ABSTRACT

VAYER, VICTORIA ROSE. Changing the Face of Hunting in America: Understanding and Influencing College Students' Hunting- Related Beliefs and Behaviors. (Under the direction of Dr. Lincoln Larson).

Declining hunting participation negatively impacts state and federal agencies' ability to achieve wildlife management objectives and generate revenue for conservation. The decline, in large part, is driven by decreasing numbers of young adult hunters. As a result, recruitment, retention, and reactivation (R3) efforts have become a high priority in the North American wildlife management community. To address these declines and build support for hunting and wildlife conservation we focused on one promising audience: college students. But to what extent do college students hunt, and what factors influence future hunting behavior? To answer these questions, we surveyed 17,203 college students at 22 universities across 22 states to assess their hunting-related beliefs, perceptions, and behaviors. Results revealed that those with past hunting experience (29%) mirror traditional hunting populations, who are predominantly white, male, and from rural backgrounds. However, those that would consider hunting in the future (28%) were more diverse, both in their demographic characteristics and their views about hunting and hunters. Based on responses, we grouped students into one of four future hunting categories: non-hunters (50%), potential hunters (22%), active hunters (26%), and lapsed hunters (3%). Comparisons of these groups revealed many significant differences based on demographic composition, beliefs, attitudes, and behaviors, providing unique insights for R3 marketing and programming and highlighting the importance of non-traditional pathways into hunting.

Despite a proliferation of these R3 initiatives in recent years, little research has systematically evaluated the effects of these programs on the knowledge, attitudes, and behaviors (short-term and long-term) of new hunters. We therefore worked with agency partners around the country to develop and implement a "Getting Started Outdoors: Hunting 101" workshop with the goal of evaluating the efficacy of R3 programs specifically designed for college students without previous hunting experience. Using quantitative and qualitative analysis of online surveys conducted before and after the workshop, we assessed the impacts of the R3 effort at 13 universities in 13 states across the United States. Across all states, 16 workshops attracted 271 total participants, many of whom were particularly interested in obtaining local, free-range meat, experiencing nature, and contributing to conservation. Overall, students enjoyed the workshop

and, following participation, reported increases in hunting-related confidence, skills and knowledge, and positive beliefs about hunters and the roles of hunting in conservation. Results showed that the workshop was effective in attracting a diverse pool of potential hunters, increasing interest in future hunting (84% said there were likely to hunt the future) and creating hunting advocates. Findings highlight the potentially powerful impact that R3 programs focused on diverse college students can have on the future of hunting across the United States. Ultimately, this research should advance the conversation about the role that college students play in R3 and hunting community at large.

Changing the Face of Hunting: Understanding and Influencing College Students' Hunting-Related Beliefs and Behaviors

by
Victoria Rose Vayer

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APPROVED BY:

Dr. Lincoln Larson Committee Chair	Dr. Nils Peterson
Dr. KangJae "Jerry" Lee	Dr. Kathryn Stevenson

DEDICATION

To Joshua Vayer: my sounding board, proofreader, supporter, and father.

BIOGRAPHY

Torey Vayer grew up and lived in Rockville, MD, until she moved to State College, Pennsylvania to pursue an undergraduate degree. In 2017, Torey graduated from Penn State with a BS in Biology and a minor in Wildlife Fisheries Sciences. After graduating, she worked as a research assistant and field technician for Penn State and the Pennsylvania Game Commission until deciding to move to Raleigh, NC, to pursue graduate school.

Torey originally fell in love with conservation biology and wanted to pursue a career in wildlife biology. But through internships, research opportunities, and summer jobs, she realized that when it comes to conservation, we can't ignore the human factor. That realization led her to NCSU to pursue a master's degree in social science. Torey's academic passions include science communication, environmental education, and human dimensions of wildlife. Ultimately, Torey aims to lessen the language barrier between scientists and the general public and bridge gaps between humans and nature.

Beyond academia, Torey is an ultimate frisbee player and CrossFit athlete. She enjoys hiking, camping, backpacking, climbing and many other outdoor recreation activities… but, not hunting, yet!

After graduating, Torey would like to work in a multi-faceted human dimensions position that allows her to contribute to biological research but also educate, interpret and inspire. She is exploring the options that NGOs, park services, and zoos have to offer!

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And last but certainly not least, thank you to all of my friends and family for their unwavering support. A heartfelt thanks to my parents for being their unconditional love and affirmations, for being my support system, and for always listening even through the toughest hours. Thank you to all of my PRTM colleagues, I wish I could list you all by name! And finally, thank you to my friends and teammates that became my chosen family and made NC feel like home.

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CHAPTER 1: INTRODUCTION AND LITERATURE REVIEW

Introduction

The number of licensed and active hunters in the United States has steadily declined since the 1980's (Larson et al., 2014; Mockrin et al., 2012; USFWS et al., 2016). This persistent decline in hunter numbers has generated an array of ecological, economic, and social consequences. For example, hunting helps to maintain balanced ecosystems through control of wildlife populations, and it also serves as an important revenue source for natural resource management agencies through taxation and license sales (Tommy L. Brown et al., 2000; Loveridge et al., 2006). Hunter recruitment, retention, and reactivation (R3) has therefore become a high priority within the North American wildlife management community.

Acknowledging these concerning trends, state wildlife agencies across the United States are introducing a variety of R3 programs designed to foster mentoring opportunities and skill development for individuals with little or no previous hunting experience (Responsive Management, 2017; Ringelman et al., 2020). These programs often emphasize new themes such as local food connections and conservation benefits (Stedman et al., 2017). Yet, despite the rise in R3 programs, there is little evaluation of those programs. It is therefore necessary to conduct research that identifies promising target audiences for R3 efforts, highlights attributes of successful programs, and systematically investigates the impacts of R3 on hunting participation and support for wildlife conservation.

For R3 efforts to succeed, they must address the social and cultural factors that enhance or impede hunting participation (Larson et al., 2014). Familial connection is the traditional pathway for hunting socialization, and many hunters are typically exposed to the activity during developmental years (Winkler & Warnke, 2013). However, as the traditional pool of hunters (e.g., White males who live in rural areas) shrinks, there is a growing push to recruit potential hunters from non-traditional backgrounds (Quartuch et al., 2017); (Winkler & Warnke, 2013). Colleges and universities, where millions of students are eager to try new activities, present unique opportunities to enhance R3 efforts (Larson et al., 2017; Stayton et al., 2017). College students are typically in a life stage often referred to as "emerging adulthood" (Arnett, 2000a), which is distinguished by relative independence from social roles and societal expectations. This means that students who were not directly exposed to hunting culture as children might be open to trying it in college. The university setting also fosters a culture of experimentation with

minimal consequences and provides an environment for cognitive and spiritual expansion and development (Johnson & Goldman, 2011), perhaps fostering pathways into hunting.

This study examines the relationship between college students and hunting, including the factors that contribute to the success of R3 programming that targets college students – success that can be measured by R3's ability to recruit new hunters and create hunting advocates. To do this, we explore answers to multiple research questions: What do college students think about hunting? What factors are associated with their hunting-related attitudes, beliefs, and behaviors? If college students are experimenting and exploring during this time period, how do we get them into programs that encourage the adoption of new recreation activities (e.g., hunting)? Do R3 programs targeting college students create new hunters and hunting advocates, and what are the factors that influence R3 program success? By creating and evaluating cooperative R3 efforts between public universities and state wildlife agencies, our research investigates the connections between college students and hunting, the factors that affect college student participation in hunting, and the contributions that college students can make to the changing hunting community.

Literature Review

The Decline of Hunting

Hunting, which has long been a mainstay in American culture (Duda et al., 2010; Mahoney & Jackson III, 2013; Reiger, 2001), is in a state of decline. A national survey concluded that the number of general hunting participants fell from 14.1 million (1991) to 11.5 million by 2016 (Responsive Management, 2017; USFWS et al., 2016), (Figure 1.1, Figure 1.2). Between 1975 and 1996, there was a 13% decrease in people who said they went hunting among the 16-24 year age cohort (Enck et al., 2000). This documented decline in the number of hunters threatens the nation's natural resource management agencies' ability to achieve their missions and goals.

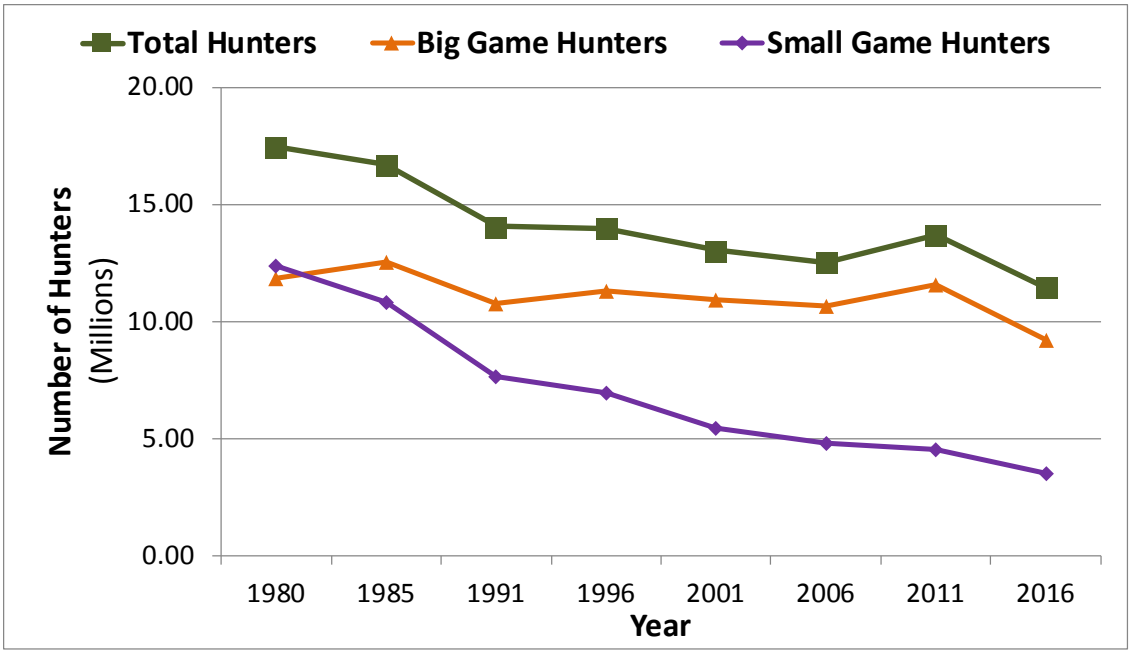

Figure 1.1. Hunting trends based on the number of hunters in the U.S. from 1980 to 2016 USFWS et al., 2016).

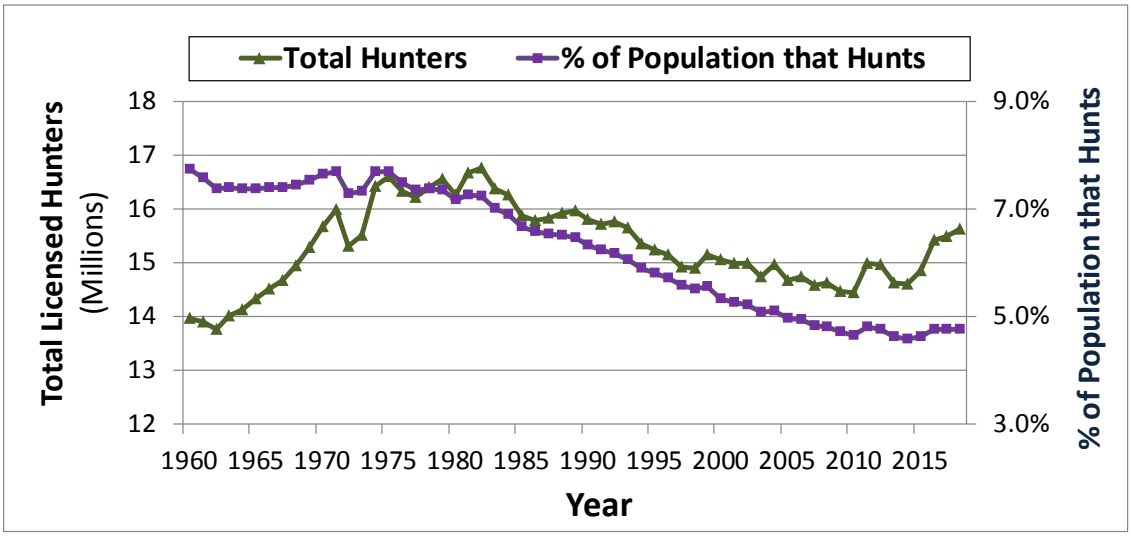

Figure 1.2. The total number of hunters, and the percent of the U.S. population that hunts, from 1960 to 2015 (USFWS et al., 2016). Both, total number of hunters and relative/per capita number of hunters, are important. The former because it impacts funding directly, and the latter because it impacts public support and government policy.

