were to study the relationship between motivation and support for turkey hunting regulations, it was important to select a sample of Tennessee turkey hunters with active hunting licenses to ensure participants' familiarity with hunting regulations and recent hunting experiences. Therefore, participants for this research study were recruited from a list of all turkey hunters that had the privilege of turkey hunting or reported to have hunted in Tennessee in 2015. The information for each license holder, including name, address, and license type, was provided by the Information Technology department of the TWRA.

Nine different types of hunting licenses that included the privilege to hunt turkeys in Tennessee were issued to 109,778 hunters in 2015 (TWRA). One of the nine license types were excluded from our survey as it allows the privilege to hunt turkeys solely to youths under the age of 18. Accordingly, due to the eight different types of surveyed licenses and the fact that some landowners hunted turkey without a license (but reported a harvest), a stratified random sampling approach was adopted to select 5,000 contacts representative of all license types and hunters. Following Mingie (2017), sample allocation across license categories was determined based on the size of each category, with an additional sample of 500 hunters who reported a harvest during the 2015 season (Table 3.1). The sample size was consistent with that suggested by Dillman (2000) for a 95% confidence interval.

Table 3.1 *Sampling Distribution by License Types of Turkey Hunting Privilege in Tennessee in 2015*

License Description	# of Licenses	% of Total License Population	Proportional Allocation	Adjusted Allocation	% of Sample
Resident Sportsman	52,068	87.6	3,942	2,301	46
Resident Big Game Gun	18,989	21.3	958	829	17
Resident Big Game Archery	1,907	2.1	95	169	4
NR 7 Day Hunting All Game	1,492	1.7	77	71	1
Resident Permanent Senior Citizen	12,879	14.4	648	147	3
Lifetime License Age 13-50	929	1.0	45	350	7
Lifetime License Age 51-64	529	0.6	27	266	5
Senior Citizen Lifetime	451	0.5	23	367	7
2014 Spring Turkey Harvesters	N/A	N/A	N/A	500	10
Total Licenses	89,244		5,000	5,000	100

The mail survey was administered following a modified catered design method (Dillman, 2006). The survey packet included a questionnaire, personalized cover letter, and a business reply envelope, and was mailed to respondents during the first week of November, 2015. It was timed so respondents would receive questionnaires shortly after the fall turkey hunting season. Two weeks later a reminder post-card (Appendix II) was sent, followed by an additional mailing of the survey packet to those who had not yet responded. The cover letter was designed to invite respondents to complete the survey and explain to them the purpose of the study. It also assured that participation was voluntary, and that contact information and responses would remain anonymous and confidential. The University of Tennessee's Office Institutional Review Board (IRB Approval #UTK IRB-15-02558-XP) approved the final survey instrument and protocols.

The mail survey format was chosen over other options such as email or phone surveys for several reasons. As the general population of hunters tends to be of older age, it was believed that this population would best respond to a mail, write-in, paper survey

format. Mail surveys are also more likely to ensure respondent anonymity and confidentiality and avoid interviewer bias (Vaske, 2008). Lastly, as the survey contained many questions, a paper form would allow the participants to have ample time to carefully read all of the questions and complete the survey.

Data processing & analysis

Of the 1,707 returned surveys, 319 did not provide data useful for this study. They were either returned unfilled/incomplete or were not included because the recipient contacted us indicating they did not utilize the turkey hunting privilege included with their license or did not want to participate. Responses for the remaining 1,388 surveys were entered in an Excel spreadsheet, and analysis was conducted using IBM SPSS® 22 statistical software.

The target population for this study was Tennessee turkey hunters who hunt in the spring season. Due to requests from the funding wildlife agency, however, we also sought opinions and perceptions from fall hunters. Accordingly, the 1,388 responses available from the survey included both fall and spring hunters. In addition, the survey allowed for valid responses from hunters who typically hunt turkeys during the spring, but for whom the spring 2015 season was an exception. Therefore, a classification system was implemented to determine if respondents were spring turkey hunters. The system is as follows:

1. Respondent reported hunting turkeys in Tennessee in the 2015 spring season (n=1,207).
2. Respondent did not hunt turkey in the 2015 spring season, and selected the option, "I typically hunt turkeys during the spring season, but 2015 was an exception" (n=166).
3. Respondent did not hunt turkey in the 2015 spring season, and selected the option, "I hunt turkeys in the fall only" (n = 15).
4. Respondent did not hunt turkey in the 2015 spring season, and selected the option, "I do not hunt turkey at all" (n = 308).

5. Respondent did not hunt turkey in the 2015 spring season, did not select an option for why they did not hunt during that season, and continued to fill out the survey, answering questions for both fall and spring seasons (n=5).

Accordingly, the final sample determined to represent turkey hunters in Tennessee consisted of 1,395 observations, 1,373 of which were spring hunters. Because the selection of a respondent as a turkey hunter was based on multiple selection criteria, it is expected the sample included respondents who all hunted turkey in the spring.

The data was analyzed to assess hunter motivations and to see how those motivations related to support for hunting regulations. Motivations were assessed through a 15-item questionnaire that was dimensionally reduced to three motivation orientations through a Principal Component Analysis. This reduction in data allowed for the sample of hunters to be analyzed individually in terms of three main motivations. Accordingly, each individual in our sample was able to be assigned to a cluster based on their motivation orientations through a cluster analysis. Once cluster membership was assigned, Analysis of Variance and Chi-Square tests of Independence allowed the clusters to be compared along several variables including demographics, hunting characteristics, satisfactions with regulation aspects, support for regulations, and activity dependence. These analyses provided a complete picture of the identity and desires of Tennessee turkey hunters in order to inform wildlife management decisions.

Assessing hunter motivations

Motivation orientations segmentation

Tennessee turkey hunters' motivation orientations were assessed based on a set of value statements related to sport hunting and nature as given in Table 3.2. These statements assessed hunters' responses regarding the importance of reasons for hunting turkey in Tennessee. Responses were gauged on a Likert scale ranging from 1, or "very unimportant," to 5, or "very important." Various statements out of the sixteen in the scale were expected to measure experience-oriented motivations, socially-oriented motivations,

Table 3.2 *Tennessee turkey hunter motivation orientation scale*

Motivations	Very unimportant ←				→ Very important
Being out in the woods	1	2	3	4	5
Enjoying nature and the outdoors	1	2	3	4	5
Experiencing the challenge of the hunt	1	2	3	4	5
Enjoying solitude and escape from normal life	1	2	3	4	5
Improving hunter skills	1	2	3	4	5
Hearing or seeing turkeys	1	2	3	4	5
Getting some physical exercise	1	2	3	4	5
Finding or seeing signs of turkeys	1	2	3	4	5
Being able to enjoy other types of recreation	1	2	3	4	5
Teaching others (kids, friends) to hunt	1	2	3	4	5
Being with friends/family	1	2	3	4	5
Helping manage the wild turkey population	1	2	3	4	5
Knowing friends/family are seeing turkeys	1	2	3	4	5
Shooting birds	1	2	3	4	5
Taking a turkey home for food	1	2	3	4	5
Killing a big, mature turkey	1	2	3	4	5

and harvest-oriented motivations. Some of the statements were primarily adapted from a range of motivation scales previously used in outdoor recreation literature (Hendee, 1974; Manfredo, 1996; Vaske & Manfredo, 2012), while others were added to represent the context of recreational hunting.

The statements, "being out in the woods," "enjoying nature and the outdoors," "enjoying solitude and escape," "getting some physical exercise" and "being able to enjoy other types of recreation" were expected to measure experience-oriented motivations. These statements indicate motivation driven from other experiences than harvesting birds alone. Conversely, the statements, "shooting birds," "killing a big, mature turkey," and "taking a turkey home for food" were expected to measure harvest-oriented motivations. These statements indicate motivations driven purely from the hunt and harvest aspects of hunting. Lastly, the statements "teaching others to hunt," "knowing friends and family are out seeing turkeys," and "being with friends and family" were expected to measure socially-oriented motivations. These statements indicate motivations driven from the social and cultural aspects of hunting.

Principal Component Analysis

A Principal Component Analysis (PCA) was performed on the multi-item motivation scale (presented in table 3.2) to test whether these basic belief statements represent the latent construct of experience, harvest, and social orientations. A latent construct refers to an unobserved variable which can be measured through the observable variables (Vaske, 2008). A PCA is a widely used statistical tool in the social sciences for dimension reduction. It reduces a large set of correlated variables into a smaller subset of underlying constructs while still retaining most of the variation in the dataset (Jolliffe, 2002). This is done by identifying the principal components where variation in the data is maximized (Ringnér, 2008), and by removing unnecessary data. Two or more correlating items can then be expressed by a single factor.

PCA assumes a multivariate normality of the variables. Accordingly, to include the motivation statements variables in to the PCA, preference was given to statements

with skewness index less than one and kurtosis index less than two (Noar, 2003). The item total correlation refers to the correlation between a variable and the total scale score. A greater item total correlation indicates greater internal consistency, and a value close to zero indicates no relationship between the given item and other items loading on the factor, thus suggesting a poor internal consistency (Pett, Lackey, & Sullivan, 2003). Therefore, following Comrey and Lee (1992) and Vaske (2008), stringent cutoffs were utilized so that only variables having an item total correlation of at least 0.5 were considered for the analysis.

A varimax rotation option was selected while running a PCA because it maximizes the variance of loadings on each factor, and eases the interpretation (Vaske, 2008). Components with eigenvalue greater than one were retained according to Kaiser Criteria (Kaiser, 1960). If all variables are independent, then the amount of principal components is the same as the amount of original variables, and all components have unit variance. Accordingly, any component with variance, or eigenvalue, less than one contains less information than one of the original variables and so is not worth retaining (Jolliffe, 2002).

Tests of reliability examine the internal consistency among the variables and show whether the multiple items in a scale measure the same construct (Vaske, 2008). The more the items are correlated, the greater their internal consistency will be. Cronbach's alpha was used to test the internal consistency of the three factors that emerged from performing the PCA on the motivation scale (Vaske, 2008). An alpha coefficient ≥ 0.7 is generally the accepted internal consistency for variables to be considered reliable for measuring, although an alpha of 0.65 to 0.70 is considered adequate in most human dimensions research (Vaske, 2008). Bartlett's Test of Sphericity and the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy was also used to confirm that the factor analysis was suitable to adequately summarize the information provided by the initial items.

Confirmatory Factor Analysis

A confirmatory factor analysis (CFA) was performed to test the construct validity of the statements used in the PCA. Construct validity is the method by which indicator variables and concepts relate to each other within an arrangement of theoretical relationships (Vaske, 2008). While an exploratory factor analysis (EFA) explores several factors to represent the data, a CFA allows one to specify the number of factors required (Vaske, 2008). In this study, the CFA tested whether the belief statements fit well to measure the three latent dimensions of social, experience, and harvest orientations discovered from the PCA.

Variables with a kurtosis index |x>10| and a skewness index |x>3| indicate a serious violation of multivariate normality (Kline, 2005), and a skewness index less than one and kurtosis index less than two are preferable (Noar, 2003). All variables used in the CFA following the PCA met both criteria (skewness and kurtosis) for a multivariate normal distribution. However, the measurement scale of the variables was in ordinal categorical nature, and the sample size was large (n >200) (Harrington, 2008). Accordingly, ADF estimation was used as suggested by Hancock and Mueller (2006) and (Harrington, 2008) for categorical data with large sample size. The results of the CFA were evaluated using factor loadings of variables and model fit indices. To retain each latent construct of the value orientation, the factor loading should be greater or equal to 0.40 (Vaske, 2008).

Cluster Analysis

Cluster analysis was used on the motivation factors derived from the PCA to segment turkey hunters in to different subgroups, or clusters, of orientations. Cluster analysis is a tool that divides data into meaningful homogenous clusters that are distinct from each other. Previous studies have used cluster analysis for segmenting hunters based on different orientations such as participation, attitudes, and experience preferences (Andersen et al., 2014; Schroeder et al., 2006; Ward et al., 2008).

Several clustering algorithms available in different software packages identify

clusters with certain characteristics. However, identifying the algorithm that best fits the data to generate valid clusters and meaningful results is important (Majumdar, Teeter, & Butler, 2008). Two clustering algorithms are assessed and compared for this study. The first algorithm is the K-means clustering algorithm, which selects K initial cluster centers and then iteratively refines them to generate homogenous clusters. However, there are a few drawbacks associated with the K-means algorithm. It assumes that the number of clusters for a data set should be known beforehand and has poor efficiency when variables are categorical (Statistical Solutions, 2013). Some statistical software has also recommended not to use K-means algorithm for categorical data (IBM, 2011). Although, this study involves a large data set (n> 200) (Harrington, 2008), the variables included in cluster analysis were categorical. Despite the drawbacks discussed above, the K-means algorithm has been widely used in hunter segmentation studies (Metcalf et al., 2015; Schroeder et al., 2006).

The second clustering algorithm being examined for this study is the Two-Step clustering procedure, which involves two separate phases. During the first phase, original items are collected into pre-clusters to reduce the size of the matrix that contains distances between all possible pairs of cases (Tkaczynski, 2016). During the second stage, the pre-clusters are clustered using a hierarchical algorithm. Once the cluster solution is produced, chi-square and t-tests are conducted to assess the significance of individual items and to examine whether the item is acceptable in the result (Tkaczynski, 2016). The analysis is then performed again until only valid items remain. This clustering method assumes that continuous variables have a normal distribution and that categorical variables have a multi-nominal distribution (Norusis, 2007).