For centuries, hunting was a centerpiece of American culture and a way of life (Duda et al., 2010). Even in the early 1900's, hunting became criticized as a sport. History professor, Thomas Altherr (1987), notes that by the 1920's, when more than half of Americans lived in urban or suburban environments detached from nature, hunting for sport and sustenance was

becoming increasingly obsolete (Altherr, 1987). However, around 1941, when the United States joined World War II, hunters and hunting affiliated companies jumped on the opportunity (Altherr, 1987). Many hunters joined the military as expert marksman, firearms instructors, or survival instructors. Many others stayed back and formed civilian militias to protect the home front, ward off predators from important crops, and provide game meat for meals when food rations became a necessity (Altherr, 1987). Hunting magazines, like Field and Stream, at this time, painted hunters as soldiers and patriots (Altherr, 1987). Authors and editors emphasized connections between military firearm expertise and hunting skills. Collectively these factors help to explain the rapid revitalization of hunting in the post-war era. However, after several decades, enthusiasm for hunting again began to wane. By the 1980's hunting had re-entered a state of steady decline.

Although the contemporary decline of licensed hunters has been well documented and discussed among wildlife professionals since the 1980's, there are multiple theories about the cause of this decline. Shifts in society and the larger social habitat for hunting are widely viewed as the primary culprits (Larson et al., 2014; Peterson et al., 2010). These shifts include increased competing demands for money and time, diminishing social support for hunting, lack of mentors, urbanization, land-use and land ownership changes, sprawling development leading to limited access, negative media coverage, and a diminished appeal to potential new participants due to a lack diversity in hunting communities (Larson et al., 2014; Winkler & Warnke, 2013). In general, lack of connectivity to the outdoor environment is thought to be a leading factor negatively affecting the number of new hunters. Peterson et al. (2010), discussed how urbanization and technology have created larger gaps between human-nature connections than ever before, with urbanization placing a physical barrier between people and nature experiences, and technology providing a substitute for the in-person socialization that nature experiences used to provide. Enck, Decker, and Brown (2000) hypothesize that decreases in hunter retention may be due in part to lesser prioritization of hunting versus other activities. Regardless of the reasons, the social, ecological, and economic impacts of this decline have been significant.

The Value of Hunting

It is impossible to discuss United States history without considering the role of hunting and its prominence in American culture. Today's wildlife management framework, which is

guided by the North American Model of Conservation, is a reflection of the historic idea that America's natural resources belong to the people (Organ et al., 2012; Reiger, 2001). The North American Model of Wildlife Conservation highlights the historic role of hunting in conservation and wildlife management and has helped form the backbone of conservation funding (Duda et al., 2010; Serfass et al., 2018).

Hunting is ingrained in the national heritage of the United States and is a part of a tradition that qualifies hunting as one of the true classic American sports. Under the British system, game was considered property of the crown and only wealthy land owners were permitted to hunt (Geist et al., 2001). By contrast, when settlers first arrived in North America, they mandated that hunting and fishing were free for "everyone" and that game were property of the people (Geist et al., 2001). Historically, resource exploitation (hunting and timber production) fueled the American settlers' expansion westward and was heavily relied upon to feed the new urban masses that arose during the industrial revolution (Duda et al., 2010; Organ et al., 2012). This served to firmly embed the cultural belief that natural resources are a national asset. Therefore, hunting traditions run deep in America and are intertwined with the country's democratic governance system (Batcheller et al., 2018; Organ et al., 2012). Additionally, hunting for food has been a part of hominid culture for centuries, according to fossil records (Arnett & Southwick, 2015). Though always used to provide food, hunting has gradually evolved into a sport and management tactic (Organ et al., 2012). In the early 1900's, America's growing urban population, particularly those with greater financial means, helped birth the idea of hunting for sport in America. The challenge of the chase was a favored pastime among those with leisure time (Organ et al., 2012), and helped fuel the conservation ethic of the original American sportsmen (Rieger, 2001). Today, hunting continues to provide a powerful connection to the outdoors and natural environment for millions of people across the United States (Duda et al., 2010; Peterson et al., 2010; Winkler & Warnke, 2013).

North America has a unique approach to wildlife conservation that has been guided since the late 1800's by leaders such as Aldo Leopold and Theodore Roosevelt, who saw hunting as an integral component of conservation (Batcheller et al., 2018; Organ et al., 2012). Historically, hunting has been used as a relatively low-cost wildlife management tool and can be effective to control overabundant wildlife populations as well as nuisance and invasive species (T. L. Brown et al., 2000; Tommy L. Brown et al., 2000; Loveridge et al., 2006). As human expansion

reduced the availability of natural habitat and overexploitation affected numerous species, many apex predator populations were extirpated. The lack of apex predators in an ecosystem leads to the disruption of the ecological food web. Hunters can serve the same purpose as apex predators in many cases (Kaltenborn et al., 2013). Regulated hunting is therefore a useful technique to control wildlife populations within their carrying capacity and at socially acceptable levels (T. L. Brown et al., 2000; Winkler & Warnke, 2013). In addition, land ownership patterns, supported by law and culture, mean many hunters own and recreate on private lands, and their land management practices are pivotal to habitat protection and promotion of biodiversity (Brenner et al., 2013; Winkler & Warnke, 2013). This is critical because about 67% of land in the United States is privately owned and managed (Dale et al., 2000). Hunters, and specifically hunters that own and manage private land for wildlife related purposes, provide ecological services to the wildlife management community at large.

Hunting is also economically important to the protection of America's natural resources. Natural resource management agencies – locally, statewide, and federally – rely on government allocations and taxes for the majority of their funding. Taxes on guns, ammunition, and some gear associated with hunting and fishing, and hunting and fishing license sales provide a substantial amount of funding back to wildlife agencies (Duda et al., 2010; Loveridge et al., 2006; Winkler & Warnke, 2013). For example, the sale of duck stamps, which are required purchases each season for waterfowl hunters, has raised over 1 billion dollars since 1934 for the National Wildlife Refuge System (Shipley et al., 2018). As of 2020, duck stamps cost each user $25 and ninety-eight cents per dollar is used to protect wetlands and wildlife habitat (USFWS, 2017). However, because the duck stamp system is a "user pay, user benefit" approach, central on hunters, the model only works if Americans are hunting (Mahoney & Jackson III, 2013). Similarly, the Pittman-Robertson Act of 1937, imposed an 11 percent excise tax on all hunting gear and ammunition to support wildlife conservation efforts (Loveridge et al., 2006). In 1950, the Dingell-Johnson placed a similar tax on fishing equipment and boat fuel (USFWS, 2015). Overall, hunters and anglers contribute roughly 60 percent annually of all revenue to support fish and wildlife conservation efforts through state natural resource management agencies (Mahoney & Jackson III, 2013). But again, these funding mechanisms only work if participation in hunting and fishing is sustained (Heffelfinger et al., 2013). Similarly, the economic outputs of hunting-related activities can have a significant impact on rural communities through expenditures and

job creation, but only if hunting continues (Munn et al., 2010). The decline of hunters is therefore particularly concerning when recognizing the economic support of hunters and anglers to communities and the conservation efforts of wildlife management agencies.

In summary, hunting in America has historically fostered cultural heritage, served as an important wildlife management tool, and generated billions of dollars for conservation (Arnett & Southwick, 2015). As a result, the wildlife management community has traditionally regarded hunters as a primary stakeholder group, and wildlife agencies have given considerable weight to their interests (Serfass et al., 2018; Stedman & Decker, 1996). Through both financial and political support, hunters have promoted conservation and championed the protection of wildlife habitat and natural areas (Rieger, 2001; Winkler & Warnke, 2013). For all of these reasons, the current decline in hunting participation across the country is concerning. But efforts are underway to curb that trend.

The Rise of Recruitment, Retention, and Reactivation (R3) Efforts

Many hunter recruitment, retention, and reactivation (R3) programs have been developed and implemented in an attempt to combat the steady decline of hunting participation. When the decline in hunting was first recognized in the 1980's, there was an initial effort to prioritize hunter recruitment and retention (Decker & Purdy, 1986). Recently, there have been more formal attempts to enhance the science of best R3 practices and methodologies for implementing successful programs (Responsive Management, 2017; Larson et al., 2014). An example of this is the switch from R&R (recruitment and retention) or HRR (hunter recruitment and retention) to R3, symbolizing a general broadening of focus to include reactivation of lapsed hunters (Byrne & Dunfee, 2018). The renewed interest in improving R3 has been characterized by more focused and deliberate efforts by agencies and organizations to target former hunters, different mechanisms for recruiting new hunters, and evolving opportunities for increasing public exposure to hunting (Responsive Management, 2017; Hinrichs et al., 2020; Price Tack et al., 2018).

Theories Informing R3

Numerous R3 programs exist, but few of them are grounded in theory, thereby impeding our ability to assess their successes and failures. One particularly relevant theoretical framing is

the concept of leisure constraints and negotiation of those constraints. Samdahl (2005) contends that constraints research represents one of the largest subfields within the field of leisure studies. Constraints, in the leisure field, are defined as "factors assumed by researchers and perceived or experienced by individuals to limit the formation of leisure preferences and to inhibit or prohibit participation and enjoyment of leisure (Jackson, 1997). Constraints can help researchers understand how individuals make leisure choices and behaviors, such as adopting a new activity like hunting. Leisure constraints theories therefore have major implications for R3 programming. The Hierarchal Model of Constraints (Crawford et al., 1991) (Figure 1.3), in particular, may be relevant in the context of hunting recruitment and retention. Crawford and colleagues (1991) describe intrapersonal, interpersonal, and structural constraints in a nested fashion, where intrapersonal constraints must be negotiated before interpersonal constraints can be addressed (Crawford et al., 1991). Intrapersonal constraints are individual and personal characteristics that influence leisure choices (e.g. fear of the outdoors), interpersonal constraints are identified as interactions with others influencing engagement in recreation and leisure (e.g. not having a friend to participate with), and finally structural constraints are operationalized here as resource-based barriers to participation that intervene between preferences and participation (e.g. not enough money or lack of transportation) (Schneider, 2016; Walker & Virden, 2005). In contrast, intrapersonal constraints are often viewed as shaping leisure preferences and, in turn, participation choices. Negotiation is the individual's process of using behavioral or cognitive strategies to facilitate participation despite constraints (Jackson et al., 1993). According to Crawford, leisure preferences are formed within a hierarchy where intrapersonal constraints must be negotiated before interpersonal and structural constraints (Crawford et al., 1991).

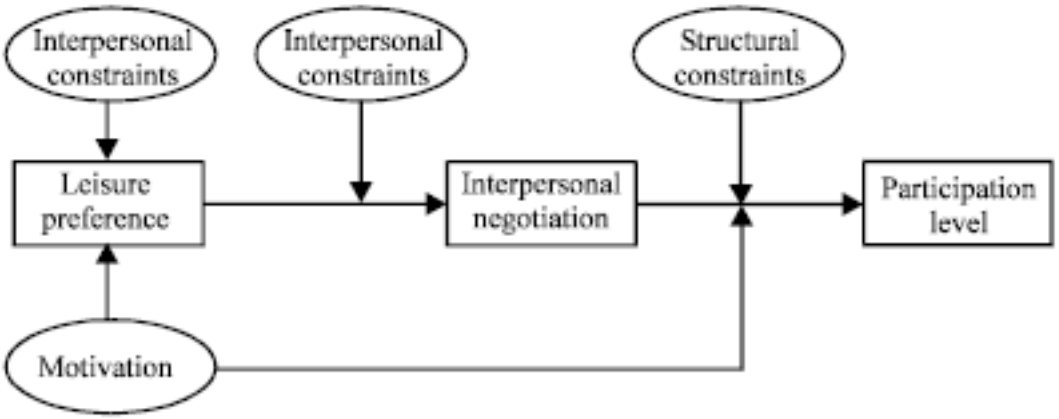

Figure 1.3. Hierarchal model of constraints adapted from Crawford et al., (1991) (Crawford et al., 1991).