For this analysis, two to four clusters resulting from the K-means algorithm were assessed and compared with the best fit results from the Two-Step cluster algorithm. Cluster solutions from each method were compared based on mean score of each variable by clusters. A cluster solution that provided the most distinct and meaningful clusters was chosen as the final solution. The meaningfulness of the clusters was checked by comparing them with the characteristics of different value orientation clusters as

suggested by existing literature in wildlife and natural resources-related motivation orientations. The demographic and hunting characteristics of turkey hunters and their support for regulatory changes were then compared among the clusters of motivation orientations.

Analysis of Variance

A one-way Analysis of Variance (ANOVA) was used to determine whether the motivation factors derived from the PCA, as well as the demographic and hunter characteristics were different for each cluster. This test was also used to determine the differences between the clusters in terms of support for seasonal bag limit and season length regulations, which utilize continuous variables (Table 3.3). A factorial ANOVA is used to compare means when two or more groups are involved. It compares how much the groups differ from each other in comparison with the amount of variability within each group. The ANOVA test utilizes the *F* statistic, which allows an inclusive comparison on whether the group means differ to be made. The *F* statistic is the average explained between-groups variance divided by the average within-groups variance

Table 3.3 *Summary of independent variables included in ANOVA and Chi-Square tests*

Variables	Description	Scale	Test
TIME_LENGTH	Reducing the season length to 36 days	Acceptability of the statement (1-very unacceptable to 5-very acceptable)	ANOVA
SEASON_BAG	Reducing the seasonal bag limit	Acceptability of the statement (1-very unacceptable to 5-very acceptable)	ANOVA
MANAGE_ZONE	Support the creation of management zones	1 if yes, 2 if no, 3 if no opinion	Chi-Square (X^2)
RESOURCE_ DEPEND	Selection of substitute activities as a response for turkey population decline	1 if yes, 0 if no	Chi-Square (X^2)

(Gravetter & Walllnau, 2014). The null hypothesis is that all the population means are equal, while the alternative would be that a difference does exist. Accordingly,

$$H_{Ø}: \mu_1 = \mu_2 = \mu_3 = \ldots \mu_k$$

$$H_a: \mu_1 \neq \mu_2 \neq \mu_3 \neq \ldots \mu_k$$

where k is the number of groups. The null hypothesis ($H_{Ø}$) can be rejected if the calculated *F*-value is larger than the critical *F*-value, showing that at least two of the items have different means with an alpha of 0.05 (Statistics Solutions[a], 2013). *F*-test degrees of freedoms are analyzed between and within groups to compute the total variability (Gravetter & Walllnau, 2014). When a significant interaction was revealed, a pairwise comparisons procedure was conducted using Tukey's Honest Significant Difference test (HSD) to pinpoint which specific pairs of groups were statistically significant from each other. Tukey's test is a conservative post-hoc test based on the standardized range statistic (i.e., *q* statistic), which adjusts for multiple comparisons (Vaske, 2008). The assumption that the scores are normally distributed was evaluated through visual analysis of the sample (Statistics Solutions[a], 2013).

Chi-Square Test of Independence

A Chi-Square (X^2) test of independence was used to determine the differences between the clusters in terms of support for management zones and resource dependences (Table 3.3). This test was also utilized to determine differences between the clusters in terms of response to potential turkey population declines. A Chi-Square test uses the frequency data from a sample to test the independence between two or more nominal variables (Gravetter & Walllnau, 2014). Each individual in the sample is classified on both of the two variables, creating a two-dimensional frequency distribution matrix, which is then used to test hypotheses (Statistics Solutions[b], 2013). It relies on two assumptions: the observations on each variable are independent of each other and expected frequencies within a cell are large ($f_e \geq 5$) (Statistics Solutions[b], 2013). The Chi-Square statistic can be expressed as:

$$X^2 = \sum \frac{(f_0 - f_e)^2}{f_e}$$

where f_0 is the observed value of the nominal variables and f_e is the expected value (Gravetter & Walllnau, 2014). In addition, the null hypothesis for this test states that the variables being measured are independent and not related to or influenced by the values of the other variables. Accordingly,

H_0: There is no statistically significant difference in level of support for regulation between motivation clusters

$H_Ø$: There is a statistically significant difference in level of support for regulation between motivation clusters

The null hypothesis ($H_Ø$) can be rejected if the calculated X^2 value is larger than the critical X^2 value, showing that at least two of the items have different means with an alpha of 0.05 (Statistics Solutions[a], 2013). When a significant interaction was revealed, a pairwise comparisons procedure was conducted using Tukey's Honest Significant Difference test (HSD) to pinpoint which items were statistically significant from each other.

Importance – Performance Analysis

A modified Importance-Performance Analysis (IPA) was applied to show a plot of the relative rating of mean importance and satisfaction for each regulation aspect as divided by motivation orientation cluster. Typically, in this analysis, importance and performance scores from Likert scale responses are placed on a two-dimensional matrix (Wade & Eagles, 2003). However, Importance-Performance analyses have been conducted to measure customer satisfaction with services in place of performance of programs in recreation settings (Tarrant & Smith, 2002). Accordingly, this analysis creates a matrix where the x-axis represents the level of importance respondents place on a given aspect of regulation (e.g., season length), and the y-axis represents hunters' current level of satisfaction with that particular item.

Within the matrix, an item plotted towards the right end of the diagram is rated more important (by hunters in this sample) than the other items located towards its left.

Similarly, hunters are more satisfied with an item plotted toward the top of the diagram than an item plotted in the middle or bottom part. The location of the cross-hair is determined by the mean rating of the respective axis items (Wade & Eagles, 2003). In this way, the northeastern quadrant shows the items that are relatively more important to the hunters and the ones they are relatively satisfied with at this time (often titled 'keep up the good work'). The northwestern quadrant shows the items that are relatively less important to the hunters, but for which they seem highly satisfied with at this time (often titled 'possible overkill'). The southwestern quadrant shows the items with which hunters are relatively less satisfied, but these items are relatively less important to them (often titled 'low priority'). Finally, the southeastern quadrant shows the items on which hunters place relatively greater importance, but for which they are relatively less satisfied with (often titled 'concentrate here').

This importance-satisfaction tool is a popular research mechanism used to explore the relative importance and satisfaction of user groups and has several advantages. The grid format allows for easy data interpretation by managers of recreational programs as each quadrant is associated with a particular approach (e.g., add, retain, reduce, or maintain) (Tarrant & Smith, 2002). It also provides an effective and efficient method for collecting and interpreting user information and prevents problems associated with making decisions based only on the opinions of wildlife managers (Tarrant & Smith, 2002).

CHAPTER FOUR
RESULTS AND DISCUSSION

Survey response

Out of 5,000 questionnaire packets sent to Tennessee turkey hunters, 189 came back as undeliverable because the person had moved, was deceased, or was otherwise unable to respond. Thus, the effective target sample was reduced to 4,811. A total of 1,707 surveys were returned for an adjusted response rate of 35.48%. This response rate is higher than several recent surveys that utilized license holders as the sampling frame (i.e., Mingie, 2017: 24% in Georgia; Kyle et al., 2007: 20% in South Carolina; Paudyal et al., 2015: 24% in Georgia; Shideler et al., 2015: 18% in Florida; Guynn, 2015: 20% in South Carolina). This higher response rate suggests minimized nonresponse error (Vaske, 2008).

To further test nonresponse error, similarities in key demographic characteristics were compared among survey respondents, non-respondents, and the sample as a whole. The nonresponse data was able to be assessed through age and gender information collected from TWRA license holder data. The respondents to the survey had an average age of 49.4 years, which is slightly greater than the age of the non-respondents (44.6 years) and of the entire sample (47.4 years). Gender proportions between the respondents and the non-respondents were consistent, however, as all groups consisted of 4% females and 94% males, with 2% unknown genders. Additionally, similarities in demographic characteristics were found between the sample and the general population of hunters in Tennessee. For example, the male and Anglo-American respondents comprised 94% and 83%, respectively, of our sample. In comparison, the population of turkey hunters in 2015 (based on license database) was comprised of 94% male and 87% Anglo-American hunters (TWRA, 2015).

Out of 1,707 responses, 1,373 identified themselves as spring turkey hunters. The remaining respondents stated that they either do not hunt turkey or quit hunting altogether. This is possible because all resident sportsman license holders have the

privilege of turkey hunting (hence their inclusion in the sample), but not everyone takes advantage of this privilege. Accordingly, the results presented in this report are based on the responses provided by a total of 1,373 spring turkey hunters. Although it is difficult to accurately predict the total number of unique hunters in the state (partly because some may hunt on private lands without a license), assuming 120,737 as the statewide number of turkey hunters (University of Tennessee Human Dimensions Research Lab, 2014), this sample size is sufficient per the desired sample size formula provided by Dillman (2007). The sampling error at the 95% confidence interval is $\pm$ 2.7% at most.

Descriptive analysis

Analysis of the data began by examining most of the survey questions in turn. Looking at frequency tables gave an idea of the response, counts, and percentages of each variable, while visually examining them using bar and pie charts gave an additional tool with which to check for outliers and errors. Any inconsistent numbers (eg., 6 entered for a 1-5 scale) were flagged to look up later for verification/correction. Descriptive statistics of the variables of interest were also analyzed to give an idea of the range and shape of the responses. This allowed for a quick determination of the average age, gender, race, employment status, and annual income of the respondents

Sample characteristics

The age of respondents ranged from 18 to 92 with the majority (63%) ranging between 45 and 70 years of age (Table 4.1). The average age of respondents was 49 years old. This is consistent with results from the 2011 National Survey of Fishing, Hunting, and Wildlife, which found that 55% of all hunters were between the ages of 45 and 70 (U.S. Census Bureau, 2013). Most respondents (96%) were male with a small minority (4%) of females. These results report a smaller fraction of women hunters than the overall hunter population reported by the Census Bureau (11%), but are consistent with the USFWS 2006 survey of turkey hunters, which found that females consist of 6% of the U.S. turkey hunting population (USFWS, 2006). Of the respondents who indicated their race, 82% of the respondents self-identified as Caucasian, while 18% identified with

Table 4.1 *Demographic characteristics of spring turkey hunters in Tennessee, 2015*

	Descriptive Statistics		
Demographics	*n*	*M* (SD)	% of Respondents
Average Age (years)	1237	49.4(13.6)	
< 45 years	414		33
45 – 60	544		44
61 – 70	233		19
71 – 80	41		3
> 80 years	5		0
Gender (female)	61		4
Race	1252		
Caucasian	1030		82
Other	222		18
Employment Status	1250		
Full-time job	960		77
Part-time job	34		3
Unemployed	26		2
Student	28		2
Retired	196		16
Military	6		0
Annual Household Income	1146		
< $50,000	335		29
$50,000 to $99,999	465		41
$100,000 to $149,999	232		20
$150,000 to $199,999	57		5
$200,000 to $249,999	21		2
$250,000 +	36		3

other races or ethnicities. The majority (77%) of the respondents were fully employed, while 16% were retired and 7% were students or either partly employed or unemployed. Of those who answered the question pertaining to income, over half (70%) reported an annual household income less than $100,000 before taxes.

Among the 1,373 respondents, about 88% reported to have hunted turkey in Tennessee in the spring of 2015 (Table 4.2). Of those who hunted turkey in the spring, 37% also reported to be fall hunters. The respondents had an average hunting experience of 15 years. They made an average of 12 hunting trips in the spring of 2015, spending 10 days hunting turkey and driving an average distance of 33 miles to hunt turkey in the spring of 2015. Hunting party sizes were rather small with the average party size being 1.5 hunters. Respondents hunted on a variety of days with 83% reporting they hunted on the opening day, 69% on both weekends and weekdays, and 32% only on weekends or weekdays. Timing within the day was also an important factor, as the majority of hunters (65%) reported harvesting a bird in the early morning hours.

Turkey hunters in Tennessee utilize areas under a variety of land ownership. About 20% of turkey hunters in the sample indicated hunting primarily on public lands such as WMAs, 24% on private land belonging to them, 54% on land belonging to friends and family, and 12% on private land leased through hunting clubs. About 33% of respondents indicated hunting in Region 2, while 24%, 21%, and 22% indicated they hunt turkey in Regions 1, 3 and 4, respectively. This is not surprising considering many of the most popular turkey hunting counties in the region (Maury, Sumner, Rutherford etc.) have seen the greatest turkey harvests (TWRA, 2015).

Lastly, 7% of respondents with Tennessee turkey hunting licenses reported to live out of state, and 31% participated in the Youth Sportsman Hunt during the spring 2015 season.