However, some authors question the hierarchical nature of this model and posit that constraints may be perceived, experienced, and negotiated in any order, and with many interactions between the levels (Hubbard & Mannell, 2001; Jackson & Scott, 1999; Schneider, 2016) (Figure 1.4). These models emphasize motivations and other factors influencing recreation activity choices (Schneider, 2016).

R3 programs must address constraints to hunting, but even if individuals negotiate these constraints a behavior still may not be performed. The Theory of Planned Behavior (TPB) and The Outdoor Recreation Adoption Model (ORAM) offer complementary explanations to explain recreation behavior.

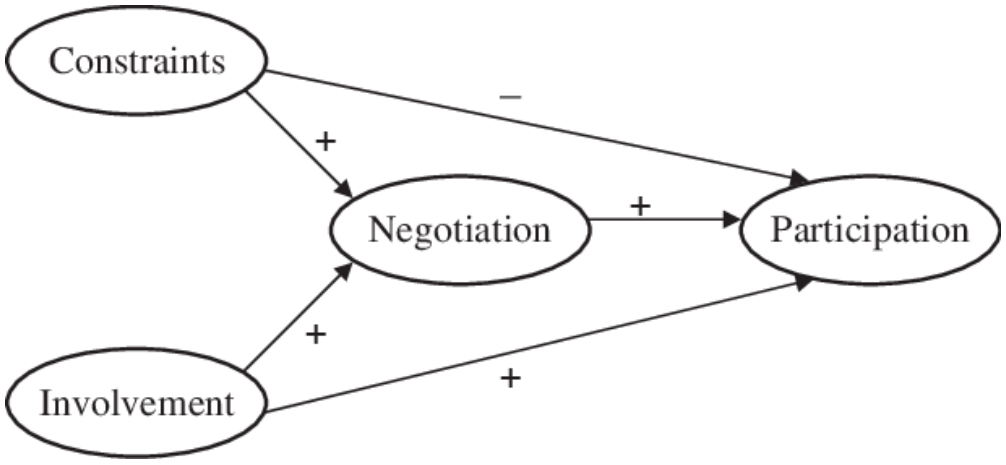

Figure 1.4. Constraints Effects Mitigation Model adapted from Hubbard & Mannell (2001) (Hubbard & Mannell, 2001).

The Theory of Planned Behavior (TPB) (Figure 1.5) and the Outdoor Recreation Adoption Model (ORAM) are frameworks that describe an individual's process of adopting a new activity. TPB explains the relationship between one's beliefs and behaviors (Ajzen, 1991). This theory postulates that attitudes, norms, and behavioral controls drive an individual's intentions and therefore influence the likelihood of performing a behavior. The greater the intention to engage, the greater likelihood that the behavior will be performed (Ajzen, 1991). Likewise, if any link in the pathway is broken, the behavior is less likely to be performed. However, some authors suggest that attitudes, norms, and behavioral control variables are not reliable predictors of actions because even when those variables lead to a positive intent, a behavior may still not be performed in the end (Larson et al., 2014). Nevertheless, this theory highlights the important role that beliefs and attitudes play as behavioral antecedents.

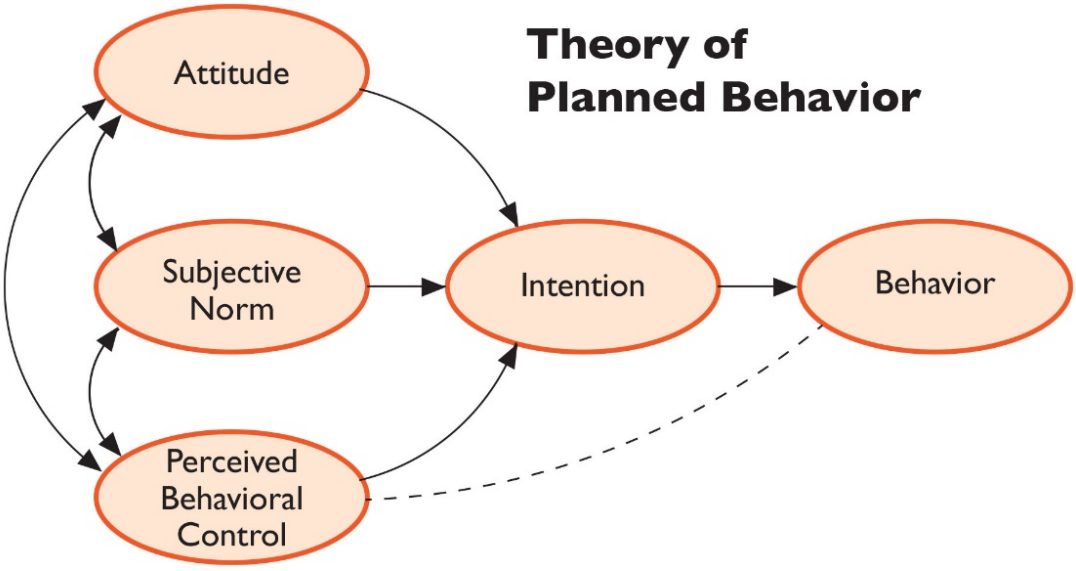

Figure 1.5. Theory of Planned Behavior adapted from Ajzen (1991) (Ajzen, 1991).

The ORAM (Figure 1.6) is a theoretical construct that is useful for understanding recreation behavior through the lens of social support, augmenting and expanding upon the normative component of TPB. The ORAM was designed with R3 programs in mind; it is specifically aimed at helping the R3 community better understand how individuals join new activities (Byrne & Dunfee, 2018). The ORAM is derived from the Diffusions and Innovations Theory, which arose out of multiple disciplines in the 1950's (Byrne & Dunfee, 2018). It describes eight stages that individuals progress through when adopting (or rejecting) a new

activity: awareness, interest, trial, apprentice, continuation without focused support (no longer apprentice), continuation as a proponent, temporary cessation stage, and permanent desertion stage (Byrne & Dunfee, 2018). In the context of R3 programs, awareness, interest and trial stages fit under the recruitment category, apprenticeship and continuation without support stages fall under the retention category, and temporary cessation and permeant desertion stages fall under reactivation. The ORAM fully recognizes the importance of social support and a social system promoting the adoption of recreation activities at every level.

According to the ORAM, the social support required for activity adoption cannot be overstated. Participants need social support at every adoption level (recruitment, retention, and reactivation) to decide to continue an action or behavior. Additionally, as we see in Figure 1.6 (Byrne & Dunfee, 2018), in the initial recruitment phase, there is a three-step process which describes how an individual even begins to generate interest and intent to participate in an activity. Although the Theory of Planned Behavior recognizes the importance of social support through both subjective and social norms, the ORAM suggests that there is more complexity to activity participation than the Theory of Planned Behavior explains. It is important to acknowledge the complexity of these theories (individually, but also in combination), and note the number of factors interacting to influence behaviors. One explanation may not fit all situations.

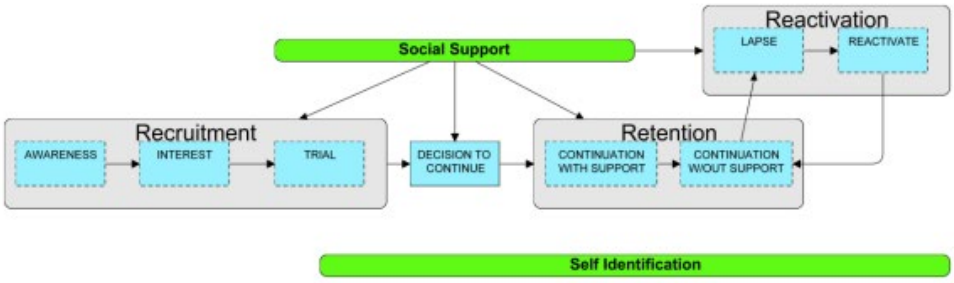

Figure 1.6. Figure adapted from Byrne and Dunfee (2018) describing the activity adoption process for outdoor recreation activities in the context of ORAM.

Hunting participation can best be understood through all of these theoretical lenses because they help highlight the most important antecedents (constraints, beliefs, attitudes, motivations, social support, etc.) to understanding and influencing hunting behavior. All of these factors are heavily influenced by the social habitat for hunting (Larson et al., 2014) – a social

habitat that evolved in traditional hunting settings but is increasingly challenged by contemporary social forces.

Traditional Pathways into Hunting and Current Shortcomings of R3

The literature considers "traditional" hunters White males from rural upbringings who were initially recruited to hunt via family influence (Larson et al., 2014). The hunting community is still predominantly male and is from rural settings, where hunting is an important part of the community identity and culture (Stedman & Heberlein, 2009). These hunters are typically recruited and initially introduced to hunting via immediate family members, specifically fathers (Decker et al., 1984). Research shows that individuals who have familial support are more likely to have positive attitudes associated with hunters and hunting (Decker et al., 1984; Larson et al., 2014). Furthermore, evidence suggests those initiated during childhood will not only develop favorable attitudes toward hunting but are likely to sustain those beliefs over the course of their lives (Larson et al., 2014). This collective evidence corroborates the importance of social support for hunting that is recognized in both the Theory of Planed Behavior and ORAM. While these forces have been great at producing traditional hunters, they often fall short when trying to expand interest to new populations where social support for hunting is inherently lacking, such as urban areas (Wilkins et al., 2019). These theoretical contexts offer some insights into why the success of many R3 programs may be limited.

Seng et al. (2007) and Larson et al. (2013) describe reasons why R3 programs fail. These possibilities include only providing opportunities as single events, managers having a "we've always done it this way" attitude, lack of evaluation of program effectiveness, lack of staff, budget, expertise and support, and misunderstanding the market and marketing tactics. While the Theory of Planned Behavior and ORAM offer a sound framework through which we can understand and improve R3, most programs have not embraced these theories. Additionally, R3 workshops typically recruited people that have already dabbled in hunting or shooting sports, and did not have success recruiting new members from outside existing hunting circles (Responsive Management, 2017). Such patterns have led some to conclude that conventional R3 programs targeting youth already socialized into hunting constitute a waste of resources (Price Tack et al., 2018). Ryan and Shaw (2011) provide anecdotal evidence supporting this claim, stating that many agency efforts have been implemented to attract the "low hanging fruit" or those that

would likely have been socialized into hunting already. As Dunfee (2018) notes, we must stop "preaching to the choir" (Dunfee, personal communication). While traditional hunters make up the majority of the hunting community, it is important to acknowledge that hunters initiated in the traditional manner are no longer sufficient to offset the declining trend of overall hunters. Therefore, it is imperative for wildlife managers to recognize the potential impact of non-traditional path hunters (NTPHs) and identify R3 strategies that work for these diverse audiences.

Non-Traditional Path Hunters (NTPHs)

Non-traditional path hunters (NTPHs) are those hunters who do not come from traditional hunting settings and who do not have familial connections to hunting. Quartuch et al. (2017) define NTPHs as hunters who are initiated into the hunting community as adults, have limited previous hunting experience, have little or no familial or social support for hunting, and/or are a part of a typically underrepresented group with-in the hunting community (e.g. women and racial/ethnic minorities). Hunting in the United States is a White masculine and rural activity (cites needed). As the number of these traditional hunters shrank and the future of hunting has become jeopardized, agencies only then started to look at NTPHs as valuable assets (Lee et al., 2014). NTPHs are unique because they are influenced and initiated into the hunting community by people who are not related to them (e.g. friends, coworkers, spouse/partner). Although, Quartuch et al. (2017) acknowledge that some adult onset hunters were recruited through more traditional pathways, they conclude that a considerable proportion of adults are socialized into the hunting community via a non-traditional, non-familial pathway.

In the face of declining overall numbers of hunters, the NTPH population is an important target for R3 programs hoping to diversify and attract a wider segment of the American population. In order to recruit NTPHs, wildlife managers must promote hunting through messaging that aligns with motivations and beliefs of people who may not have been introduced or initiated into hunting yet (Ryan & Shaw, 2011). One prime example of this is using the local food movement as a tactic to attract "locavores" to hunting (Tidball et al., 2013). The local food movement emphasizes consuming food that is ethically grown, harvested, or produced locally, and has become increasingly popular even among urbanites (Stedman et al., 2017). As they did with soldiers returning from World War II, managers and hunting advocates might capitalize on

social changes such as the local food movement to alter hunting trajectories. Targeting locavores may be one fruitful avenue for R3 efforts (Stedman et al., 2017; Tidball et al., 2013). But other groups of NTPHs also have the potential to reshape the way many Americans think about and engage with hunting Quartuch et al. (2017), a phenomenon that has already been observed in other countries (Hansen et al., 2012; Rodriguez et al., 2016).