Table 4.2 *Hunting characteristics of spring turkey hunters in Tennessee, 2015*

	Descriptive Statistics		
Hunting Characteristics	*n*	*M* (SD)	% of Respondents
Hunting Experience (yrs)	1255	14.85(10.4)	
Hunted in Spring 2015	1373		87.9
Hunting Trips in 2015	1202	11.45 (11.2)	
Hunting Days in 2015	1172	10.21(10.4)	
Distance Traveled (miles)	1351	33.2(72.68)	
Hunting Party Size	1340	1.49(0.63)	
Harvest Success	1195	1.03(1.27)	
Day Preference	1264		
Opening Day			83.2
Weekends Only			27.8
Weekdays Only			4.4
Weekends and Weekdays			68.8
Timing Preference	614		
Before 9am			65.0
9am to 12pm			22.1
12pm to 3pm			5.2
After 3pm			7.7
Hunting Land Preference	1355		
Private Land (Own)			23.9
Private Land (Friend's)			54.9
Public Land (WMA)			20.2
Hunting Club			11.9
Residence	1373		
In State			93.2
Out of State			6.8
Hunting Region	1350		
Region 1			24.0
Region 2			33.2
Region 3			21.3
Region 4			21.5
Fall Hunters	467		37.1
Youth Hunt Participation	1262		31.3

Motivations for turkey hunting

In general, respondents found most motivation statements to be of high importance, with over 50% of all responses marked "somewhat or very important" (Table 4.3). The statements, "being out in the woods" and "enjoying nature and the outdoors" received the greatest "very important" ranking percentage at 78% and 77%, respectively. Alternatively, the statements "being able to enjoy other types of recreation" and "knowing friends/family are seeing turkeys" received the lowest "very unimportant" ranking percentages at 9% and 7% respectively. In addition, few hunters (31%) marked "shooting birds" to be the most important aspect in terms of motivation. These results suggest that Tennessee turkey hunters are highly motivated by multiple factors for engaging in recreational hunting other than solely harvesting birds.

Principal component analysis

A PCA was performed on the hunter motivation scale to identify any common underlying themes in orientation (Table 4.4). As only variables having an item total correlation of 0.5 or greater were considered for this analysis, one out of the sixteen statements did not meet the criteria to be included in the PCA. As shown in Table 4.4, the variable "finding or seeing signs of turkeys" failed to meet this minimum threshold; therefore, it was excluded from analysis.

Three factors emerged from the fifteen motivation statements, identifying common themes in orientation (Table 4.5). Seven statements representing motivations that are more experientially focused, such as being out in the woods and enjoying nature and the outdoors, loaded in the first component, which was therefore named, "Experience-Oriented." Similarly, five statements that represent social aspects of motivation, such as being with friends and family and teaching others to hunt, loaded in the second component, which was named "Socially-Oriented." Finally, three statements representing more bag-oriented motivations, such as killing a big mature turkey and shooting birds, loaded in the third component, which was accordingly named "Harvest-

Table 4.3 *Distribution of Tennessee turkey hunters by motivation statements*

	Percent of Respondents by Levels of Agreement				
Motivations	1	2	3	4	5
Being out in the woods	4.3	0.8	3.3	14.0	77.7
Enjoying nature and the outdoors	4.2	1.1	2.7	15.0	76.6
Experiencing the challenge of the hunt	4.2	1.3	3.4	16.8	74.4
Enjoying solitude and escape from normal life	4.4	1.4	5.2	17.0	72.0
Improving hunter skills	4.4	3.0	9.7	21.5	61.4
Hearing or seeing turkeys	5.1	2.1	7.1	19.7	66.0
Getting some physical exercise	4.5	5.2	15.5	24.9	49.9
Finding or seeing signs of turkeys	4.2	2.0	9.8	22.7	61.3
Being able to enjoy other types of recreation	9.0	9.9	26.1	21.5	33.5
Teaching others (kids, friends) to hunt	5.0	4.7	15.0	23.2	52.1
Being with friends/family	4.9	4.5	13.6	21.2	55.8
Helping manage the wild turkey population	4.4	5.4	19.5	21.8	48.8
Knowing friends/family are seeing turkeys	7.0	7.7	22.4	28.2	34.3
Shooting birds	5.9	9.5	31.1	22.8	30.7
Taking a turkey home for food	5.7	8.4	21.4	23.7	40.8
Killing a big, mature turkey	4.9	5.9	17.1	27.0	45.0

Note: 1 (very unimportant) to 5 (very important)

Table 4.4 *Factor loadings representing correlations between Tennessee turkey hunter motivations*

	PCA results		
Motivations	1	2	3
Being out in the woods	.884	.263	.206
Enjoying nature and the outdoors	.870	.301	.198
Experiencing the challenge of the hunt	.857	.289	.221
Enjoying solitude and escape from normal life	.852	.249	.189
Improving hunter skills	.698	.365	.242
Hearing or seeing turkeys	.641	.284	.381
Getting some physical exercise	.542	.489	.161
Finding or seeing signs of turkeys	*.450*	*.427*	*.423*
Being able to enjoy other types of recreation	.108	.792	.063
Teaching others (kids, friends) to hunt	.350	.742	.107
Being with friends/family	.402	.707	.050
Helping manage the wild turkey population	.358	.610	.352
Knowing friends/family are seeing turkeys	.243	.608	.342
Shooting birds	.124	.089	.843
Taking a turkey home for food	.169	.184	.769
Killing a big, mature turkey	.392	.106	.605

Table 4.5 *Factors derived from Tennessee turkey hunter motivation variables*

Factors	Motivations	*M*	Factor Loadings	Eigenvalues	Cronbach's Alpha
Experience-Oriented				7.97	0.94
	Enjoying **solitude** and escape from normal life	4.50	0.85		
	Being out in the **woods**	4.59	0.89		
	Experiencing the **challenge** of the hunt	4.56	0.86		
	Improving hunter **skills**	4.32	0.70		
	Enjoying **nature** and the outdoors	4.59	0.87		
	Getting some physical **exercise**	4.10	0.54		
	Hearing or seeing turkeys	4.39	0.67		
Socially-Oriented				1.34	0.84
	Being with **friends**/family	4.18	0.71		
	Being able to **enjoy** other types of recreation	3.60	0.80		
	Teaching others (kids, friends) to hunt	4.12	0.75		
	Helping **manage** the wild turkey population	4.05	0.61		
	Knowing friends/family are seeing turkeys	3.74	0.59		
Harvest-Oriented				1.17	0.74
	Shooting birds	3.62	0.85		
	Taking a turkey home for **food**	3.85	0.78		
	Killing a **big**, mature turkey	4.01	0.61		
Analysis n=1187					

Oriented." In addition, all factors had Cronbach's Alpha coefficients above the acceptable range of 0.7 (Vaske, 2008) and eigenvalues greater than one.

The majority of items loaded at 0.7 or above, and ranged from 0.871 (Enjoying nature and the outdoors) to 0.588 (Knowing friends/family are seeing turkeys). The eigenvalues showed how most of the variance was explained by the Experience-oriented component, but the three factors together explained 70% of the variance in the data. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.933, above the recommended value of 0.6, and Bartlett's Test of Sphericity was significant at $X^2(105) = 1{,}3391.77$, $P < .001$. Overall, these analyses indicated that respondents' motivations measured with the thirteen motivation statements represented the latent construct of motivation orientations.

Confirmatory factor analysis

Once the PCA revealed the best fit of the data to represent latent construct of motivation orientation, construct validity of this continuum was further checked with a CFA. The model shown in Figure 4.1 shows the data provided an acceptable model fit and fifteen variables supported the construct validity of experience, social, and harvest orientations, with minimum thresholds of 0.4 (Vaske, 2008). The factor scores (standardized regression weights) ranged from 0.72 (hear) to 0.95 (wood) in the first factor (Experience-Oriented), 0.74 (manage) to 0.81 (teach) in the second factor (Socially-Oriented), and 0.66 (big) to 0.72 (food) in the third factor (Harvest-Oriented). The variance explained by the first factor (Experience-Oriented) was the highest for the variable "social" (95%), whereas variance explained by the second factor (Socially-Oriented) was highest for the variable "teach" (81%). Finally, the variable "food" explained most of the variance in the third factor (Harvest-Oriented) at 72%.

Cluster analysis

The three latent constructs of experience, social, and harvest orientations from the PCA, and whose construct validity was confirmed from the CFA, were fed into the cluster analysis procedure. To identify the meaningful clusters, both the K-means

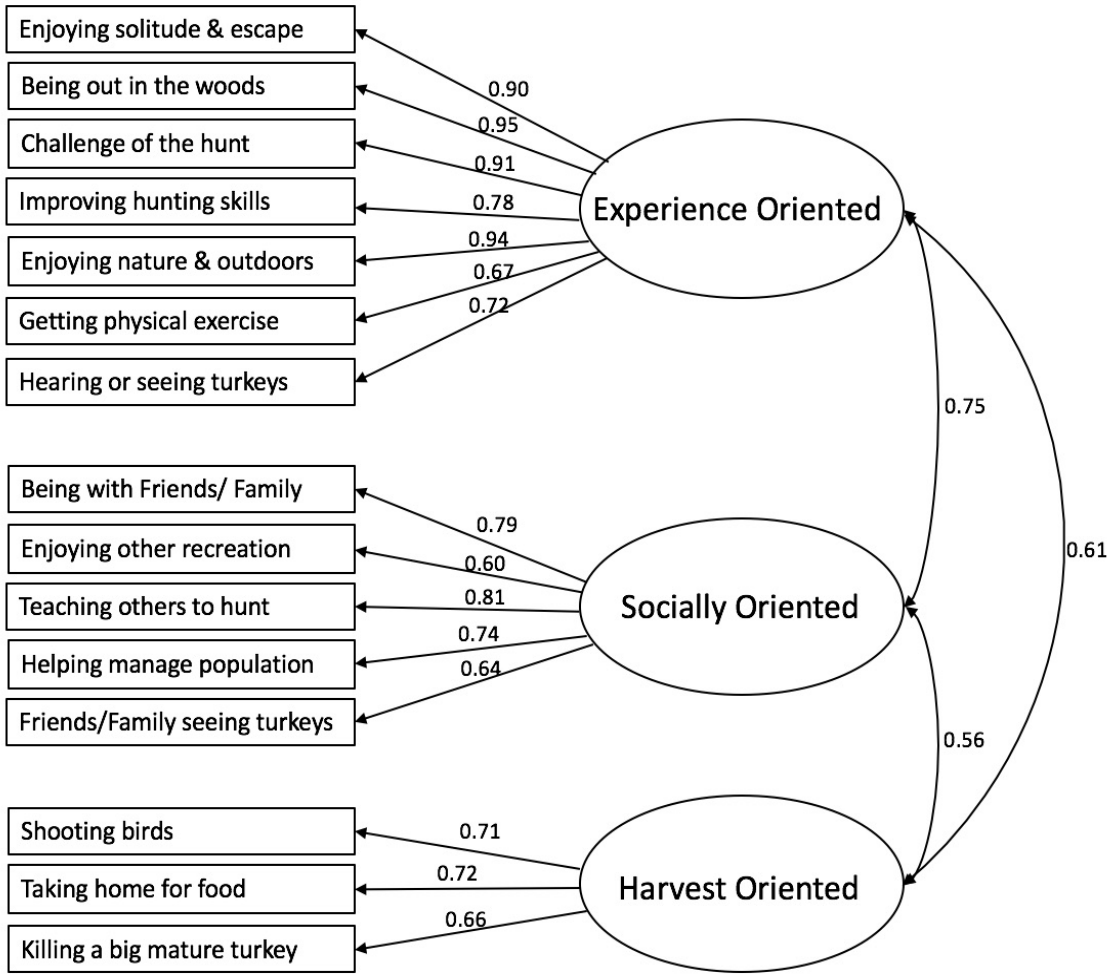

Figure 4.1 *Factor loadings showing construct validity of Experience, Social, and Harvest Oriented components from confirmatory factor analysis in Tennessee turkey hunters*

and Two-Step clustering algorithms were tested respectively. Two to four cluster solutions from each method were compared using STATA statistical analysis software.

The K-means clustering method gave mixed results for the three cluster solutions (Table 4.6). In the two-cluster solution, average scores in experience and harvest orientations were high in the first cluster, while all three orientations were low in the second cluster. In the three-cluster solution, average scores for the social orientation were greater than in the experience and harvest orientations for the first cluster, while the opposite was true in the second cluster, and the third cluster had higher average scores in experience and social orientations than the harvest orientation. In the four-cluster solution, the first cluster had high average scores in all motivation orientations and the second and third clusters had low average scores in all motivation orientations. In this four-cluster solution, only the fourth cluster had meaningful discrepancies within the motivation orientations, averaging high on experience and harvest orientations and low on social orientations.

The two-step clustering method gave more mixed results (Table 4.7). In the two-cluster solution, all three motivation orientations averaged low scores in the first cluster while only the experience orientation scored low in the second cluster, with the other two motivations averaging higher scores. In the three-cluster solution, experience and harvest orientations averaged higher scores, while the social orientation averaged a lower score in the first cluster. In this solution, experience and social orientations averaged high scores for the second cluster while only the experience orientation averaged high scores for the third. Lastly, in the four-cluster solution, the first cluster averaged relatively high scores in experience and harvest orientations, the second cluster averaged high scores in social and harvest orientations, the third cluster averaged high scores in experience and social orientations and the fourth cluster averaged relatively low scores on all three motivation orientations.

In comparing the cluster solutions, the four-cluster solution did not provide the clearest results. The average scores were less distinct in both methods and results created cluster membership groups with one or two of the clusters having very few members. In

Table 4.6 *Average response scores from K-means two to five cluster solutions*

	Cluster Solutions								
	2		3			4			
Motivation	1	2	1	2	3	1	2	3	4
Experience	.46	-3.40	-.15	.47	-.12	.06	-3.05	-3.77	.49
Social	-1.17	-.90	.56	-1.3	.14	.60	-1.18	-.373	-1.10
Harvest	.25	-.98	.64	.41	-1.1	.04	-1.48	-.065	.096

Note: Responses measured on a scale of 1 (very unimportant) to 5 (very important)

Table 4.7 *Average response scores from Two-Step two to five cluster solutions*

	Cluster Solutions								
	2		3			4			
Motivation	1	2	1	2	3	1	2	3	4
Experience	-3.91	-3.17	.04	.01	.50	.04	-.01	.12	-.50
Social	-.38	1.26	-.10	.13	-.16	-.10	.15	.02	-.16
Harvest	-.16	1.49	.05	-.04	-.16	.06	.04	-.32	-.16

Note: Responses measured on a scale of 1 (very unimportant) to 5 (very important)

addition, the two-cluster solution also had less distinct scores and less meaningful comparisons. Accordingly, the three-cluster solution was chosen as the optimal number. Both methods gave meaningful differences in average scores for the three-cluster solution, however, the clusters from the K-means were more distinct in average scores and gave more meaningful distributions and cluster sizes. Accordingly, following Schroder et al., (2006) and Metcalf et al., (2015), a three-cluster solution from K-means method was considered as the final cluster solution.

Characteristics of final clusters

In general, respondents had a variety of motivations in terms of experience, social, and harvest orientations. The respondents were fairly equally distributed among three clusters, showing mixed motivation orientations (Figure 4.2). A varied distribution of motivation orientations among the three clusters can also be seen (Figure 4.3). The F-statistic associated with each of the values statement was significant ($p<0.001$), rejecting the null hypothesis (Table 4.8). Thus, as expected, respondents formed distinct segments based on motivation orientations and as described further below, the three clusters were labeled "*Social Harvesters*," "*Experiential Harvesters*," and "*Social Outdoor Enthusiasts*."

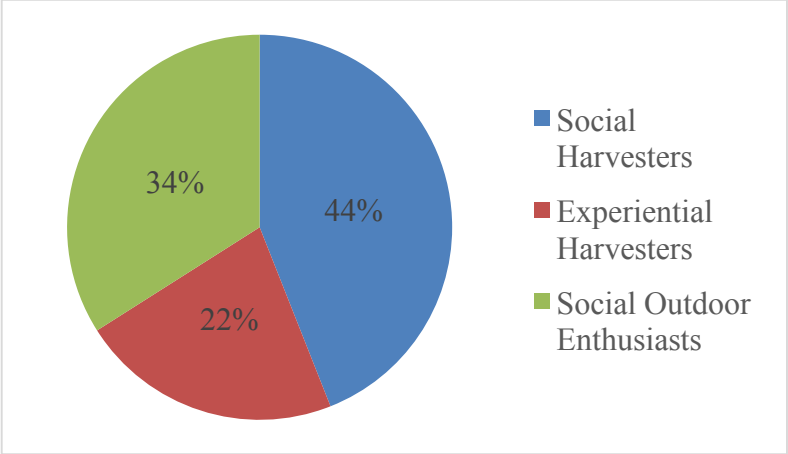

Figure 4.2 *Percentages of Tennessee Turkey Hunters by Cluster*

Table 4.8 *Average response scores on Tennessee turkey hunter motivation orientation factors by final cluster solution*

	Motivation Orientation Typologies			F-statistic
Motivations	Social Harvesters	Experiential Harvesters	Social Outdoor Enthusiasts	
Experience-Oriented	-.15	.47	-.12	39.57**
Socially-Oriented	.56	-1.32	.14	670.47**
Harvest-Oriented	.64	.41	-1.08	937.92**

Notes: Responses measured on a scale of 1 (very unimportant) to 5 (very important); ** and * indicate significance at 1% and 5%, respectively.

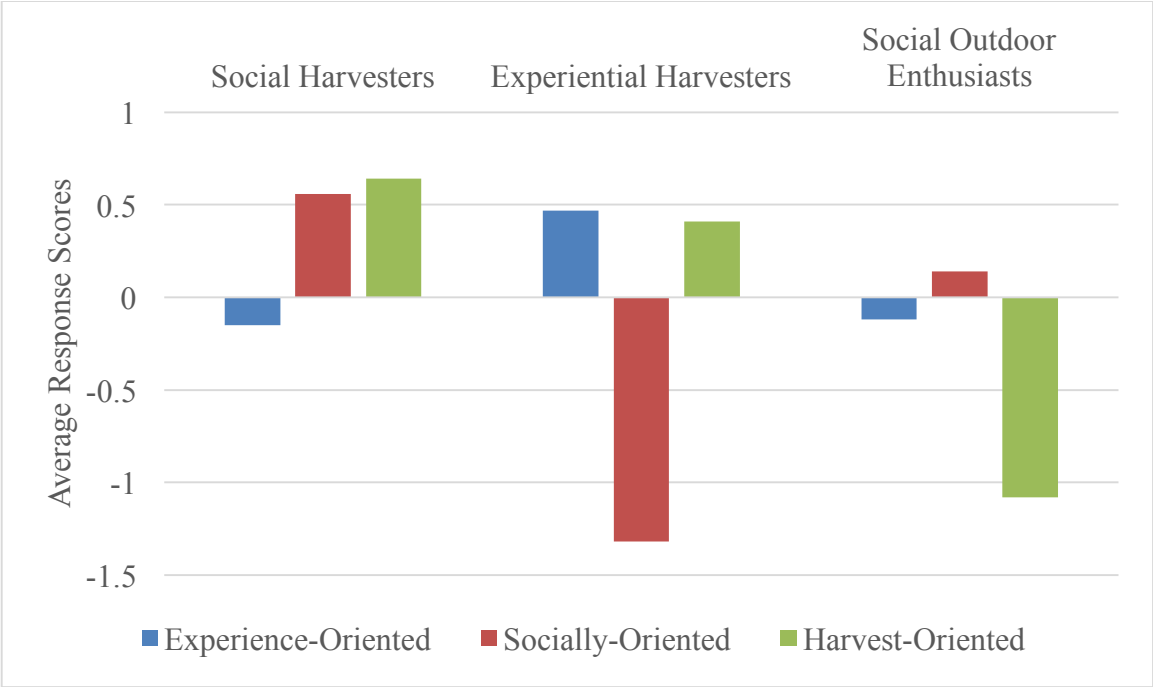

Figure 4.3 *Average response scores on Tennessee turkey hunter motivation orientation factors by final cluster solution*

As previously stated, the sampling frame for this study contained 500 turkey hunters who has successfully harvested and checked-in a bird during the 2014 spring season. A sensitivity analysis was therefore, conducted to examine whether the results were sensitive to the inclusion of harvesters in the sample (Table 4.9). The proportion of turkey hunters within each of the three typologies remains consistent among the sample and the sample without the 2014 harvesters. Accordingly, the impact of including the 2014 harvesters in the sample on the typology of Tennessee turkey hunters is minimal if any.

Table 4.9 *Sensitivity test of typology results to 2014 Tennessee turkey harvesters*

	Motivation Clusters		
	Social Harvesters	Experiential Harvesters	Social Outdoor Enthusiasts
Sample	43.6%	22.2%	34.2%
Sample without 2014 harvesters	43.7%	21.7%	34.7%
Notes: n = 1,256			

<u>*Social Harvesters*:</u> This cluster contained 518 respondents, which was 44% of the sample (Figure 4.2). They had the overall highest agreement scores with all motivation variables (Table 4.10), suggesting that they are highly motivated by most aspects of turkey hunting. Respondents in this cluster, however, did have statistically significant differences in motivation orientations. They had high relative agreement with harvest and socially-oriented motivations and low relative agreement with experience-oriented motivations (Table 4.8). They placed relatively low levels of importance on enjoying nature, the outdoors, and getting physical exercise with greater importance on enjoying the challenge of the hunt and knowing friends and family were seeing turkeys (Table 4.10).

In terms of demographics, this cluster was the youngest, averaging 48 years old (Table 4.11). They also had the lowest income, reporting an average household income of $77,499 per year, and the largest number of people living in their household who were

Table 4.10 *Average response scores on Tennessee turkey hunter motivation orientation factors by final cluster solution*

Motivations	Motivation Orientation Clusters			F-statistic	Sample Mean
	Social Harvesters	Experiential Harvesters	Social Outdoor Enthusiasts		
Wood	4.73	4.74	4.35	24.3**	4.60
Nature	4.75	4.67	4.34	23.6**	4.56
Challenge	4.72	4.68	4.29	27.0**	4.56
Solitude	4.65	4.31	3.26	22.8**	4.03
Skills	4.62	4.24	4.03	39.9**	4.34
Hear	4.65	4.52	4.01	46.7**	4.40
Exercise	4.35	3.69	3.87	59.6**	4.09
Enjoy	4.26	2.35	3.61	282.6**	3.62
Teach	4.61	3.24	4.10	171.2**	4.13
Friends	4.64	3.30	4.19	152.6**	4.20
Manage	4.61	3.55	3.72	130.5**	4.07
Know	4.65	3.18	3.49	97.6**	3.75
Shoot	4.45	3.96	2.52	544.5**	3.64
Food	4.56	4.05	2.85	380.9**	3.86
Big	4.49	4.31	3.26	192.1**	3.86

Notes: Responses measured on a scale of 1 (very unimportant) to 5 (very important); ** and * indicate the ANOVA test significance at 1% and 5% respectively.

Table 4.11 *Demographic characteristics of Tennessee turkey hunters by motivation clusters*

Motivations	Motivation Orientation Clusters			F-statistic
	Social Harvesters	Experiential Harvesters	Social Outdoor Enthusiasts	
Age	47.85	50.53	49.92	4.15*
Percent Employed	79.2%	80.6%	80.3%	.136
Race	1.70	1.68	1.67	.037
Annual Household Income ($)	77,499	83,749	92,499	10.5**
People living in household	2.99	2.70	2.97	5.43*
People living in household <18	.97	.65	.99	6.88*
Hunters living in household	1.79	1.58	1.74	3.48**

Note: ** and * indicate significance at 1% and 5% respectively.

also hunters (1.79). In terms of hunting characteristics, they took the highest number of hunting trips (12.44), spent the most days hunting (11.21), and had the largest hunting parties (1.56) (Table 4.12). They also traveled the least distance to reach their preferred hunting site (27.8 miles), had the largest percentage of hunters who hunt in both the spring and fall seasons (42%), and were the most likely to hunt on opening day (.87).

This cluster is more motivated to hunt by the socio-cultural aspects of hunting as well as harvesting birds and improving hunter skills. They appear to be less motivated by other aspects of hunting such as being in the outdoors. They also had the largest hunting party size and number of hunters in their household, suggesting a social nature. In addition, they hunted the longest and had the most fall and spring hunters out of the three clusters, suggesting their harvest driven motivations. Accordingly, this cluster was named, "*Social Harvesters*," because of their social and harvest-driven motivations for hunting turkey.

Experiential Harvesters: This cluster contained 263 respondents, which was 22% of the sample (Figure 4.2). Respondents in this cluster had relatively high agreement with experience and harvest-oriented motivations and very low relative agreement with socially-oriented motivations (Table 4.8). This cluster placed high levels of importance on experiential factors such as being out in the woods, enjoying nature, and enjoying the challenge of the hunt as well as harvest-oriented factors such as killing a big mature turkey and taking a bird home for food. They placed relatively low levels of importance on knowing friends and family are seeing turkeys, teaching others to hunt, and being with friends and family (Table 4.10).

In terms of demographics, this was the oldest cluster, averaging 51 years of age (Table 4.11). This cluster had the median income out of the three clusters at $83,749 and significantly less people (2.70) and hunters (1.58) living in their households than the other two. In terms of hunting characteristics, this cluster had the least hunting experience (13.9 years) and the smallest hunting party size (1.29) (Table 4.12). They also spent the median number of days hunting (10.03) and traveled the furthest distance (39.0 miles) to reach their preferred site. This cluster had the largest percentage of out of state residents

Table 4.12 *Hunting characteristics of Tennessee turkey hunters by motivation orientation clusters*

Motivations	Motivation Orientation Clusters			F-statistic
	Social Harvesters	Experiential Harvesters	Social Outdoor Enthusiasts	
Hunting Experience (years)	14.5	13.9	15.9	3.3*
Number of hunting trips	12.44	11.33	10.65	2.83
Number of days hunted	11.21	10.03	9.30	3.54*
Distance Traveled (miles)	27.80	39.0	36.09	0.58**
Hunting Party Size	1.56	1.29	1.53	18.0**
Hunting Land Preference				
Private Land (own)	.22	.26	.22	.836
Private Land (friends)	.58	.56	.53	4.89*
Public Land (WMA)	.19	.15	.24	.28
Hunting Club	.12	.11	.13	.97
Harvest Success	1.16	1.31	0.89	8.47*
Fall Hunter	42%	34%	31%	6.52*
Juvenile Hunt Participation	.33	.21	.36	9.28*
Opening Day Preference	.87	.83	.81	2.7**
Percentage of hunters per TWRA region				4.06**
Region 1	22.6%	26.2%	23.2%	
Region 2	31.0%	38.0%	31.8%	
Region 3	21.2%	17.9%	22.4%	
Region 4	25.2%	17.1%	21.4%	

Note: ** and * indicate significance at 1% and 5% respectively.

(8.8%), the most successful harvesters (1.31), and the lowest participation in the juvenile hunt (0.21).

It appears this cluster is more motivated to hunt by the overall experience of hunting as well as harvesting birds and is less motivated by social aspects of turkey hunting. In addition, they tended to live with less people, participated the least in the juvenile hunt, and took less people out hunting in their hunting party than the other two clusters. They also traveled the farthest and spent the most time hunting on average. Accordingly, this cluster was named, "*Experiential Harvesters,*" due to their high experience and harvest-driven motivations and low social motivations for hunting wild turkey.