A key question therefore arises: are NTPHs recruited, influenced, and sustained differently than traditional hunters? Research suggests that while some NTPHs may be primarily motivated for conservation or civic oriented reasons (Decker et al., 2015), some motivations and perceived constraints align between traditional hunters and NTPHs (Peterson et al., 2009; Quartuch et al., 2017). For example, both traditional hunters and NTPHs acknowledge obtaining local, free-range meat and a sense of belonging or connectedness to the outdoors as major motivators for hunting (Quartuch et al., 2017). Additionally, perceived lack of skill, perceived lack of access, and perceptions about regulations were noted as top barriers to future hunting participation for both groups (Quartuch et al., 2017). The primary difference then, lies within the social support for NTPHs. In a study by Quartuch et al. (2017), 56% of adult onset hunters were initially influenced by a close friend, 48% by a spouse or partner, and only just above 30% were influenced by a father or close family member. The available research therefore indicates that while both NTPHs and traditional hunters acknowledge similar motivations, social support and relationships may be key to recruiting and retaining NTPHs. This may be particularly true of one possible group that is often overlooked yet includes many different types of NTPH hunters: college students.

College Students as Potential Hunters

College students are an attractive focus population for R3 programs (Larson et al., 2017; Stayton et al., 2017), yet the subset of students who are potential NTPHs has not yet received much attention. Nearly 42% of young adults ages 18-24 (about 23 million people) currently attend college, and that number has increased steadily since 1980 (NCES, 2016, 2019). Of those 23 million students, 57% identify as female, 59% identify as non-white, and about 50% are from non-rural hometowns (NCES, 2016, 2019). Land-grant universities, which often feature wildlife and natural resource-oriented majors and courses, collectively enroll about 2 million diverse students across the United States; many of these students constitute potential hunters or hunting

advocates (NCES, 2016). For years, however, wildlife agencies and organizations have viewed low hunting participation rates within this demographic group as a reason for diverting limited R3 resources elsewhere – often assuming that young adults lack the time, money, capacity, or desire to hunt on a regular basis (Duda, personal communication). Research also highlights major misconceptions among college students about the motives of hunters and the value of hunting (Peterson et al., 2009). However, low rates of hunting participation among young adults also represent an opportunity for either recruiting new hunters or retaining/reactivating individuals whose hunting participation may be waning in the college years. As a result, R3 programs targeting college student populations are increasing in popularity (Larson et al., 2017; Ringelman et al., 2020; Stayton et al., 2017). As an added bonus, college students may be naturally inclined to try new activities like hunting, and the college atmosphere may help to nurture that type of exploratory behavior.

Emerging Adulthood and the Unique University Setting

The construct of emerging adulthood demonstrates one reason why R3 efforts focused on college students might be successful. In order to capitalize on the unique aspects of emerging adulthood, one must understand the historical context in which the behaviors associated with contemporary emerging adulthood have evolved. The pre-1970's pattern of behavior among young adults reflected an urgency to establish familial stability and settle into enduring adult conventions (Arnett, 2007). During this period, individuals married, entered the work force, and established autonomy by around age 20 (Arnett, 2007). This did not leave much time specifically for active self-identification and exploration. Developmental psychology suggests that life stages at that time were categorized by adolescence (from puberty to late teens) and young adulthood (late teens to 30's), with a brief transition between the two discrete stages (Hartmann & Swartz, 2006). However, by the 1980's and 90's, a societal shift had occurred which changed the normative behaviors of young adults. The 18-28 year old age range became a time of experimentation and instability (Arnett, 2000a; Hartmann & Swartz, 2006; Johnson & Goldman, 2011). The mean age of marriage increased from 21 to 25 between 1970 and 1996, and the mean age of first childbirth paralleled that trend (Arnett, 2000a). Additionally, the pursuit of postsecondary education, frequent job turnover, and changes in sexual norms resulted

in and allowed for a longer transitional period between traditional adolescence and young adulthood (Arnett, 2007).

In 2000, Arnett (2000a) proposed the term "emerging adulthood" to suggest that the time between adolescence and young adulthood is sufficiently distinct to be a unique life stage rather than just a transition and is a useful way to conceptualize the time between the late teens and mid-20's (p. 68). Emerging adulthood is distinguished by relative independence from traditional social roles and expectations, with an emphasis on role exploration and self-identification (Arnett, 2000a). This life stage is characterized by identity development, activity experimentation, self-assessment, and boundary testing. Emerging adults have freedom from the constraints and supervision often faced by adolescents, but are not fully burdened by the responsibilities associated with adulthood (Johnson & Goldman, 2011). Due to this autonomy, individuals have ample opportunities to explore, create, test, and re-identify themselves without the external burdens from parents and other constraints.

Traditional undergraduate college students, who are 18-24 years old, fit perfectly into the emerging adulthood category (Arnett, 2000a). American colleges and universities present a psychosocial moratorium: a period in which individuals can shed constraints and explore new values and behaviors without making enduring commitments that are standard in "the real world" outside of college (Johnson & Goldman, 2011). This is a relatively brief time during which psychosocial constraints are held in abeyance during a formative stage of development. Emerging adults are promising targets for R3 efforts because college provides dynamic opportunities to alter behavior while also fostering a social context where outdoor recreation (including hunting) adoption, especially in the exploration and trial phases, can occur (Larson et al., 2017; Stayton et al., 2017). These opportunities linked to personal development are facilitated by the unique social setting that college provides.

Schwartz and Pantin (2006) identified colleges and universities the most common setting for the psychosocial moratorium experience for emerging adults described above. The university setting permits individuals to take risks and explore alternative pathways without long-lasting consequences, commitment, or unintended effects (Ravert, 2009). This encourages self-expression, self-exploration, and self-assessments, while also gradually increasing emotional and intellectual demands, the combination of which helps set the boundaries of personal identity. The forgiving college environment is the ideal safe place for the "in between status" of emerging

adults; it is nurturing, protective, and permissive, fostering additional cognitive and spiritual development (Johnson & Goldman, 2011). Risk taking behaviors during this period are encouraged by the perception that such opportunities will be limited in adulthood (Arnett, 2000b; Ravert & Gomez-Scott, 2015). Emerging adults are acutely aware that they are only young once and an opportunity squandered during the college years may never be revisited (Ravert, 2009). The university environment allows students to operate outside their comfort zone which is characterized by behaviors such as drug, alcohol, and sexual exploration, questioning long held beliefs, and engaging with people different than themselves (Ravert, 2009). For many Americans, the college experience represents the prime period of leisure activity experimentation – a time when new recreation activities are adopted (Luyckx et al., 2006).

The juxtaposition of the post adolescent brain, which is primed for self-exploration, with the unique social setting of universities, creates a unique opportunity for development of new attitudes, beliefs, and values regarding leisure and recreation preferences. This means that students who were not directly exposed to hunting culture as children or teens might be open to trying it in college. The convergence of R3 goals with emerging adult psychosocial development and the culture of the university setting create the perfect storm for leveraging non-traditional pathways into hunting and addressing the vexing decline in the hunter population. This body of research, taken in combination, suggests that college students might be an ideal target population for R3 efforts, and that strategic implementation of approaches that appeal to the motivations of diverse groups of college students could help to increase the effectiveness of R3 programs.

Market Segmentation as a Tool to Focus Agency Resources

College students may be a promising target for R3 efforts, but they are certainly not a homogenous population with respect to either demographic attributes or hunting-related beliefs and behaviors. Therefore, market segmentation may be a useful tool to separate varied groups of college students to better understand which groups are most worth targeting for R3 efforts. Although R3 efforts will not resonate with every student, market segmentation can help to determine which groups of students have the highest potential of being recruited and retained, as well as help managers create more effective marketing materials.

Market segmentation was first utilized in the early 20th century in a business context, but has since become a popular tool in the field of tourism and leisure research (Dolnicar, 2002) and is even gaining traction within the realm of wildlife conservation (Metcalf et al., 2019).

The reason to use market segmentation is simple: a competitive advantage is gained if managers can identify what groups of targeted people hold the most potential to respond and what marketing resources and products best align with each distinct subgroup (or segment). If marketing actions can be adapted to attract members of a specific target group rather than a general public audience, they become more effective (Dolnicar, 2002, 2007). Market segmentation has been used in the context of tourism, outdoor recreation, and hunting recruitment in a number of previous research studies (OIA, 2015; Floyd & Gramann, 1994; Romsa, 1973; Romsa & Girling, 1976; Tathman & Dornoff, 1971; Weaver et al., 2009). For example, Floyd and Gramann (1994) discuss market segmentation with experience-based setting management. They claim this research is particularly important for private landowners who provide outdoor recreation activities because experience-based setting management improves landowner's (and potentially wildlife agency's) ability to reach specific subgroups of hunters based on their preferences. More recent research has attempted to segment hunter populations based on license purchasing behavior (Hinrichs et al., 2020). In the context of our study, managers should recognize that potential hunters from non-traditional backgrounds may respond to marketing products differently than traditional hunters due to differing motivations, constraints, and beliefs about hunters and hunting. However, we acknowledge a critical gap in the hunting literature utilizing a market segmentation approach. Although previous studies have used market segmentation to group hunters into segmented groups (Gigliotti, 2000; Miller & Vaske, 2003; Schroeder et al., 2006), no study (to our knowledge) has compared groups of hunters and non-hunters with *the intention of recruiting new hunters*. Our study aims to compare groups of diverse college students that will never hunt, those that might, those that are active hunters, and those who have hunted but do not intend to in the future. If significant numbers of diverse college students are interested in adopting hunting as a new recreation activity, it is imperative that managers and agencies use their limited resources to create and implement marketing strategies that are most effective at attracting and recruiting key population segments with a proclivity toward hunting. It is also important for managers to develop a deeper understanding of students who do not hunt (Blascovich & Metcalf, 2019), for their support (or

opposition) to hunting and other activities and policies could impact conservation for generations.

Research Objectives and Thesis Format

This thesis is written in a manuscript format. The first (and present) chapter introduces the research context and presents a review of the relevant literature related to the decline of hunting, non-traditional pathways into hunting, and the promise of R3 efforts focused on college students. Chapters two and three are written as independent manuscripts that will be submitted for publication. Considering this larger research context, our research objectives in those chapters are as follows:

CHAPTER 2 - COLLEGE STUDENTS' HUNTING-RELATED BELIEFS, ATTITUDES, AND BEHAVIORS REVEAL NEW OPPORTUNITIES FOR HUNTER RECRUITMENT AND RETENTION

1. To what extent do college students hunt and what socio-demographic factors are associated with past hunting participation?
2. How likely are college students to hunt in the future and what socio-demographic factors are associated with future hunting participation?
3. What are key differences in socio-demographic attributes, social support, and hunting-related beliefs, motivations, and barriers among college students in four groups (or possible hunting markets): (1) non-hunters (students who have never hunted and say they will never hunt); (2) potential hunters (students who have never hunted but would consider hunting); (3) active hunters (students who have hunted and will continue hunting); and (4) lapsed hunters (students who have hunted and will not continue hunting)?

CHAPTER 3 - CAN R3 PROGRAMS CREATE NEW HUNTERS? EVALUATING IMPACTS OF HUNTING WORKSHOPS ON COLLEGE STUDENTS ACROSS THE UNITED STATES

1. Who registers for a beginners' hunting workshop and why?
2. How does the R3 workshop experience impact participants' confidence, attitudes and beliefs, perceived barriers, and intended hunting behaviors?

3. What did students like the most and the least during the workshop experience?

Throughout the discussion section of each chapter, we highlight broader implications for research and practice and describe the potential and broader benefits of R3 efforts aimed at college students.

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CHAPTER 2: A CHANGING FACE FOR HUNTING IN AMERICA? EXPLORING THE HUNTING-RELATED BELIEFS AND BEHAVIORS OF DIVERSE COLLEGE STUDENTS ACROSS THE UNITED STATES

Abstract

Declining hunting participation negatively impacts state and federal agencies' ability to achieve wildlife management objectives and generate revenue for conservation. The decline, in large part, is driven by decreasing numbers of young adult hunters. As a result, recruitment, retention, and reactivation (R3) efforts have become a high priority in the North American wildlife management community. Our study focused on one particularly promising audience – college students – to address these declines and build support for hunting and wildlife conservation. We surveyed 17,203 college students at 22 universities across 22 states to assess their past and intended hunting behavior as well as demographic, cognitive, and affective correlates. Demographically weighted estimates revealed that, across all states, 29% of students had previous hunting experience. Students who had previously hunted were more likely to be white, male, from rural areas and/or hunting families, and studying a natural resource related field. However, students who would consider hunting in the future (28%) were much more diverse, both in their demographic characteristics and their views about hunting and hunters. Based on responses, we ultimately grouped students in one of four future hunting categories: non-hunters (50%), potential hunters (22%), active hunters (26%), and lapsed hunters (3%). Comparisons of these groups revealed many significant differences based on demographic composition, beliefs, attitudes, and behaviors, providing unique insights for R3 marketing and programming. Findings highlight the potentially powerful impact diverse college students can have on R3 efforts and the future of hunting across the United States.

Introduction

Hunting has long been a controversial and politically contested topic (*Conservation Science and Practice Series*, 2009; Lin, 2020). Nevertheless, hunting is valuable because it: protects part of American's cultural heritage (Mahoney & Jackson III, 2013; Organ et al., 2012; Peterson et al., 2010; Winkler & Warnke, 2013), provides economic resources to rural communities (Frew et al., 2018), helps wildlife agencies achieve ecological management goals (Loveridge et al., 2006; Organ et al., 2012), and supports the conservation funding system in

North America (Serfass et al., 2018). Despite these benefits, the number of licensed and active hunters has steadily declined since the 1980s, raising concerns in the North American wildlife management community and generating an array of ecological, economic, and social consequences (Larson et al., 2014; Mockrin et al., 2012; USFWS et al., 2016). Between 1975 and 1996, there was a 13% decrease in people who said they went hunting among the 16-24 year old age cohort (Enck et al., 2000). In 2016, only 4% of 16-24 years-olds in the United States participated in hunting (USFWS et al., 2016). The overall number of hunters decreased 16% between 2011 and 2016, with 9% of the national population reporting hunting participation (USFWS et al., 2016). A national survey concluded that the number of general hunting participants fell from 14.1 million (1991) to 11.5 million by 2016 (Responsive Management, 2017; USFWS et al., 2016). Many researchers attribute this decline to shifts in societal structures and priorities that have resulted in diminishing social support for hunting (Peterson et al., 2010). These shifts include increased competing demands for money and time, lack of mentors, urbanization, land-use and land ownership changes that impact hunting access, and negative media coverage (Larson et al., 2014; Winkler & Warnke, 2013). Overall lack of connectivity to nature and the outdoors is thought to be another factor contributing to decreasing the number of new hunters (Kellert et al., 2017). Regardless of reasons, this documented decline in the number of hunters threatens the nation's natural resource management agencies' ability to achieve their missions and goals.

To combat the steady decline of hunting participation, wildlife management agencies and conservation organizations are increasingly emphasizing hunter recruitment, retention, and reactivation (R3) programs (Responsive Management, 2017). However, despite this growing emphasis on R3, its efficacy remains questionable. Seng et al. (2007) and Larson et al. (2013) describe reasons why R3 programs fail. Misunderstanding of the potential hunting market and marketing tactics has limited the success of R3 programs (Larson et al., 2013; Seng et al., 2007). Many R3 workshops recruit people with previous experience hunting or previous engagement in shooting sports, thereby limiting ability to recruit new hunters from outside existing hunting circles (Responsive Management, 2017). While traditional hunters – typically White males from rural backgrounds (Decker et al., 1984; Larson et al., 2014)- make up the majority of the hunting community, it is important to acknowledge that hunters initiated in the traditional manner are no longer sufficient to offset the declining trend of overall hunters (Winkler & Warnke, 2013).

Therefore, it is imperative for wildlife managers to move beyond the traditional white, masculine conceptualization of hunting and recognize the potential impact of non-traditional path hunters (NTPHs), ultimately identifying R3 strategies that work for a more diverse range of audiences (Lee et al., 2014).

The Rise of Non-Traditional Path Hunters (NTPHs)

Quartuch et al. (2017) define NTPHs as hunters who are initiated into the hunting community as adults, have limited previous hunting experience, have little or no familial or social support for hunting, and/or are a part of a typically underrepresented group with-in the hunting community (e.g. women and racial/ethnic minorities). Largely, NTPHs are women, racial/ethnic minorities, urbanites, and people with non-agricultural backgrounds (Quartuch et al., 2017). "Locavores" represent another potential non-traditional pathway into hunting (Stedman et al., 2017). The local food movement emphasizes consuming food that is ethically grown, harvested, or produced locally and has become increasingly popular, even among urbanites (Stedman et al., 2017). Most game meat falls into that category. Some evidence suggests NTPHs may be motivated to hunt for conservation or civic-oriented reasons, like improving ecosystem health or controlling species damaging to humans. Yet, alignment of hunting motivations and perceived constraints between traditional hunters and NTPHs is also common (Decker et al., 2015; Peterson et al., 2009). Social support and relationships are key to recruiting and retaining any hunters, but may be particularly important for NTPHs (Larson et al., 2014). However, identifying and fostering social support for hunting among diverse and geographically dispersed segments of potential NTPHs has proven to be a monumental challenge. College students, however, provide a concentrated group of NTPHs in a life stage conductive to experimenting with new activities.

College Students as Future Hunters?

College students are an attractive target population for R3 programs for many reasons (Larson et al., 2017). Nearly 41% of young adults ages 18-24 (about 23 million people) currently attend college, and that number has increased steadily since 1980 (NCES, 2016). Of those 23 million students, 57% identify as female, 59% identify as non-white, and about 50% are from non-rural hometowns (NCES, 2016). Land-grant universities, which often feature wildlife

and natural resource-oriented majors and courses, collectively enroll about 2 million diverse students across the United States. Many of these students, in particular, may constitute potential hunters or hunting.

One reason R3 efforts aimed at college students may be particularly fruitful is that emerging adults are primed to try new activities that they may adopt long-term. During the 1980's and 1990's, a societal shift occurred that changed the normative behaviors of young adults. Even more than in previous eras, the 18-28-year-old age range became a time of experimentation and instability (Arnett, 2000a; Hartmann & Swartz, 2006; Johnson & Goldman, 2011). For example, the mean age of marriage increased from 21 to 25 between 1970 and 1996, and the mean age of first childbirth paralleled that trend (Arnett, 2000). Additionally, the pursuit of postsecondary education, frequent job turnover, and changes in sexual norms allowed for (and resulted in) a longer transitional period between traditional adolescence and young adulthood (Arnett, 2007). Emerging adulthood is distinguished by relative independence from traditional social roles and expectations, with an emphasis on role exploration and self-identification (Arnett, 2000). This life stage is characterized by identity development, activity experimentation, self-assessment, and boundary testing. Emerging adults have freedom from the constraints and supervision often faced by adolescents, but are not fully burdened by the responsibilities associated with adulthood (Johnson & Goldman, 2011). Among other things, they feel free to try new recreation activities.

Traditional undergraduate college students, 18-24 year olds, fit into the emerging adulthood category (Arnett, 2000). American colleges and universities present a psychosocial moratorium: a period in which individuals can explore new values and behaviors without making enduring commitments that are standard in "the real world" outside of college (Johnson & Goldman, 2011). These opportunities linked to personal development are facilitated by the unique social setting that college provides. The university setting permits individuals to take risks and explore alternative pathways without long-lasting consequences, commitment, or unintended effects (Ravert, 2009). This encourages self-expression, self-exploration, and self-assessments, while also gradually increasing emotional and intellectual demands, the combination of which helps set the boundaries of personal identity.

The integration of the post adolescent brain, which is primed for self-exploration, with the unique social setting of universities, creates a good opportunity for development of new

attitudes, beliefs, and behaviors regarding leisure and recreation. For many Americans, the college experience represents the prime period of leisure activity experimentation (Luyckx et al., 2006). This means that students who were not directly exposed to hunting culture as children or teens might be open to trying it in college. It also highlights opportunities for retaining or reactivating individuals whose hunting participation may be waning in the college years. The convergence of R3 goals with emerging adult psychosocial development and the culture of the university setting create the perfect storm for leveraging non-traditional pathways into hunting and achieving R3 goals. In short, college students may be naturally inclined to try new activities like hunting, and the college atmosphere may help to nurture that type of exploratory behavior and enhance R3 success.

Searching for Students Who Hunt (or Might Hunt)

Considering the diversity present across college campuses, R3 efforts will not resonate with every student. Market segmentation, an approach widely used in other fields (Dolnicar, 2002), could help R3 managers determine which groups of students have the highest potential of being recruited and retained and illuminate strategies for creating more effective marketing materials geared toward those specific audiences. Previous studies have used market segmentation to place hunters into particular subgroups, such as low-challenge harvesters and high-challenge harvesters (Floyd & Gramann, 1994), deer hunters divided into seven groups by main motivating factor (Gigliotti, 2000), waterfowl hunters grouped into five categories by experience preferences (Schroeder et al., 2006), and deer hunters grouped by age and experience (Miller, 2003). However, no study (to our knowledge) has specifically compared groups of hunters and non-hunters to identify strategies for recruiting new hunters.

Focusing on college students across the United States, our study aimed to fill this gap in the literature and explore the connection between college students and hunting. We used a number of leisure theories to guide our investigation. For example, the Theory of Planned Behavior suggests that value orientations (about wildlife or conservation in general), beliefs (about hunters and hunting), and social norms about hunting might influence behavior (Hrubes et al., 2003). Motivational theory reveals potential reasons why individuals might engage in hunting (Quartuch et al., 2017), and Leisure Constraints Theory highlights the various factors that might impede hunting participation (Metcalf et al., 2015). The Outdoor Recreation

Adoption Model underscores the critical importance of social support on outdoor recreation participation (Byrne & Dunfee, 2018). We therefore considered all of these key behavioral antecedents, as well as demographic predictors, when attempting to understand college students hunting-related behaviors, beliefs, and attitudes. We asked three research questions: (1) To what extent do college students hunt and what socio-demographic factors are associated with past hunting participation; (2) How likely are college students to hunt in the future and what socio-demographic factors are associated with future hunting participation, and (3) What are key differences in socio-demographic attributes, social support, and hunting-related beliefs, motivations, and constraints among college students in four groups (or possible hunting markets): (1) non-hunters (students who have never hunted and say they will never hunt); (2) potential hunters (students who have never hunted but would consider hunting); (3) active hunters (students who have hunted and will continue hunting); and (4) lapsed hunters (students who have hunted and will not continue hunting). Exploring similarities and differences between non-hunters, potential hunters, active hunters, and lapsed hunters might enable managers to create and utilize more effective R3 methods to recruit and retain college students as hunters and hunting advocates.

Methods

Sample & Data Collection

To understand the hunting- related beliefs, attitudes, and behaviors of college students and evaluate their potential support for hunting, we partnered with university researchers and state wildlife agencies around the United States to conduct a web-based survey of undergraduates at 22 large public universities in 22 different states across a two-year period from 2018-2020 (Appendix 2.1). Sample frames range in size from 2000 to 16,000 students per institution. At most universities, we sent a web survey link via Qualtrics to a random sample of undergraduate students. In cases where a university-wide random sample was not possible, we worked with specific colleges at partner universities to obtain a diverse sample of participants across a variety of majors. We used an adapted version of the Dillman (2009) approach to administer the surveys. This method included two email contacts at approximately weekly intervals, followed by one shorter survey (with a subset of items) of remaining non-respondents to check for potential response bias.

Survey Instrument

The survey instrument was developed by project leaders at NC State University with input from collaborators across all participating institutions, as well as R3 staff from each of our state agency partners. The instrument was designed to assess college students' connections to hunting and hunters by addressing many different themes. For certain variables, we used Principal Component Factor Analysis with an orthogonal rotation to reduce multiple items into larger thematic constructs (see Appendix 2.3). The following variables and themes are those relevant to the analysis in this paper: (Appendix 2.2; Table 2.1):

Past Hunting Experience. This theme focused on participants' previous hunting experience, including social support for hunting. For example, we asked participants to indicate who in their lives hunts (e.g., parent, sibling, other relative). We also asked participants "have you ever hunted before?", with response options of (1) yes, (2) I have accompanied someone hunting but did not personally hunt, or (3) no. If students answered "yes" or that they have accompanied someone, we asked additional questions about how old they were for their first hunting experience, how many times they've been hunting in the past year, and what type(s) of game they have hunted. This analysis focused on the respondents who answered "no".