Social Outdoor Enthusiasts: This cluster included 406 respondents, which was 34% of the sample (Figure 4.2). Respondents in this cluster had relatively high agreement with socially-oriented motivations, relatively lower agreement with experience motivations, and much lower agreement with harvest-oriented motivations (Table 4.8). This cluster placed relatively high levels of importance on being with friends and family, being out in the woods, and enjoying the challenge of the hunt. They also placed relatively low levels of importance on shooting a big mature turkey and taking a turkey home for food (Table 4.10).

In terms of demographics, this cluster had the largest annual household income ($92,499) and the largest number of people living in their household under the age of 18 (0.99) (Table 4.11). In terms of hunting characteristics, they had the most hunting experience (15.9 years) and spent less days hunting (9.30) than the other two clusters (Table 4.12). They also had the lowest percentage of out of state hunters (5.7%), the lowest harvest success (0.89), and the lowest percentage of fall hunters (31%).

This cluster appears to be more motivated to hunt by the social aspects of hunting and less motivated by the outdoor experience of hunting and harvest-oriented motivations. In addition, they had the highest income, the highest number of people under the age of eighteen in their household and spent the least number of days hunting, suggesting that they have social responsibilities and time constraints that limit their

harvesting ability. Accordingly, this cluster was named, "*Social Outdoor Enthusiasts,*" due to the relative importance they place on social motivations and the low importance on harvest motivation orientations.

Assuming the sample represents the population of turkey hunters, findings from the three segments of respondents support the first hypothesis that Tennessee turkey hunters form distinct segments based on their motivation orientations. Results are consistent with the findings in some of the previous studies that show hunters can be segmented by motivations (Andersen et al., 2014; Decker & Connelly, 1989; Floyd & Gramann, 1997; Légaré & Haider, 2008). With a few exceptions, results of demographic and hunter characteristic variations among orientation segments are consistent with findings of other studies. For example, consistent with other studies, this study also found that hunters with lower incomes and less hunting experience are more likely to be harvest-oriented (Decker & Connelly, 1989; Floyd & Gramann, 1997). In addition, studies have shown that hunters with more years of hunting experience and greater incomes are more socially motivated (Decker & Connelly, 1989; Floyd & Gramann, 1997). Unlike the findings in this study, some previous motivation orientation studies found non-harvest oriented hunters such as "outdoor enthusiasts" to be older than more harvest-oriented hunters (Decker & Connelly, 1989; Schroeder et al., 2006).

Results from this study indicate that 66% of the respondents were highly motivated by consumptive, harvest-oriented aspects of hunting, while 34% were relatively much less motivated by harvest-oriented aspects. A study of hunters in Texas found similar results in that a majority of their hunter respondents (54%) had strong harvest motivations, while only 7% had non-harvest motivations for hunting and 39% had experience-oriented motivations (Floyd & Gramann, 1997). Although the sizes of the non-harvest clusters heavily differed, characteristics of hunters harvest and non-harvest orientations in this study are very similar to those of the corresponding clusters found in the Texas study. However, in further comparison, the study in Texas had some limitations or differences that justify the variation in the percentage of hunters holding non-harvest orientations. First, unlike the turkey hunters in this sample, the Texas study included all

types of active hunters. Second, the Texas study did not include social motivation factors in their study. Their motivation scale consisted only of experiential factors such as nature enjoyment and seeing animals in their natural habitat, and hunting factors such as trophy harvesting and skill testing. Accordingly, their results are skewed to exclude social aspects of hunting. Lastly, these two studies were conducted in two different regions with significant differences in underlying social and cultural characteristics.

In addition to the harvest orientations, 78% of the respondents in this study were motivated by the social aspects of hunting, while 22% were much less motivated by social aspects. A study of waterfowl hunters in Minnesota found similar results in that 59% of their hunter respondents were highly motivated by social aspects of hunting, while 10% of their hunters were highly motivated by hunting alone and seeking solitude (Schroeder et al., 2006). The sizes of these clusters could differ from those of this study due to the nature of waterfowl hunting as a more social sport including hunting in blinds. However, while the sizes of the clusters differed slightly, these results are similar to those of this study in that a large proportion of respondents were motivated by social aspects of hunting and cluster characteristics were similar as well.

In contrast, a study of deer hunters in New York found that only 24% of their respondents had high social motivations, while 65% of their hunter respondents had high experience-oriented motivations, and 11% had high achievement, harvest-oriented motivations (Decker & Connelly, 1989). This study, however, had differences that justify the variation in the percentage of respondents holding social motivations. Deer hunting is typically a more solitary sport, less often done in hunting groups (Decker and Connelly, 1989). The New York study also took the three orientations of appreciative, achievement, and affiliative motivations to be mutually exclusive, while this study allowed for combinations of those motivation orientations to create clusters. For example, in this study the *Experiential Harvesters* cluster contains respondents who placed high values for both experience-oriented motivations and harvest-oriented motivations. In other words, like this study, Decker and Connelly (1989) used a PCA to identify the number of factors that best fitted the responses of hunters; however, they did not use further

segmentation techniques to identify orientations of each hunter using combinations of factors.

Importance and satisfaction of regulation aspects

An importance-performance analysis (IPA) was conducted to assess hunters' reported satisfaction with, and the importance they placed on, various aspects of spring turkey hunting regulations. Responses for importance were solicited using a 5-point Likert scale from 1 (not important at all) to 5 (very important). Responses for satisfaction were solicited using a 5-point Likert scale from 1 (unsatisfied) to 5 (very satisfied). Cross-hairs for the IPA charts were located at the mean rating of the respective axis items (Satisfaction at 4.01 and Importance at 4.07).

Hunters on average think all aspects of spring turkey hunting regulation are important, with season length and timing of the opening and closing dates being the two most important among the seven asked about (Table 4.13). In terms of satisfaction, hunters in the sample placed the highest level of satisfaction on season limit, followed by the availability of checking options. Satisfaction with the daily limit and timing of the opening and closing dates were seen with relatively lower satisfaction.

As these figures show, turkey hunters from all three clusters place relatively greater importance on season limit, season length, and timing of the season. They differ, however, in the aspects in which they are most satisfied. While all clusters were highly satisfied with check in options, the *Social Harvesters* were more satisfied with a consistency in regulations and the current season bag limit regulations (Figure 4.4), while the *Experiential Harvesters* were more satisfied with season bag limit and season length regulations (Figure 4.5), and the *Social Outdoor Enthusiasts* were more satisfied with consistency in regulations and season length regulations (Figure 4.6).

Turkey hunters from all three clusters seemed relatively less satisfied with the daily bag limit and the timing of the spring season, while the relative importance varied by cluster. For example, the *Social Harvesters* placed a relatively greater importance on daily bag limit regulations than the other two clusters. In addition, while all clusters rated

consistency in regulations and the number of weekends in the season highly in terms of satisfaction, they place a relatively low importance on these regulation aspects.

Looking at the relative importance and satisfaction with these seven items only, it appears that "timing of the opening and closing date" might be something to be considered from a management standpoint, as all three clusters rated this regulation aspect as low in satisfaction but high in importance. In addition, the number of weekends in the season and daily bag limit regulations could be of interest when considering the *Social Harvesters* cluster of turkey hunters. These hunters rated these aspects highly in terms of importance and relatively low in terms of satisfaction. Overall, however, hunters are relatively satisfied with all aspects of spring turkey hunting regulations.

Table 4.13 *Tennessee turkey hunters' reported importance of and satisfaction with various aspects of spring turkey hunting regulations*

Aspects of regulations	Mean Importance	Confidence Interval (95%)	Mean Satisfaction	Confidence Interval (95%)
Season Length	4.24	(4.19, 4.29)	4.06	(3.99, 4.11)
Timing	4.16	(4.10, 4.21)	3.95	(3.88, 4.01)
Weekends	4.02	(3.95, 4.08)	3.98	(3.92, 4.04)
Season limit	4.11	(4.04, 4.17)	4.11	(4.04, 4.17)
Daily limit	4.0	(3.93, 4.07)	3.83	(3.74, 3.90)
Rules Consistency	3.92	(3.86, 3.98)	4.07	(4.01, 4.12)
Check in options	4.04	(3.97, 4.10)	4.10	(4.02, 4.15)

Note: Importance scale: 1 – Not important, 5 – Very Important; Satisfaction scale: 1 - Unsatisfied, 5 – Very satisfied

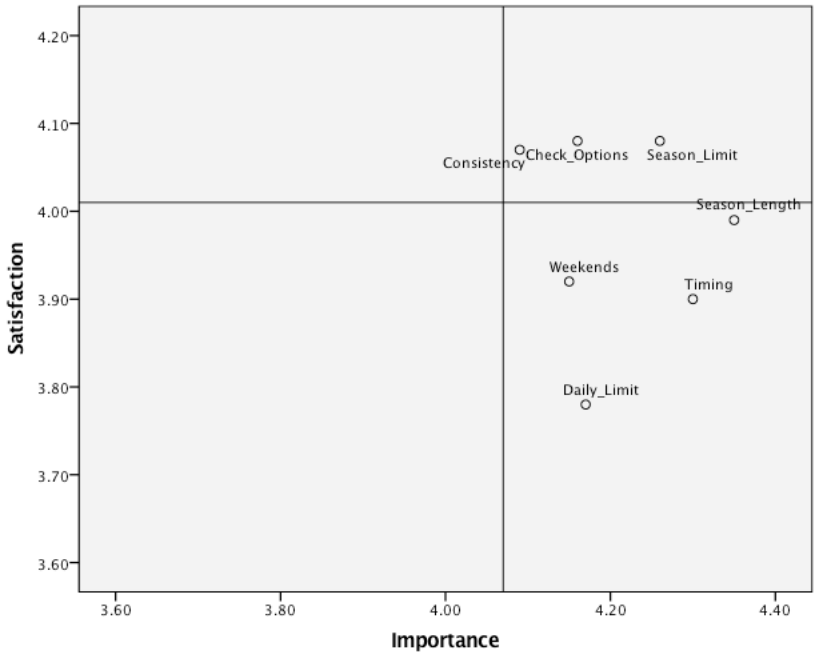

Figure 4.4 *Importance-Satisfaction analysis of hunting regulation features for the Social Harvesters Cluster*

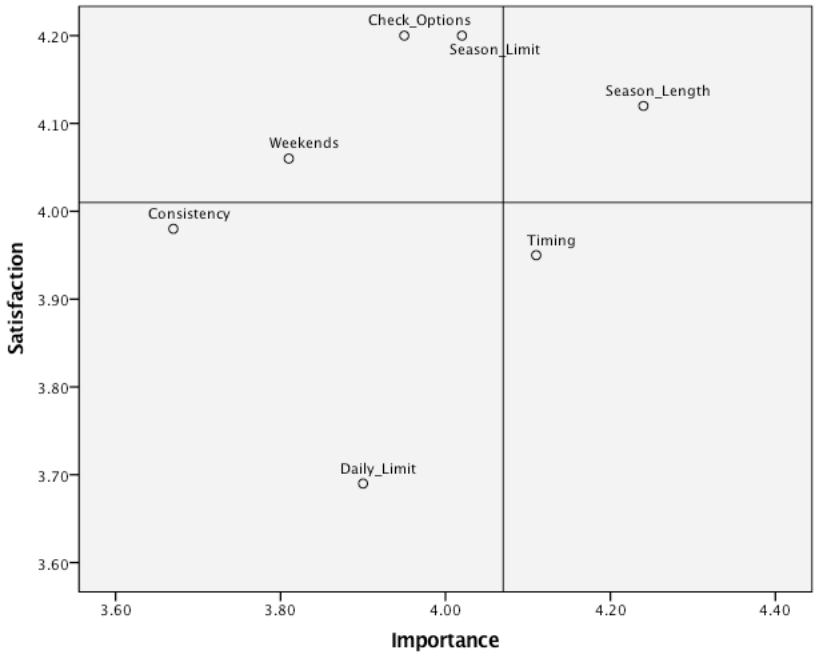

Figure 4.5 *Importance-Satisfaction analysis of hunting regulation features for the Experiential Harvesters Cluster*

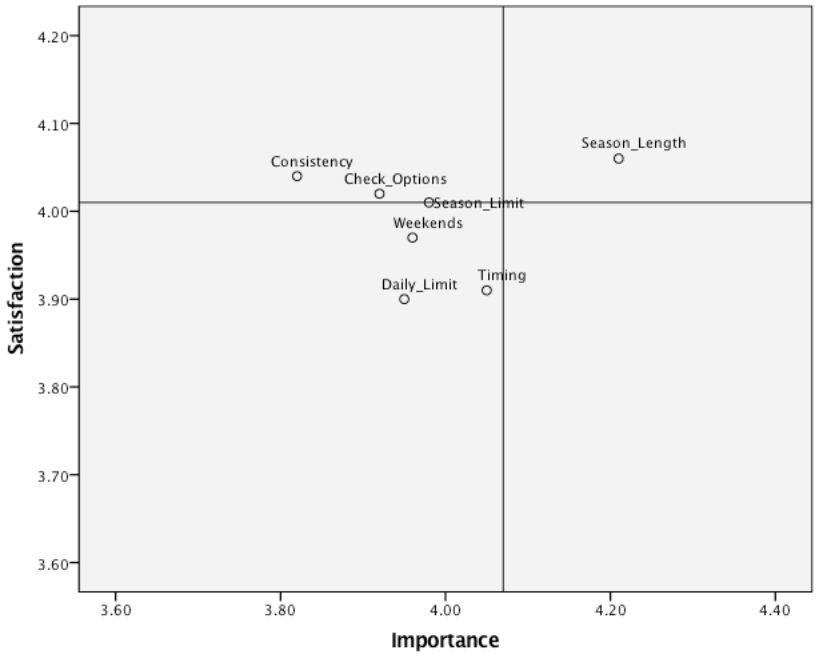

Figure 4.6 *Importance-Satisfaction analysis of hunting regulation features for the Social Outdoor Enthusiasts Cluster*

Support for management actions

An Analysis of Variance (ANOVA) and Chi-Square Test of Independence were used to explain the relationship between the respondents' cluster membership and support for regulations. The clusters differed in terms of their preference for the season length [F (1,172) = .5.97, $P < .01$] and seasonal bag limit regulations [F (1,176) = 4.28, $P < .01$] (Table 4.14). Respondents formed distinct segments of motivation clusters based on support for these regulations. However, the clusters did not differ in terms of their preference for management zones [$X^2(df = 4) = 2.41$, $P = .67$] (Table 4.15). Therefore, respondents did not form distinct segments of motivation clusters based on support for management zone regulations.