Future Hunting Participation. To assess future hunting prospects, we asked participants "how likely are you to hunt in the future?", with response options of (1) "I will definitely not hunt", (2) "I will probably not hunt", (3) "not sure", (4) "will probably hunt", or(5), "I will definitely hunt." If a participant answered (3), (4), or (5), or (5) "will definitely hunt", we asked a question regarding how often they predict they would hunt: the response options were (1) "might try it once", (2) "Rarely (once every few years)", or (3) "Regularly (at least once per year)".

Beliefs and Approval about Hunters and Hunting. To assess students' beliefs about hunters and hunting, we asked about the extent to which participants approved of "legal, regulated hunting" on a scale from (1) strongly disapprove to (5) strongly approve, following the approach used in previous studies (Responsive Management, 2017). This theme addressed approval of hunting for different purposes. For example, participants are asked whether they disapprove (1), are neutral (2), or approve (3) of hunting for reasons such as engaging in sport or

recreation, being close to nature, or obtaining local, free-range meat. Participants answered questions about these potential reasons to approve of hunting. We asked if they approve of hunting for this purpose. Response options were: (1) "no", (2) "maybe", (3) "yes". Potential reasons for hunting were adapted from previous studies (Decker et al., 2015; Responsive Management, 2017).

For approval items, the factor analysis identified four categories (see Appendix 2.3): egoistic motivations focused on personal reasons for hunting such as spending time with friends and family and connecting with nature (5 items, Cronbach's alpha = 0.938), altruistic reasons focused on community benefits of hunting such as controlling wildlife that are damaging ecosystems or causing problems for people (2 items, alpha = 0.823), hunting to obtain meat (1 items), and hunting to obtain a trophy (1 item). Composite scores were created for each of the four factors, based on the mean of the items with had their primary loadings on each factor. Higher scores indicated greater approval.

We asked participants to rank their level of agreement with nine beliefs statements on a scale from (1) strongly disagree to (5) strongly agree. These items measure a variety of beliefs about hunters and hunting such as hunting is a safe activity, hunters behave responsibly and follow hunting laws, and hunting is cruel and inhumane to the animals.

Factor analysis identified one overarching category for beliefs about hunters and hunting (see Appendix 2.3), and it included items focused on perceptions of hunters and hunting culture such as hunting is a safe activity and hunters financially contribute to wildlife conversation (9 items, Cronbach's alpha = 0.936). A composite score was created for the factor, based on the mean of the items. Higher scores indicated greater positive beliefs about hunters and hunting.

Motivations to Hunt. To assess motivations for hunting, we synthesized items from previous studies to identify a range of possible hunting motivations (Decker et al., 2015; Responsive Management, 2017). Matching the approval items, possible reasons included to engage in sport and/or recreation, to obtain local, free-range meat, to spend time with friends or family, and to control wildlife populations that are damaging to ecosystems. Participants answered questions about these potential reasons for hunting. We asked if they would consider hunting for this purpose. Response options were: (1) "no", (2) "maybe", (3) "yes".

Factor analysis of motivation items revealed the same factor structure seen in the hunting approval items (see Appendix 2.3), yielding four categories: egoistic motivations focused on personal reasons for hunting such as spending time with friends and family and connecting with nature (5 items, Cronbach's alpha = 0.939), altruistic reasons focused on community benefits of hunting such as controlling wildlife that are damaging ecosystems or causing problems for people (2 items, alpha = 0.946), hunting to obtain meat (1 items), and hunting to obtain a trophy (1 item). Composite scores were created for each of the four factors, based on the mean of the items with had their primary loadings on each factor. Higher scores indicated greater motivation.

Barriers to Hunting. To assess barriers to hunting, we synthesized items from previous studies to identify a range of hunting constraints (Responsive Management, 2017; Metcalf et al., 2015). We listed 18 potential barriers designed to cover intra-personal (individual), inter-personal, and structural (context) constraints (Crawford & Godbey, 1987; Stodolska et al., 2019). Possible intra-personal barriers were items such as preferring other activities, and discomfort around hunters and hunting culture. Possible interpersonal barriers were items such as not having anyone to go with and concern about others judging the respondent. Possible structural barriers were items such as time, cost, and access. All items were rated on a scale from (1) "not at all" a barrier to (4) "very much" a barrier.

Factor analysis identified five categories of constraints (see Appendix 2.3): individual constraints focused on morality and comfort such as a reluctance to personally kill an animal and discomfort around firearms and hunting equipment (4 items, Cronbach's alpha = 0.908); skills and knowledge constraints such as lacking the knowledge/skills to prepare game meat to eat and unsure of how/where to store equipment and firearms (6 items, alpha = 0.935); logistical constraints such as lacking transportation to hunting areas and unsure of where to hunt (6 items Cronbach's alpha = 0.805); judgement and experience constraints such as feeling discouraged by past negative experiences in the outdoors and feeling uncomfortable due to a lack of racial and ethnic diversity associated with hunting (3 items, Cronbach's alpha = 0.735); and alternative activities constraints such as I would rather do other activities (1 item). Composite scores were created for each of the five factors, based on the mean of the items with had their primary loadings on each factor. Higher scores indicated greater perception of constraint (i.e., more significant barriers).

Participant Demographics and Value Orientations. We collected demographic information including gender identity, ethnicity, college major, and population size of the area where a participant grew up (e.g., urban vs. rural). We measured participants' other outdoor recreation activities with a checklist including adventure sports, bird watching, camping, canoeing/kayaking, hiking, jogging/running, off-road vehicles, swimming, wildlife viewing/photography. We used items from existing scales to characterize participants' wildlife value orientations (Teel & Manfredo, 2010) and conservation caring (Skibins et al., 2013).

Factor analysis of wildlife value orientation data identified two categories (see Appendix 2.3) that align with previous research (Teel & Manfredo, 2010): mutualistic wildlife value orientations (i.e., 2 items, viewing all living things as part of one big family and feeling a strong bond with animals, Cronbach's alpha = 0.647); dominionistic wildlife value orientations with items: managing fish and wildlife populations so that humans benefit and prioritizing humans over fish and wildlife protection (2 items, Cronbach's alpha = 0.592). Composite scores were created for both of the factors, based on the mean of the items with had their primary loadings on each factor. Higher scores indicated greater alignment with that value orientation.

Factor analysis of conservation caring items (see Appendix 2.3) identified one category for all for conservation caring items (Cronbach's alpha = 0.799). Matching previous research (Skibins et al., 2013), these items included statements about the importance of wildlife conservation and willingness to voluntarily spend money on conservation. A composite score was created for the factor, based on the mean of the items. Higher scores indicated a greater degree of conservation caring.

The shorter survey that we used to check for response bias addressed most of these same themes using identical items, but only a single item to measure each theme (8 items total, see Appendix 2.4 for details).

Data Analysis

Prior to interpreting frequencies, we conducted post-stratification weighting with normalized weights based on enrollment and student demographic data provided by the National Center of Education Statistics (2019), multiplying weights independently calculated for each variable at each institution to calculate the total weight per respondent based on their school, their gender (men vs. women), and their race/ethnicity (white vs. non-white) (Vaske, 2008).

These weights enabled us to account for potential sampling bias and develop more accurate predictions from our data to represent all of the 532,735 students enrolled at the universities that we sampled around the country. Sample sizes for each analysis described below varied due to missing data on <10% of surveys, and weights were not applied to multivariate analyses unless otherwise noted.

To address research question 1, we developed a blocked logistic regression model to examine the relative influence of various factors on past hunting participation. The dependent variable was membership in one of two clusters: "no previous hunting participation" (including respondents who had accompanied someone on a hunt) and "previous hunting participation". Independent variables were added sequentially to the model in blocks, beginning with demographic variables, followed by wildlife value orientations and conservation attitudes, attitudes about hunters and hunting, and social support for hunting. The contributions of each block to overall predictive power of the model was assessed using change in AIC block chi-square, model classification accuracy, and Nagelkerke R^2. After comparing the effects of each variable block, we assessed the significance of specific predictor variables in the full model using parameter estimates and odds ratios.

To address question 2, we developed a multinomial logistic regression model to examine the relative influence of various factors on the likelihood of future hunting. The dependent variable was membership in one of three groups: "No, I will not hunt in the future" (response of 1 or 2 in future hunting question), "I might hunt in the future" (response of 3 or 4), and "Yes, I will definitely hunt in the future" (response of 5). Independent variables included all variables tested in research question one with the substitution of hunting motivation variables for hunting approval variables. We assessed the effectiveness of the total model using model classification accuracy and Nagelkerke R^2. We then assessed the significance of specific predictor variables in the full model using parameter estimates and odds ratios.

To address question 3, we developed four clusters of respondents based on a combination of past hunting experience and likelihood of future hunting: non-hunters (I have not hunted in the past and I will not hunt in the future), potential hunters (I have not hunted in the past and I might hunt in the future), active hunters (I have hunted in the past and I will continue hunting in the future), and lapsed hunters (I have hunted in the past but I will not continue hunting in the future). We used Chi-square tests (for categorical variables) and ANOVA tests (for continuous

variables) to compare each groups' socio-demographic attributes and beliefs about wildlife and hunting. When the assumption of unequal variances was violated in ANOVA comparisons, we used Welch's ANOVA with Games-Howell post hoc tests to determine significant differences between future hunting subgroups. We assessed effect size using Cramer's V (for Chi-square tests) and eta-squared (for ANOVA).

Table 2.1. Variables used in data analysis for all three objectives, with means (M) and standard deviations (SD) for aggregate scales based on entire sample of university students (n = 17,203).

Variable	Definition	M	SD	No. items on scale	Cronbach's alpha
Race	Dummy Variable: 1 if white, 0 if non-white or mixed	0.75	0.43		
Gender	Dummy Variable: 1 if male identifying, 0 if female identifying or gender non-conforming	0.43	0.49		
Major	Dummy Variable: 1 if majoring in natural resource related field, 0 if non-Ag/NR field	0.20	0.40		
Hometown	Dummy Variable: 0 if urban (> 50,000), 1 if rural (< 50,000)	0.51	0.50		
Overall Approval	(Scale: 1 = Strongly disapprove to 5 = Strongly approve)	3.72	1.23		
Approval: Altruistic	(Scale: 1 = Disapprove to 3 = Approve)	2.62	0.59	2	0.823
Approval: Egoistic	(Scale: 1 = Disapprove to 3 = Approve)	2.21	0.73	5	0.938
Approval: Meat	(Scale: 1 = Disapprove to 3 = Approve)	2.55	0.70	1	
Approval: Trophy	(Scale: 1 = Disapprove to 3 = Approve)	1.58	0.78	1	
Motivations: Altruistic	(Scale: 1 = No to 3 = Yes)	2.02	0.86	2	0.940
Motivations: Meat	(Scale: 1 = No to 3 = Yes)	2.01	0.90	1	
Motivations: Egoistic	(Scale: 1 = No to 3 = Yes)	1.84	0.80	5	0.930
Motivations: Trophy	(Scale: 1 = No to 3 = Yes)	1.39	0.71	1	
Barrier: Other Activities	(Scale: 1 = Not at all to 4 = Very much)	3.11	1.09	1	
Barriers: Morals and Comfort	(Scale: 1 = Not at all to 4 = Very much)	2.22	1.09	4	0.908
Barrier: Skills and Knowledge	(Scale: 1 = Not at all to 4 = Very much)	2.22	1.08	6	0.935
Barriers: Logistics	(Scale: 1 = Not at all to 4 = Very much)	1.93	0.78	6	0.805
Barriers: Judgement	(Scale: 1 = Not at all to 4 = Very much)	1.29	0.56	3	0.735
Beliefs	(Scale: 1 = Strongly disagree to 5 = strongly agree)	3.42	0.91	9	0.938
WVO: Mutualistic	(Scale: 1 = Strongly disagree to 5 = strongly agree)	3.68	0.88	2	0.651
WVO: Dominionistic	(Scale: 1 = Strongly disagree to 5 = strongly agree)	2.96	0.95	2	0.596
Conservation Caring Score	(Scale: 1 = Strongly disagree to 5 = strongly agree)	4.07	0.67	4	0.799
Outdoor Recreation Score	Dummy Variable: Sum of 6 items, higher score means more participation	2.85	1.74		
Hunting Activities Score	(Scale: 1 = Never to 5 = Very often)	1.98	0.97		
Social Support	Dummy Variable: 0 if no social support, 1 if extended family or friends hunt, 2 if immediate family hunts	1.17	0.74		

Results

After filtering out responses that were less than 33% complete and removing respondents who were not undergraduates within the 18-34 year age range, our response rate across all institutions was 14.23% (ranging from 6.11% to 31.53%), yielding a total effective sample size of 17,203 (Appendix 2.5). After weighting data, the sample included 65% respondents identifying as white, 47% identifying as male, 47% from rural hometowns or cities smaller than 50,000 citizens, and 17% majoring in subjects related to Agriculture and Natural Resources. These ratios roughly align with the national averages of college students at public universities across the United States (NCES, 2016).