Post hoc comparisons using the Tukey HSD test were used to determine which specific items differed for the season length and bag limit regulations, as these

Table 4.14 *Tennessee turkey hunter support for season length and bag limit regulations by motivation cluster*

Variable	Description	Motivation Clusters			F-statistic
		Social Harvesters	Experiential Harvesters	Social Outdoor Enthusiasts	
TIME_ LENGTH	Reducing the season length to 36 days	2.29[a]	2.51[b]	2.58[b]	5.97**
SEASON _BAG	Reducing the seasonal bag limit	2.90[a]	3.07[a,b]	3.30[b]	8.25**

Notes: Acceptability of the statement (1-very unacceptable to 5-very acceptable); ** and * indicate significance at 1% and 5% respectively; Means with different subscripts are statistically different (Tukey's HSD test)

Table 4.15 *Tennessee turkey hunter support for a regulation to create management zones across the state by motivation cluster*

Response	Motivation Clusters			Chi-Square (X^2)
	Social Harvesters	Experiential Harvesters	Social Outdoor Enthusiasts	
Yes	45%	46%	47%	2.42
No	27%	26%	24%	
No Opinion	28%	28%	27%	

Notes: Acceptability of the statement (1-yes, 2-no, 3-no opinion); ** and * indicate significance at 1% and 5% respectively.

regulations were found to be significantly related. Most of the clusters were statistically significant from each other for each regulation statement. In terms of the season length regulation, the *Social Harvesters* cluster was significantly different from the other two ($P < 0.05$), while the *Experiential Harvesters* and the *Social Outdoor Enthusiasts* were not significantly different ($P = 0.72$). This indicates that social motivation orientations play a significant role in preference for season length. In terms of the seasonal bag limit regulation, the only statistical difference between the clusters was between the *Social Harvesters* cluster and the *Social Outdoor Enthusiasts* cluster ($P < 0.01$). This indicates that harvest-orientation plays a significant role in preference for bag limit regulations.

In terms of support for bag limit regulations, respondents were asked to state their acceptability of reducing the seasonal bag limit from four to three birds. While the mean acceptability scores varied only slightly between clusters, results from the ANOVA confirmed the difference between cluster clusters and this variable was statistically significant [F (1,176) = 4.28, $P < .01$]. Therefore, the null hypothesis "there is no difference among the groups" was rejected.

Upon further exploring acceptability for bag limit regulations, the *Social Outdoor Enthusiast* hunter cluster had the highest average acceptability score of 3.30 out of the three cluster clusters, while the *Social Harvesters* had the lowest average acceptability score of 2.90. As the main motivational difference between these two clusters is their harvest orientation, these results make sense. The *Social Harvesters* have lower acceptability for reducing the seasonal bag limit because their main motivations are the harvest-oriented goals. As these hunters are more motivated to hunt by harvesting birds, it follows that they would prefer a larger bag limit in order to harvest more birds.

In terms of support for timing, respondents were asked to state their acceptability of reducing the season length to 36 days. The responses from all three clusters averaged between 2 (somewhat unacceptable) to 3 (neutral). However, the results indicated significant differences between the clusters. Results from the ANOVA confirmed that the difference between clusters and this variable was statistically significant [F (1,172) =

5.97, $P < .01$]. Therefore, the null hypothesis "there is no difference among the groups" was rejected.

The *Social Outdoor Enthusiasts* hunter cluster had the highest average acceptability score of 2.58 out of the three clusters, while the *Social Harvesters* had the lowest average acceptability score of 2.29. As the main motivational difference between these two clusters is their harvest orientation, these results make sense. The *Social Harvesters* have lower acceptability for reducing the season length because their main motivations are the harvest-oriented goals. Thus, it follows that they would prefer more time and a longer season in order to harvest more birds.

Lastly, in terms of support for management zones, a statement in the questionnaire measured respondents' preference for establishing a regional, or zonal, management approach to turkey hunting regulations (Table 4.15). Results from the Chi-Square test of independence confirmed that the difference between clusters and this variable was not statistically significant $X^2(df = 4) = 2.41$, $P = 0.67$. Therefore, the null hypothesis "there is no difference among the groups" was not rejected and results indicate that Tennessee turkey hunters do not differ in support for management zones based on hunting motivation orientations.

Generally, however, the results were fairly evenly distributed among the three clusters for the response choices. Roughly half of turkey hunters were accepting of the proposed management zones (45-47%), whereas roughly a quarter of respondents were against it (24-26%), and another quarter (27-28%) had no opinion.

Assuming the sample represents the population of turkey hunters, findings from the three segments of respondents and distinct characteristics of these segments partly support the hypothesis that Tennessee turkey hunters vary in their support for regulations based on clusters segmented from motivation orientations. Results are consistent with findings in previous studies in which hunter typologies were used to assess support for regulations (Schroeder et al., 2006; Wam et al., 2013; Ward et al., 2008).

Wam et al., (2013) created typologies based on satisfaction determinants to assess grouse hunter support for regulations in Norway. Their findings are similar to this study

in that hunters with greater harvest-oriented satisfactions were less likely to support regulations that would lower the seasonal bag limit, and hunters with greater experience-oriented satisfactions were more accepting of these regulations. Another study created typologies based on motivation orientations to assess waterfowl hunter support for regulations in Minnesota (Schroeder, et al., 2006). Similar to the results in this study, the Minnesota study found that hunters with greater social motivations are more likely to support restrictive regulations such as lowering bag limits and limiting the number of shooting hours in a day.

In addition, several studies have found that hunter typologies may be better suited to assess some regulations rather than others. For example, Wam et al. (2013) discovered that typologies may be more useful if they are more specific to a topic rather than general, as they could not find a set of typologies that corresponded to the two regulations they were studying (bag size and crowding tolerance). In addition, Schroeder et al., could not find a significant relationship between hunter typologies and the creation of wildlife refuges (2006). These results are consistent with the findings in this study in that no significant relationship exists between hunter typologies and the creation of management zones.

Activity Dependence

Hunter response to potential turkey population decline and the relative importance they place on spring regulation aspects were also examined in terms of membership within the three motivation clusters. As turkey populations appear to be declining slightly in several parts of the state, turkey hunters may adopt several adaptation strategies such as continuing to hunt in the same place, while others could adapt by taking the site substitution strategy in order to continue hunting turkey. Still, others may take an activity substitution strategy to continue recreating in the same county. For this reason, wildlife management agencies may find it of interest to see how hunters of different motivation clusters will be affected by the population decline and how they may adapt.

Population Decline and Hunter Response

The majority of respondents stated "no" to each of the seven substitute activities given as options in the survey (Figure 4.7). However, the activities "go somewhere else in Tennessee to hunt turkey" and "go fishing in the same county" had the highest positive response rate. This indicates that a large portion of turkey hunters would continue to pursue a consumptive activity within the state rather than going to another state or pursue a non-consumptive activity within the state such as camping, staying home, or going to work. This indicates that consumptive recreation activities may continue to thrive among Tennessee turkey hunters despite a turkey population decline.

The substitute activity variables were also analyzed to compare differences between the hunter clusters (Table 4.16). Out of the seven statements selected to measure hunter response, only two showed significant differences between hunter clusters after a

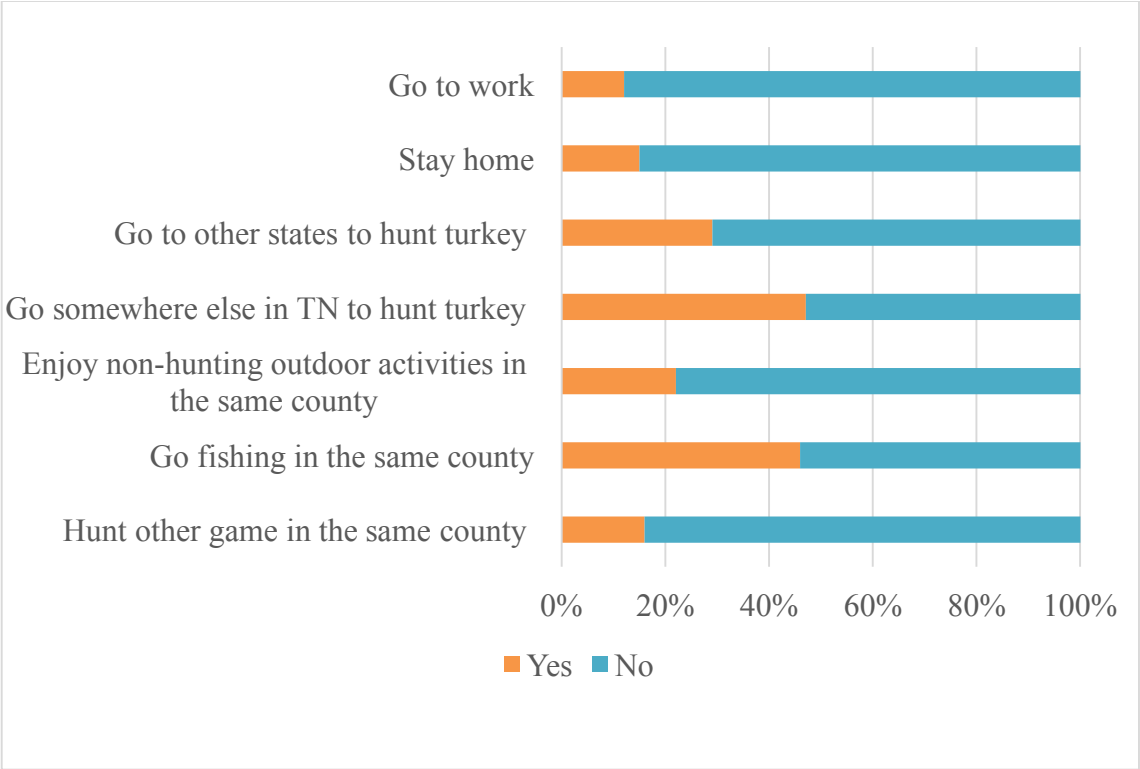

Figure 4.7 *Tennessee turkey hunter response to turkey population decline*

Table 4.16 *Hunting characteristics of Tennessee turkey hunters by motivation orientation clusters*

	Motivation Clusters			Chi-Square (X^2)
Substitute	Social Harvesters	Experiential Harvesters	Social Outdoor Enthusiasts	
Hunt other game in same county	21%	7%	15%	25.60**
Go fishing in same county	47%	43%	45%	.53
Enjoy non-hunting outdoor activities in same county	23%	15%	26%	11.22**
Go somewhere else in TN to hunt turkey	48%	49%	45%	.50
Go to other states to hunt turkey	32%	28%	29%	.90
Stay home	13%	19%	15%	2.04
Go to work	11%	11%	13%	.21

Note: ** and * indicate significance at 1% and 5% respectively.

Chi Square test of independence was conducted. The response, "hunt other game in the same county" was statistically significant [$X^2(df = 2) = 25.6$, $P < .01$] as was the response, "enjoy non-hunting outdoor activities in the same county" [$X^2(df = 2) = 11.22$, $P < .01$].

For the variable, "hunting other game in the same county," the *Social Harvesters* cluster had the highest percentage of respondents (21%), while the *Experiential Harvester* cluster had the lowest percentage of respondents (7%). Because the Social *Harvester* cluster is highly motivated by harvest-oriented goals, it follows that they would be more likely to substitute turkey hunting with hunting other game. As this cluster also has the least income and traveled the least distance of all three clusters to reach their hunting sites, it also follows that they would choose to remain in their same county, keeping their close social ties, rather than going elsewhere to hunt. In contrast, the *Experiential Harvesters* cluster averaged driving the furthest distance in order to reach their preferred hunting destination. For this reason, they may be more adaptable to moving to another county to hunt turkey rather than adjusting their game preference, as the turkey hunting experience is their main driver.

For the variable, "enjoying non-hunting outdoor activities in the same county," the *Social Outdoor Enthusiasts* cluster had the highest percentage of respondents (26%), while the *Experiential Harvesters* cluster had the lowest percentage of respondents (15%). The *Social Outdoor Enthusiasts* cluster is mostly motivated by the social aspects around turkey hunting, and are not as motivated by the harvesting aspects. For this reason, it follows that this cluster would be more willing to enjoy non-hunting activities in their same counties where they can preserve their social ties, in contrast with the other two clusters, which are more consumptive-oriented and have less social ties. The *Experiential Harvesters* cluster, on the other hand, is more driven by harvest-oriented motivations and may be more willing to drive longer distances to reach hunting sites rather than enjoy non-hunting activities closer to home.

CHAPTER FIVE

CONCLUSIONS AND IMPLICATIONS

The overall goal of this project was to examine the motivations of wild turkey hunters in Tennessee along with their attitudes and preferences concerning turkey hunting and management. More specifically, this study aimed to determine the motivation orientations of wild turkey hunters in Tennessee, identify the typology of these hunters based on their motivations for hunting, and to assess and compare attitudes towards and support for hunting regulations among segments of wild turkey hunters in Tennessee. The findings increase our understanding of the characteristics and motivations of Tennessee wild turkey hunters. They may also guide wildlife managers in designing socially acceptable management strategies and in developing education materials catered towards particular groups that may not favor some regulations necessary to promote healthy wildlife populations.

A multivariate cluster analysis of survey responses to motivation orientations questions revealed three typologies of Tennessee turkey hunters: *social harvesters* (44%), *experiential harvesters* (22%), and *social outdoor enthusiasts* (34%). Turkey hunters within each cluster retained unique characteristics in terms of their motivations for hunting. Clusters were also different in terms of their basic demographic characteristics such as age, employment, household size and income, as well as their hunting characteristics such as hunting experience, number of days hunted, distance traveled, party size, harvest success, fall hunter status, juvenile hunt participation, and opening day preference. Further, significant differences were also observed among clusters regarding their support for regulation changes, indicating a considerable heterogeneity among the Tennessee turkey hunting population.

Overall, hunters with more harvest-oriented motivations are less accepting of regulations that would limit hunting time or decrease bag limits. In contrast, hunters who are more motivated by other aspects of hunting such as experiential factors like enjoying nature or social factors like being with friends and family, are more accepting of these types of regulations. By combining the two consumptive motivation clusters within this

population sample, the majority (66%) of Tennessee turkey hunters are highly motivated by harvesting birds, while 34% have other priorities in terms of motivation. In addition, by combining the two social motivation clusters within this population sample, the majority (78%) of Tennessee turkey hunters are socially motivated, while 22% are more individually motivated.

In addition to motivation, the wild turkey hunter population appears to differ in terms of satisfaction with current regulation aspects. For example, *the Social Harvesters* appear to be less satisfied with current regulations on the daily bag limit and the number of weekends in the season, while the *Experiential Harvesters* are less satisfied with consistency of regulations across the state, and the *Social Outdoor Enthusiasts* are less satisfied with the overall timing. In addition, "timing of the opening and closing date" might be something to be considered from a management standpoint, as all three subgroups rated this regulation aspect as low in satisfaction but high in importance.

It is also important to note that the biological data for season timing may conflict with the desires of Tennessee wild turkey hunters. From a wildlife management perspective, it is imperative for recreational hunting to have minimal risks to turkey populations. Accordingly, the timing of the seasons may never completely align with the desires of turkey hunters. For this reason, it is increasingly important for wildlife managers to provide education materials to their hunter populations about the reasoning behind this. Communication between wildlife agencies and turkey hunters can help to bridge this gap in satisfaction. By acknowledging and responding to the concerns of these variations in their hunter population, managers could promote understanding and reduce conflicts between themselves and their hunter constituents.

In order to enhance recreation satisfaction, managers must focus on what experiences motivate the various types of hunters, rather than solely for the "average turkey hunter." This information could be helpful in not only assisting wildlife managers to cater regulations to meet the needs of their diverse hunter group but also to produce educative materials to address hunter concerns.

Looking at the clusters from our typology, the experience of social turkey hunters

might be enhanced through management that facilitates social interaction, while individualist turkey hunters' experience might be enhanced through opportunities for solitary turkey hunting. Managers of public hunting lands such as Wildlife Management Areas (WMAs) could also develop turkey hunting areas that provide a high level of access, group camp sites, and other opportunities for interaction, along with areas that limit hunter numbers to provide more solitary hunting experiences. Alternately, managers could schedule particular days or events that allow for high levels of socializing along with events that limit hunter numbers. In this way, hunters could choose areas that reflect their preferences for socializing. Likewise, managers could enhance the experience of harvest-oriented hunters by maintaining the season bag limit or reducing the bag limit only in areas with decreased turkey populations.

Individuals from different motivation types may also respond differently to management activities as social and experience-oriented hunters may be more supportive of certain management restrictions than more harvest-oriented hunters. For this reason, understanding the proportions of hunters based on their motivations may further assist wildlife managers in adapting management strategies. For example, knowing the proportion of hunters that are more experience and socially-orientated, rather than harvest-oriented, may help wildlife agencies anticipate relative change in expected hunting pressure. Similarly, if greater proportions of hunters belong to a group of isolative experience seekers, agencies may want to address the hunter crowding issues in pubic hunting areas. Likewise, if many hunters are social experience seekers, managers interested in maintaining hunting as a population control tool may want to facilitate companion hunting. Lastly, if a region has a small proportion of hunters that are more motivated by harvesting, perhaps a decline in population or a restriction on bag limits will not be viewed as widely unpopular in that zone.

TWRA managers could review turkey management activities and refine management to support hunters' desired experiences. While management activities directed at specific turkey hunter types may be more difficult to implement, managers' efforts at adaptive management could be refined by regularly tracking hunters'

motivations for hunting, satisfaction with the hunting experience, demographic characteristics, and harvest numbers relative to current regulations. This study provides a baseline for the TWRA to monitor how the diversity of the turkey hunter population in the state changes over time. Conducting more human dimensions studies to gather cross-sectional data could provide information on how individual hunters respond to changing regulations and help managers model hunter participation and satisfaction. Longitudinal data measuring motivations and satisfactions can also help wildlife managers in assessing where education and communication can be directed in order to improve satisfaction in the future. This could be an important tool for agencies who are interested in maximizing public participation in hunting while also sustaining hunting as a tool for population management.

Despite the variances between hunter clusters on regulations such as bag limits and season length, no difference in acceptability occurred between clusters in terms of creating management zones. Therefore, while the regulations themselves are important to hunters, motivation clusters seem indifferent towards proposals regionalizing or decentralizing the enforcement of those regulations. In fact, for these types of regulations, other factors such as perceived population numbers could be a greater influencing factor than motivations. Because 65% of respondents indicated moderate to extreme levels of concern for a turkey population decline, it would be interesting to see if population decline perceptions could be a more significant factor. Accordingly, further studies on turkey hunter perceptions to population declines could be useful to determine support for management zones based on population data.

In addition to management regulations, turkey hunters also respond differently to population declines. If turkey population declines were to continue to persist in several areas of Tennessee, the more harvest-oriented hunters may adapt through activity substitution. As 45% of respondents stated they would adapt by fishing and 18% stated they would adapt by hunting other game in the same area, this activity substitution strategy could threaten the long-term potential of hunting as a population management tool for turkey management in Tennessee. Additionally, more experience-oriented

hunters may adapt through site substitution as they may be more willing to drive long distances to reach areas with higher turkey populations to continue hunting turkey. With 49% of hunters reporting this strategy as their response to population declines, this could affect hunting pressure in nearby counties. The socially-oriented hunters may also be more willing to substitute hunting altogether with another outdoor activity, which could increase public participation in other recreation activities such as camping and lead to increased crowding or congestion elsewhere. Lastly, roughly 25% of turkey hunters stated they would leave the state to hunt turkey elsewhere, potentially giving less revenue to the TWRA and restricting the funding towards managing the turkey population. Regardless of the various hunter response strategies, however, wildlife managers will need to adapt management practices to best respond to these actions.

The findings of this study also further human dimensions of wildlife literature by utilizing motivations to predict support for regulations. This study filled a research gap by applying a motivational approach with a comprehensive set of motivation scales to study heterogeneity in Tennessee wild turkey hunters. Results also further motivation literature by expanding Driver et al.'s (1996) recreational experience preference (REP) scales and showing that Tennessee wild turkey hunters have diverse motivations and do not form a homogenous group. Results also support existing motivation theories in human dimensions literature such as the Multiple Satisfactions Approach and Driver et al.'s desired psychological outcomes (Driver et al., 1991; Hendee, 1974). Accordingly, in addition to management recommendations, this study contributed to the science of human dimensions of wildlife.

Finally, a few limitations of this study should be noted. The motivation orientation statements used in this study were heavily adopted from existing literature. However, as explained in the method section, some statements were reworded and few statements were introduced in this study to better reflect the context of interest (turkey hunting). While modification of established scales to fit the study context is fairly common (Manfredo, 1996), future research should consider examining the validity and

reliability of these statements in measuring associated constructs in diverse recreation contexts.

In addition, eight different license types allow for the opportunity of hunting turkey in Tennessee, and respondents from all were selected to participate in this study. Certain respondents returned the survey without any data, and indicated that they do not hunt for turkey. Many of the survey recipients may have not returned the survey, if they felt the topic was not relevant to them (Pearl & Fairley, 1985). This could be a reason for a relatively low response rate. However, response rate of mail surveys have declined over the years (Connelly, Brown, & Decker, 2003). Nevertheless, the response rate of this survey is on par or even better than recent surveys of hunters conducted recently elsewhere. For example, a survey of Georgia big game hunters had a response rate of 24% (Mingie et al., 2017).

While this study showed clear evidence of heterogeneity among Tennessee turkey hunters and their support for management regulations, further research could explore if hunters remain within a type, or if they transition from one type to another over the course of their hunting lives. In addition, future research could examine support for regulations based on perceptions of declining turkey populations, and whether support for the creation of management zones can be influenced by other factors.

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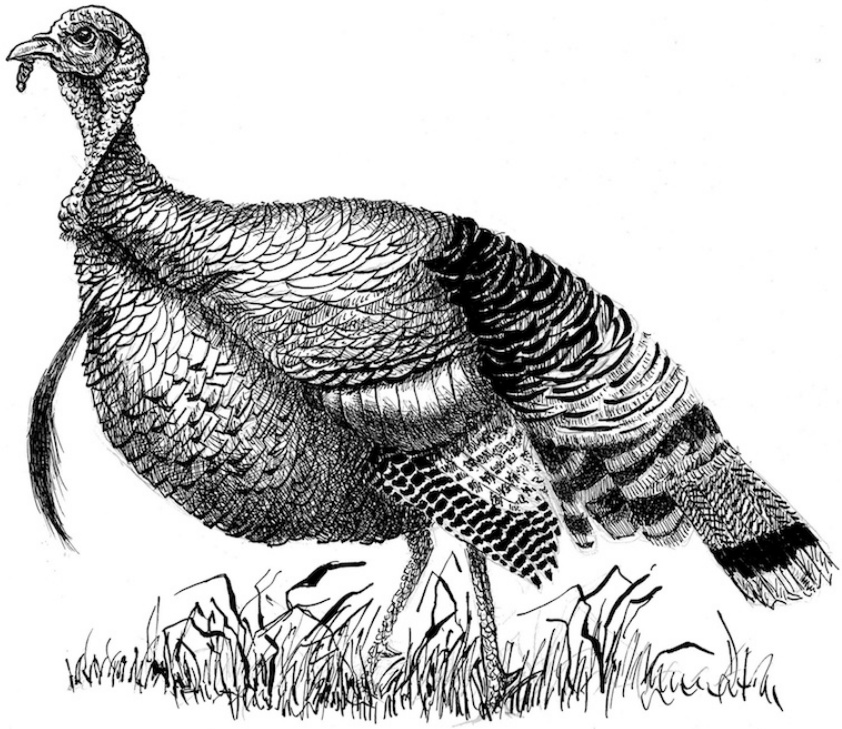
APPENDIX

Appendix I. Questionnaire Survey

Tennessee Spring Wild Turkey Hunters Survey



Department of Forestry, Wildlife, and Fisheries

University of Tennessee

2015

You have been randomly selected as a big game hunter in Tennessee to participate in this survey. Your response will provide TWRA with critical information needed to regulate the harvest of wild turkeys and to provide Tennessee hunters with a high quality hunting experience. If you are less than 18 years old, please do not fill out the survey.

This is a University of Tennessee study with the support of Tennessee Wildlife Resource Agency

Section A. **Current and past turkey hunting in Tennessee**

1. Did you hunt turkeys in Tennessee during the 2015 SPRING turkey season?
_____Yes, please go to Q 3. _____No

2. If you said "no" above, which best describes your reason for not hunting?
_____ I typically hunt turkeys during the Spring, but 2015 SPRING was an exception, go to Q 4.
_____ I hunt turkeys in Fall only, go to Section B.
_____ I do not hunt turkey at all, PLEASE STOP HERE AND RETURN YOUR QUESTIONNAIRE.