We also collected a total of 6,585 non-response surveys. Our non-response check with chi-square tests revealed relatively minor differences between the full survey respondents and students who completed the follow-up survey (i.e., non-respondents). Based on weighted averages across all schools, non-respondents were less likely to have hunted in the past (23% vs. 28%), less likely to report they would definitely hunt in the future (15% vs. 20%), more likely to report they might hunt in the future (32% vs. 28%), and more likely to be male (46% vs. 41%). However, the effect size for all of these differences was quite small (Cramer's $V < 0.05$). The biggest difference was observed for college major, with non-respondents more likely to report non-natural resource majors (12% vs. 20%, Cramer's $V = 0.091$). All other variables, including conservation caring and approval of hunting, were nearly identical across both groups. Because these differences were minimal, we elected to proceed without adjusting for potential non-response bias.

Past Hunting Experience (Obj. 1)

Weighted estimates revealed the previous hunting experience reported by students was higher than anticipated, with 29% of the weighted sample of respondents reporting some past solo hunting experience with an additional 11% reporting having accompanied a hunter. However, about one third (33%) of students who had hunted in the past had not been hunting in the last 12 months.

Results of the full blocked logistic regression supported the existence of a strong relationship between the predictors and past hunting participation [Model χ^2 (df =8) = 15.61 p = 0.0484; Nagelkerke Pseudo $R^2 = 0.661$; n = 15,110]. The overall rate of correct classification in

the model was estimated to be 86.71%, easily surpassing the proportional by chance accuracy rate cutoff criterion of 58.82%. Iterative incorporation of blocks in the model showed that, when considering the relative influence of distinct groups of variables, beliefs about hunters/hunting and demographic variables had the most significant effects on respondent's past hunting participation (Table 2.2). The base model, which included only demographic variables, produced a pseudo R^2 of 0.29. Inclusion of attitudes about hunters and hunting led to a 0.22 increase in pseudo R^2, a 0.266 decrease in AIC, and an 8.6% increase in model classification accuracy. Inclusion of social support variables for the full model led to a 0.11 increase in pseudo R^2 (R^2 = 0.661), a 0.13 decrease in AIC, and a 3.4% increase in classification accuracy. Inclusion of wildlife value orientations and the conservation caring score led to a pseudo R^2 increase of 0.05, a 0.043 decrease in AIC, and a 2% increase in model classification accuracy.

Examination of parameter estimates and odds ratios associated with variables in the full model provide a more in-depth look at specific factors associated with past hunting among college students (Table 2.3). Among the variables in the demographic block, all but region were significant. Students who were white (OR = 1.370), male (OR = 4.098), natural resource majors (OR = 1.468), and from rural areas (OR = 1.414) more likely to report previous hunting participation. Among the variables in the wildlife value orientation block, the conservation caring variable (OR = 1.315) was the best predictor of past hunting participation. Among the variables in the approval and beliefs block, approval of hunting for personal reasons (OR = 1.283) and beliefs about hunters and hunting (OR = 3.320) were significant predictors of past hunting participation, whereas approval of hunting for civic or broader reasons, and approval for hunting to obtain local, ethically sourced meat were not significant predictors. Social support for hunting among immediate familial members (OR = 37.839) and extended family and friends (OR = 4.252) were among the most significant predictors of past hunting participation.

Table 2.2. Relative predictive power of distinct variable blocks in hierarchal logistic regression model predicting past hunting participation among college students across 22 U.S. states (n = 15,110).

Logistic regression block	**No. of variables**	**AIC**	**Δ Nagel. R^2**	**Class. Accuracy**	**χ^2**	***df***	**Sig.**
1. Demographics	5	1.007	+0.29	74.80%	107.94	56	< 0.001
2. Wildlife Conservation Values	3	0.964	+0.05	76.80%	9084	8601	< 0.001
3. Attitudes and Beliefs	4	0.741	+0.22	83.36%	18002.64	15019	< 0.001
4. Social Support	1	0.608	+0.11	86.71%	17276.85	15049	<0.001
5. FULL MODEL	13	0.608	0.66	86.71%	17276.85	15049	<0.001

Table 2.3. Parameter estimation from full hierarchical logistic regression model predicting past hunting participation[a] of college students across 22 U.S. states (n = 15,110).

Variables in model	Mean	SD	Beta	SE	OR
Constant	-		-10.877	0.33	
Region (Ref = MW)	0.33				
NE	0.13	0.34	-0.203	0.09	0.82*
SE	0.32	0.47	0.079	0.07	1.08
W	0.22	0.41	0.086	0.07	1.09
Race/ethnic (Ref=Non-white or Mixed Race)	0.25				
Race/ethnic - White	0.75	0.43	0.315	0.08	1.37***
Gender (Ref = Female Identifying or Gender Non-Conforming)	0.57				
Gender – Male Identifying	0.43	0.49	1.410	0.06	4.10***
College Major (Ref = Non Ag/NR)	0.80				
College Major – Ag/NR	0.20	0.40	0.384	0.07	1.47***
Childhood Location (Ref = Urban)	0.51				
Childhood location - Rural	0.49	0.50	0.347	0.05	1.41***
Mutualistic WVO[b]	3.68	0.88	-0.088	0.04	0.92*
Dominionistic WVO[b]	2.96	0.95	-0.046	0.03	0.96
Conservation caring[b]	4.07	0.67	0.274	0.05	1.32***
Approval - Egoism[c]	2.21	0.73	0.249	0.06	1.28***
Approval – Altruism[c]	2.62	0.59	-0.062	0.07	0.94
Approval - Meat[c]	2.55	0.70	-0.042	0.07	0.96
Approval - Trophy[c]	1.58	0.78	0.558	0.07	1.75***
Positive beliefs about hunters/hunting[b]	3.42	0.91	1.200	0.06	3.32***
Social Support (Ref = No Support)[d]	0.20				
Social Support - Extended Family	0.42	0.74	1.447	0.16	4.25***
Social Support - Immediate Family	0.38	0.74	3.633	0.16	37.84***

*, **, *** denote statistically significant Odds Ratio (OR) at α = 0.05, 0.01, and 0.001, respectively.
[a] Unweighted percentage of students responding "Yes, I've hunted in the past": 31%. Model Fit Statistics: n = 15,110 Cragg-Uhler (Nagelkerke) R^2: 0.661, AIC: 0.608, Classification Accuracy: 86.71%.
[b]Scale: 1 = Strongly disagree to 5 = Strongly agree
[c]Scale: 1 = Disapprove to 3 = Approve
[d]Scale: 0 = No social support to 2 = immediate family support

Likelihood of Future Hunting (Obj. 2)

After weighting data, we found that 19% of respondents in our sample (n = 16,534) reported they would definitely hunt in the future, and 27% reporting they might participate in hunting in the future. We developed a multi-nominal logistic regression model to examine the relative influence of various factors on future likelihood of hunting (n = 14,626 χ^2 (df = 16) = 206.310, $p < 0.001$, Nagelkerke Pseudo $R^2 = 0.771$).

We found that, compared to students who said they would not hunt in the future, students in the "definitely hunt" category were 3.04 times as likely to be male, 2.17 times as likely to be majoring in an agricultural or natural resource based field, 1.27 times as likely to be from a rural hometown, and more likely to be from the western region of the United States than students who would not hunt in the future (Table 2.4). Beyond demographic variables, attitudes and beliefs, motivations, and social support were all significant predictors of future hunting likelihood. Students in the "definitely hunt" category were 1.23 times as likely to score high on the conservation caring scale, 10.27 times as likely to report hunting for egoistic reasons, and 9.15 times as likely to report positive beliefs about hunters and hunting compared to students who would not hunt in the future. These students were also 4.24 times as likely to have extended family members who have hunted, and 25.27 times as likely to have immediate family members who are hunters (Table 2.4).

Compared to students who said they would not hunt in the future, students in the "might hunt" category were 1.45 times as likely to be male, 1.41 times as likely to be majoring in an agricultural or natural resource based field, and more likely to be from the western region of the United States (Table 2.4). Beyond demographic variables, attitudes and beliefs, motivations, and social support were all significant predictors of future hunting likelihood. Students in the maybe hunt category were 4.59 times as likely to report hunting for egoistic reasons and 1.83 times as likely to report motivations focused on obtaining local and ethically sourced meat. They were 2.10 times as likely to have positive beliefs about hunters and hunting. These students were only 1.94 times as likely to have extended family members who hunt and 2.89 times as likely to have immediate family members who hunt (Table 2.4). In other words, although the same general patterns were observed for both definite future hunting and possible future hunting groups, differences between the "possibly hunt" group and the "would not hunt" group were far less pronounced.

Table 2.4. Parameter estimation from the multinomial logistic regression model predicting the likelihood of future hunting participation[a] of college students across 22 U.S. states (n = 14,626).

	Might Possibly Hunt in Future (29%)			Will Definitely Hunt in Future (22%)		
Variables in model	**Beta**	**SE**	**OR**	**Beta**	**SE**	**OR**
Constant	-7.051	0.299	-	-22.091	0.552	-
Region (Ref = MW)						
NE	-0.052	0.093	0.95	-0.215	0.141	0.81
SE	-0.036	0.073	0.96	0.165	0.105	1.18
W	0.300	0.079	1.35***	0.594	0.113	1.81***
Race/ethnic (Ref=Non-white or Mixed Race)	0.267			0.115		
Race/ethnic - White	-0.267	0.069	0.77***	-0.115	0.119	0.89
Gender (Ref = Female Identifying or Gender Non-Conforming)	-0.370			-1.112		
Gender – Male Identifying	0.370	0.062	1.45***	1.112	0.091	3.04***
College Major (Ref = Non Ag/NR)	-0.343			-0.776		
College Major – Ag/NR	0.343	0.081	1.41***	0.776	0.108	2.17***
Childhood Location (Ref = Urban)	0.017			-0.237		
Childhood location - Rural	-0.017	0.058	0.98	0.237	0.086	1.27**
Mutualistic WVO[b]	-0.015	0.040	0.99	-0.228	0.057	0.80***
Dominionistic WVO[b]	0.027	0.035	1.03	-0.039	0.051	0.96
Conservation caring[b]	-0.272	0.053	0.76***	0.211	0.077	1.23**
Motivation – Altruism[c]	0.301	0.044	1.35***	0.541	0.073	1.72***
Motivation - Meat[c]	0.606	0.042	1.83***	0.955	0.075	2.60***
Motivation - Egoism[c]	1.523	0.057	4.59***	2.330	0.093	10.27***
Motivation - Trophy[c]	0.521	0.080	1.68***	1.135	0.088	3.11***
Positive beliefs about hunters/hunting[b]	0.742	0.055	2.10***	2.214	0.089	9.15***
Social Support (Ref = No Social Support)[d]						
Social Support – Extended	0.664	0.084	1.94***	1.445	0.244	4.24***
Social Support – Immediate	1.061	0.094	2.89***	3.230	0.244	25.27***

*, **, *** denote statistically significant Odds Ratio (OR) at α = 0.05, 0.01, and 0.001, respectively.

[a] Based on unweighted data, 51% of respondents reported "No I will not hunt in the future" (compared to 29% in the maybe hunt and 22% in the definitely hunt category). The "No Future Hunting" group is the reference category for both models. Model Fit Statistics: Nagel $R^2 = 0.769$. Full model χ^2 (df =16) = 206.310, p < <0.001. LR χ^2 (df =34) = 16,329.333), p < <0.001.

[b]Scale: 1 = Strongly disagree to 5 = Strongly agree

[c]Scale: 1 = No, 2 = Maybe, 3 = Yes

[d]Scale: 0 = No social support to 2 = immediate family support

Grouping College Students Based on Future Hunting Potential (Obj. 3)

After weighting data and integrating student responses to the past and future hunting questions, we determined that 50% of students were non-hunters, 22% are potential hunters, 26% are active hunters, and 3% are lapsed hunters. Membership in each group varied based on demographic, belief, and attitudinal variables (Table 2.5, 2.6).