3. How many trips and days did you go turkey hunting in the 2015 SPRING season?
_____ **total trips** *(a trip is when you travel from home to your hunting site. You could make two trips in one day if you went to the site in the morning, returned home, and then went back to hunt in the afternoon)*

_____ **total days** *(whether you go more than once on the same calendar day, it still counts as one day of hunting. Regardless of how long you hunt on a calendar day, it still counts as one day of hunting)*

4. Approximately, how far from your residence was your primary hunting location?
_____ miles (one way)

5. How many people travel in the same vehicle with you during a typical turkey hunting trip?
_____ including myself

6. Besides turkey, what other game do you hunt in Tennessee?

_____ Deer	_____ Bear	_____ Waterfowl
_____ Elk	_____ Rabbit	_____ Grouse
_____ Bear	_____ Quail	
_____ Duck	_____ Squirrels	

7. Where do you do most of your turkey hunting? (check one)
_____ My own land
_____ Publicly owned lands such as WMAs
_____ Hunting club
_____ Friends' and family land
_____ Other (specify)_____

8. In which Tennessee Counties do you hunt turkey most often?
   a. County #1: _____ (if unsure, write the name of the nearest city or town)
   b. County #2: _____ (if unsure, write the name of the nearest city or town)

9. During your 2015 spring turkey hunting season, how many turkeys did you harvest?
_____ If no harvest in 2015, Skip to Q. 11.

10. During your 2015 spring turkey hunting season, what time did you harvest your turkey(s)? (check one box for each row applicable)

Turkey #	Before 9 am	9 am - Noon	Noon- 3 pm	After 3 pm
1	☐	☐	☐	☐
2	☐	☐	☐	☐
3	☐	☐	☐	☐
4	☐	☐	☐	☐

11. Although hunters are required to "check in" their harvest, some hunters do not have the opportunity to do so for a variety of reasons. Did you have difficulty checking in your harvest?
_____ Yes _____ No

12. Which of the following makes checking a harvested bird difficult? (Check all that apply)
_____ Lack of information about where to check in
_____ Not familiar with the checking process
_____ Lack of traditional check stations
_____ Lack of computer or smartphone to check in over the Internet
_____ Uncomfortable using computers and smartphones
_____ Other, please
specify_____

13. Please indicate how likely or unlikely are you to use each of the following to check your harvested birds (Check all that apply)

Possible changes	**Very unlikely**	**Somewhat unlikely**	**Neutral**	**Somewhat likely**	**Very likely**
At a traditional check station	1	2	3	4	5
On the computer	1	2	3	4	5
On a smartphone or tablet	1	2	3	4	5

14. Overall, how would you rate your Spring 2015 turkey hunting experience?
_____ Very dissatisfied
_____ Somewhat dissatisfied
_____ Neither satisfied nor dissatisfied
_____ Somewhat satisfied
_____ Very satisfied

15. If you indicated somewhat or very dissatisfied in Q. 14, please briefly mention the reason for dissatisfaction.

---

16. Which of the following days do you typically hunt turkey in the Spring?

_____ Weekends only
_____ Weekdays only
_____ Both

17. Do you typically hunt on the opening day in Spring?

_____ Yes _____ No

18. Did you take a juvenile hunting during the Spring Youth Sportsman Hunt in any of the past three years (2013-2015)?

_____ Yes _____ No, go to Q. 20.

19. If you said "yes" in Q. 18, which of the following juveniles did you take hunting?

_____ Own child
_____ Relative
_____ A child that I mentored
_____ Other
(specify):_____

20. Do you go turkey hunting during the Fall?

_____ Yes, go to Q. 21 _____ No, go to Q. 29

Section B. Your experience with FALL turkey hunting in Tennessee

21. How many trips and days did you go turkey hunting in the FALL of 2015?

_____ **total trips** *(a trip is when you travel from home to your hunting site. You could make two trips in one day if you went to the site in the morning, returned home, and then went back to hunt in the afternoon)*

_____ **total days** *(whether you go more than once on the same calendar day, it still counts as one day of hunting. Regardless of how long you hunt on a calendar day, it still counts as one day of hunting)*

22. How important is being able to hunt turkeys in the FALL season to you?

_____ Not at all important
_____ Slightly important
_____ Moderately important
_____ Very important
_____ Extremely important

23. Which type of hunting weapon do you use the most for FALL turkey hunting? (check all that apply)

_____ Shotgun _____ Bow (compound or Longbow) _____ Crossbow

24. To what extent do you use a decoy when hunting turkeys in the FALL season, if at all?

_____ Never _____ Sometimes _____ Always

25. Which method do you use most to hunt turkeys in the FALL season? (check all that apply)

___Flush and Call
___Opportunistic hunting (i.e., waiting and shooting)
___Other (specify)_____

26. Currently, any turkey can be harvested in the FALL season. How would you feel about being able to harvest **bearded** turkeys only?

___Very unacceptable
___Somewhat unacceptable
___Neither acceptable nor unacceptable
___Somewhat acceptable
___Very acceptable

27. Currently, the FALL turkey hunting occurs during the deer hunting season. Are you satisfied with the general timing of fall turkey hunting season?

_____ Yes _____ No _____ No opinion

28. Which of the following would be your preferred time for FALL turkey hunting season? (please check all that apply)

___First half of November
___Second half of November
___First half of December
___Second half of December
___No opinion

The next section contains questions about your opinion regarding SPRING turkey hunting regulations in Tennessee. Even if you do not hunt during the Spring season, please answer as many questions as you feel comfortable with.

Section C. Opinions about SPRING turkey hunting regulations in Tennessee

29. The present SPRING turkey season opens on the weekend (Saturday) nearest to April 1 and lasts for 44 days. A hunter may take 1 bearded turkey per day, not to exceed 4 per season. How satisfied are you with the following aspects of spring turkey season regulation in Tennessee? (circle one number for each row)

	Satisfaction Unsatisfied ← → Very Satisfied				
Season length	1	2	3	4	5
Timing of opening and closing dates	1	2	3	4	5
Number of weekends in the season	1	2	3	4	5
Season bag limit	1	2	3	4	5
Daily bag limit	1	2	3	4	5
Consistency in regulations across the state	1	2	3	4	5
Availability of options to check in harvest	1	2	3	4	5

30. How important are the following aspects of SPRING turkey hunting regulations in Tennessee to you? (check one number for each row)

	Importance Not Important ← → Very Important				
Season length	1	2	3	4	5
Timing of Opening and closing dates	1	2	3	4	5
Number of weekends in the season	1	2	3	4	5
Season bag limit	1	2	3	4	5
Daily bag limit	1	2	3	4	5
Consistency in regulations across the state	1	2	3	4	5
Availability of options to check in harvest	1	2	3	4	5

31. Tennessee's spring turkey season opens late March or Early April. Which of the following do you think describes the timing?

_____ Too early
_____ About right
_____ Too late
_____ It does not matter to me
_____ Do not know

32. If wildlife biologists recommended adjustments in Tennessee's SPRING turkey hunting regulations that could help maintain a healthy and stable turkey population, how acceptable or unacceptable do you think the following changes would be?

Possible changes	**Very unacceptable**	**Somewhat unacceptable**	**Neutral**	**Somewhat acceptable**	**Very acceptable**
Opening the season on or after the second week of April	1	2	3	4	5
Reducing the season length to 36 days	1	2	3	4	5
Reducing the season bag limit to 3	1	2	3	4	5

33. Would you support increasing the current daily bag limit from 1 to 2, without changing the season limit?

_____ Yes
_____ No, not under any circumstance
_____ Unsure, it depends on structure

34. If replied "yes" or "unsure" above, would you support the following requirements with the 2-per-day limit?

Possible changes	**Very unacceptable**	**Somewhat unacceptable**	**Neutral**	**Somewhat acceptable**	**Very acceptable**
First harvest be checked in before harvesting second turkey	1	2	3	4	5
One bird be harvested in the AM and one in the PM	1	2	3	4	5
An additional special permit be required to harvest 2 per day	1	2	3	4	5
Increase the daily limit to 2, with none of the above restrictions (checking in, AM/PM, special permit) in place	1	2	3	4	5

35. The Tennessee Wildlife Resource Agency's approach to spring turkey hunting management has traditionally involved establishing turkey hunting regulations that apply to the entire state (i.e., statewide bag limit, season length). Would you be in favor of a different management approach to establish turkey management zones that would have individual hunting regulations?

_____ Yes _____ No _____ No opinion

Section D. **Perception of turkey populations and importance of amenities**

36. How long have you been turkey hunting in Tennessee?

_____ # years

37. Do you believe there are enough turkeys in the areas you hunt to allow you ample opportunity to harvest a bird?

_____ Yes _____ No _____ No Opinion

38. Based on your experience over the years, how have turkey population changed in areas you hunt?

____ Increased ____ Stayed the same ____ Decreased _____Don't know

39. If you have noticed a decrease in turkey numbers, what do you believe are the reasons?

_____ Hunting pressure
_____ Disease
_____ Wild hogs
_____ Armadillos
_____ Predation on poults (coyotes, owls, hawks, other)
_____ Predation of nests (coyotes, skunks, raccoons, opossums, other)
_____ Loss of habitat
_____ Poaching
_____ Bad hatches
_____ Bad weather during nesting
_____ Don't know
_____ other:_____

40. How would you rate the quality of turkey hunting in Tennessee now compared to when you first started hunting here?

_____ Much worse
_____ Worse
_____ Same
_____ Better
_____ Much better

41. How important are each of the following reasons for why you hunt turkeys in Tennessee? (circle one number for each row).

	Very unimportant	Importance ←		→	Very Important
Hearing or seeing turkeys	1	2	3	4	5
Finding or seeing signs of a turkey(s)	1	2	3	4	5
Knowing friends or family are seeing or hearing turkeys	1	2	3	4	5
Shooting birds	1	2	3	4	5
Taking a turkey home for food	1	2	3	4	5
Killing a big, mature turkey	1	2	3	4	5
Enjoying solitude and escape from normal life	1	2	3	4	5
Being out in the woods	1	2	3	4	5
Experiencing the challenge of the hunt	1	2	3	4	5
Improving hunting skills	1	2	3	4	5
Enjoying nature and the outdoors	1	2	3	4	5
Getting some physical exercise	1	2	3	4	5
Being with friends/family	1	2	3	4	5
Being able to enjoy other kinds of recreation (e.g. camping, hiking)	1	2	3	4	5
Teaching others (kids, friends) to hunt	1	2	3	4	5
Helping manage the wild turkey population	1	2	3	4	5

42. Recently, some parts of the state have reportedly seen a decrease in the turkey population. Before reading this survey, had you heard about this issue?

_____ Yes _____ No

43. How concerned are you that the turkey populations is declining in some parts of the state?

_____ Not at all concerned
_____ Slightly concerned
_____ Somewhat concerned
_____ Moderately concerned
_____ Extremely concerned

44. If for some reason the turkey population in the counties you hunt most often were to decline, what else would you consider doing with your spring turkey hunting time?

_____ Hunt other game in the same county
_____ Go fishing in the same county
_____ Enjoy non-hunting outdoor activities (e.g. camping, boating) in the same county
_____ Go somewhere else in Tennessee to hunt turkey
_____ Go to other states (e.g. Alabama, Kentucky) to hunt turkey
_____ Stay home
_____ Go to work
_____ Other (specify)_____

Section D: Demographic information. The following questions will help us ensure that people we are surveying are representative of all turkey hunters in Tennessee. All information will be kept **confidential.**

---

45. What is your age? _____ years

46. What is your gender?
_____Male _____Female

47. How many people live in your household?
_____ # total
_____ # under 18 years
_____ # hunters

48. What is your current employment status?
_____ Full-time job _____ Student
_____ Part-time job _____ Retired
_____ Unemployed _____ Military

49. If you are employed, when do you work the most?
_____ Weekdays only
_____ Weekends only
_____ Both

50. Do you hunt turkeys outside Tennessee?
_____ No _____ Yes, Please specify the states:
_____

51. In 2014, what is your approximate annual household income before taxes? (please check one)
_____Less than $25,000 _____$150,000 to $174,999
_____$25,000 to $49,999 _____$175,000 to $199,999
_____$50,000 to $74,999 _____$200,000 to $224,999

_____$75,000 to $99,999
_____$100,000 to $124,999
_____$125,000 to $149,999
_____$225,000 to $249,999
_____$250,000 and higher

Thank you for completing this survey

Please use the space provided below for any additional comments on turkey hunting or turkey populations.

Thank you for completing this survey. If you have any additional questions, please contact
Dr. Neelam Poudyal – 865.974.8771; npoudyal@utk.edu

Please return this survey in the enclosed postage-paid envelope. If you have misplaced the envelope, send the completed survey to:

Dr. Neelam C. Poudyal
Assistant Professor
Department of Forestry, Wildlife, & Fisheries
University of Tennessee
274 Ellington Plant Science Bldg.
Knoxville, TN 37996

Appendix II. Survey Reminder

Survey Reminder

We recently invited you to participate in a research survey regarding your experience of wild turkey hunting in Tennessee and your opinion about spring turkey hunting regulations. If you have already completed the survey, please accept our sincere thanks. If not, please complete and return it as soon as possible.

In case your survey was misplaced or lost, you will be receiving another copy in a few days. You are one of the very few randomly selected turkey hunters to participate in this study and your response is extremely important. Even if you do not hunt turkey, please complete as many questions as you can and return it in the prepaid envelope provided.

Dr. Neelam Poudyal
Assistant Professor
University of Tennessee

VITA

Cristina Maldonado is a MS student at the Department of Forestry, Wildlife, & Fisheries, at the University of Tennessee. She earned a B.A. in Environmental Science from the University of Virginia and worked with Teach for America as a high school environmental science teacher in North Carolina post-graduation. Her research and professional interest lies on social science aspects of natural resource management and its implications for natural resource policies and regulations. Her current research project investigates motivations and constraints in order to be able to predict attitudes towards wildlife management policies. In particular, she is working on assessing attitudes of Tennessee hunters towards wild turkey harvest regulations. She hopes to pursue a career in natural resource management with a federal or state agency.