First, we considered how different populations of students were distributed among the four future hunting groups using weighted frequencies (Table 2.5). Nearly 65% of non-white students fit into the non-hunter group versus only 43% of white students (Table 2.5). Likewise, only 12% of non-white students were active hunters compared to 34% of white students. We observed similar trends by gender, major, and childhood location variables, where a higher proportion of men, students majoring in a natural resource related field, and students from rural hometowns fit into the active hunter category. We found that, although 66% of womxn were non-hunters, 13% were active hunters and 19% were potential hunters. While 56% of students from urban hometowns fit into the non-hunter category, 21% were in the potential hunter category. We found that 39% of students majoring in a natural resource related field were active hunters, in contrast to 23% of students studying other disciplines. About 66% of students majoring in non-natural resource disciplines were non-hunters, but 19% were potential hunters. Differences were also seen between future hunting group and past hunting-related and other outdoor recreation activities. For example, non-hunters participated in fewer outdoor recreation activities than potential hunters and active hunters (Figure 2.1). As expected, active hunters had more experience with hunting-related activities such as viewing media (blogs, social media posts, YouTube videos) than any other group (Figure 2.1). Based on effect size, differences in social support for hunting among these groups was particularly pronounced. Whereas 74% of students without social support for hunting were non-hunters, only 5% of active hunters lacked social support. Nearly 20% of students without any social support were in the potential hunting group. About 60% of students who had immediate family members (parents or siblings) who hunted were active hunters, yet only 20% of students reporting immediate family support were non-hunters.

To facilitate characterization of potential market segment, we also examined demographic differences within each future hunting subgroup using weighted frequencies (Table 2.5; 2.6). Active hunters were primarily white (84%), male (74%), and from rural hometowns

(62%). About 81% of active hunters had immediate family who hunted, and only 7% had no social support for hunting. Potential hunters were far more diverse than current hunters: 35% of potential hunters were non-white or mixed race, 49% were female identifying or gender non-conforming, 77% were non-agriculture majors, 54% were from urban hometowns and 77% did not have immediate family members who hunt. Lapsed hunters were students who were mostly from rural hometowns, white, male identifying, and studying disciplines outside the natural resources. They were similar to active hunters with respect to these characteristics, but those similarities ended with social support. Only 50% of lapsed hunters reported having immediate familial support versus nearly 70% of active hunters, a trend that may be due to their geographical separation from family and community while away at college. Non-hunters, the largest group of students, were largely white, female identifying or gender nonconforming, majoring in disciplines outside of natural resources, from urban hometowns, and lacked social support for
hunting.

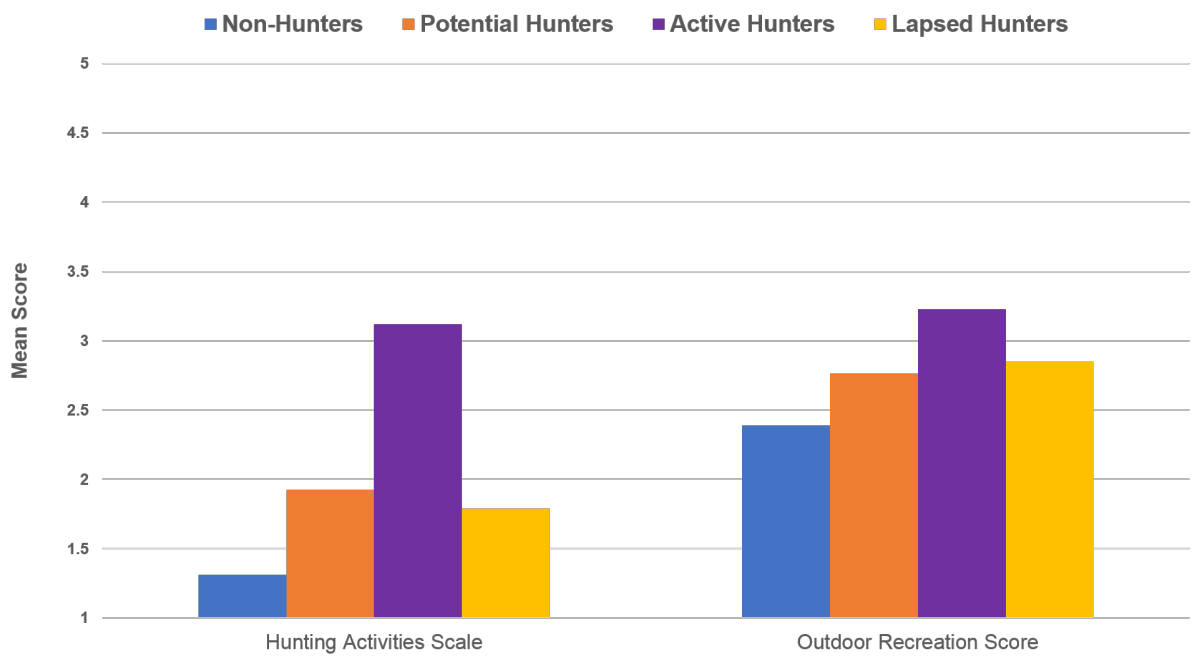

Figure 2.1. Mean scores of past hunting-related activities and outdoor recreation activities by future hunting subgroup (n = 15,750). Hunting activities rated on a scale from 1 = I never participate. to 5 = Very often I participate. The outdoor recreation score was created by summing binary answers to a list of activities (the higher the score, the more activities one has done in the past, rated on a scale from 1 to 6). Aggregate variables used, see Table 2.1 for more information.

We also found significant differences between non-hunters, potential hunters, active hunters, and lapsed hunters based on their motivations, constraints, and beliefs about hunters and hunting (Table 2.6). Active hunters had the most positive beliefs about hunters and hunting, followed by potential hunters, lapsed hunters, and then non-hunters (Figure 2.2). Although potential hunters' motivations were slightly lower than active hunters, both groups ranked altruistic motivations, social motivations and meat motivations higher than non-hunters and lapsed hunters. While approval of hunting for different purposes (Figure 2.3) varied among the four groups, some convergence was observed around altruistic and meat-centered reasons for hunting, which were generally viewed as favorable by all groups, including non-hunters (Figure 2.4). In terms of barriers, "I would rather do other activities" was overall the highest ranked barrier among non-hunters, potential hunters, and lapsed hunters, but non-hunters and lapsed hunters ranked this significantly more important than either potential hunters or active hunters. Non-hunters ranked moral barriers higher than the other three hunter groups. Active hunters ranked logistical barriers higher than the other three groups. For potential hunters, knowledge-related barriers were a prominent constraint (Figure 2.5).

Table 2.5. Distribution[a] and attributes of college students across 22 U.S. states assigned to four future hunting groups based on survey responses: Non-hunters (n = 7,820, 50% of sample), Potential hunters (n = 3,572, 22% of sample), Active hunters (n = 4,421, 26% of sample), and Lapsed hunters (n = 718, 3% of sample).

	Future Hunting Groups							
	Non-Hunters		Potential Hunters		Active Hunters		Lapsed Hunters	
Variable	% of variable within hunting group	% of hunting group defined by variable	% of variable within hunting group	% of hunting group defined by variable	% of variable within hunting group	% of hunting group defined by variable	% of variable within hunting group	% of hunting group defined by variable
Region								
MW	50.1	27.4	20.1	25.4	26.8	27.8	2.9	31.7
NE	55.4	17.5	21.5	15.7	20.5	12.2	2.6	16.5
SE	49.7	33.3	21.3	33.0	26.6	33.8	2.4	32.0
W	45.5	21.8	23.5	26.0	28.9	26.3	2.1	19.9
Race*								
White	43.0	55.4	20.6	62.5	33.6	84.0	2.8	73.6
Non-White or Mixed Race	63.6	44.6	22.8	37.5	11.8	16.0	1.8	26.4
Gender**								
Male Identifying	30.3	28.6	24.6	53.4	41.9	73.7	3.1	59.4
Female Identifying or Gender Non-Conforming	66.2	71.4	18.8	46.6	13.1	26.3	1.9	40.6
College Major*								
Ag/NR	35.6	14.4	22.6	21.0	39.4	29.6	2.4	19.4
Non- Ag/NR	52.9	85.6	21.2	79.0	23.4	70.4	2.5	80.6
Childhood Location*								
Rural	42.2	39.9	22.9	56.6	35.1	61.6	2.7	51.5
Urban	55.8	60.1	20.0	43.4	19.1	38.4	2.2	48.5
Social Support**								
No Social Support	73.9	55.6	19.7	35.1	4.9	7.3	1.4	21.7
Extended Family	56.3	30.4	30.6	39.2	10.8	11.5	2.3	25.1
Immediate Family	20.3	13.9	15.9	25.7	60.0	81.2	3.8	53.2

Note: All Chi-square tests are significant at $p < 0.001$. Effect size denoted as * = small (0.1), ** = medium (0.3), *** = large (0.5).

[a]Distribution represents weighted percentage of students within each variable falling into a certain hunting group (% of variable sub-column) and the percentage of hunting groups defined by each variable (% of hunting group sub-column)). Weights were calculated using Stata fweight procedure accounted for enrollment, gender, and race ratios across schools, and were rounded to nearest integers in Chi-square analysis.

Table 2.6. Means ratings for beliefs and attitudes, motivations, and barriers to hunting participation among college students across 22 U.S. states assigned to four future hunting groups based on survey responses: Non-hunters (n = 7,820, 50% of sample), Potential hunters (n = 3,572, 22% of sample), Active hunters (n = 4,421, 26% of sample), and Lapsed hunters (n = 718, 3% of sample).

Variable	Future Hunting Groups			
	Non-Hunters (M)	Potential Hunters (M)	Active Hunters (M)	Lapsed Hunters (M)
Mutualistic WVO Score[1]*	3.86[a]	3.60[b]	3.43[c]	3.78[a]
Dominionistic WVO Score[1]**	2.65[c]	3.14[b]	3.38[a]	2.97[b]
Total Conservation Caring Score[1]	4.13[a]	3.97[b]	4.14[a]	4.12[a]
Beliefs about Hunters and Hunting[1]***	2.77[a]	3.65[b]	4.23[c]	3.31[d]
Egoistic Approval[2]***	1.72[d]	2.46[b]	2.79[a]	2.16[c]
Altruistic Approval[2]***	2.39[d]	2.72[b]	2.89[a]	2.59[c]
Meat Approval[2]***	2.21[d]	2.72[b]	2.90[a]	2.54[c]
Trophy Approval[2]***	1.17[c]	1.61[b]	2.23[a]	1.41[c]
Egoistic Motivation[3]***	1.21[d]	2.13[b]	2.66[a]	1.60[c]
Altruistic Motivation[3]***	1.46[d]	2.33[b]	2.74[a]	1.97[c]
Meat Motivation[3]***	1.36[d]	2.36[b]	2.78[a]	1.92[c]
Trophy Motivation[3]***	1.03[d]	1.34[b]	2.04[a]	1.13[c]
Other Activities Barriers[4]***	3.61[a]	2.95[b]	2.34[c]	3.65[a]
Skills and Knowledge Barriers[4]***	2.30[b]	2.88[a]	1.60[d]	2.03[c]
Logistic Barriers[4]***	1.59[d]	2.19[b]	2.41[a]	1.92[c]
Moral and Comfort Barriers[4]***	3.06[a]	1.80[d]	1.91[c]	2.20[b]
Judgement Barriers[4]**	1.45[a]	1.31[b]	1.11[c]	1.35[ab]
Hunting Activities Scale[5]***	1.31[d]	1.93[b]	3.12[a]	1.79[c]
Outdoor Recreation Score[6]*	2.39[d]	2.76[c]	3.23[a]	2.85[b]

All Welch's F-statistics are significant at $p < 0.01$. Effect size denoted as * = small (0.01), ** = medium (0.06), *** = large (0.14). Games-Howell post hoc tests used to determine significant differences in means between subgroups of future hunters denoted by superscripts.

[1]Scale: 1 = Strongly disagree to 5 = Strongly agree

[2]Scale: 1 = Disapprove to 3 = Approve

[3]Scale: 1 = No, 2 = Maybe, 3 = Yes

[4]Scale: 1 = Not at all to 4 = Very much

[e]Nature based recreation index: sum of the activities participated in min 0 max 6

[6]Scale: 1 = Never to 5 = Very often

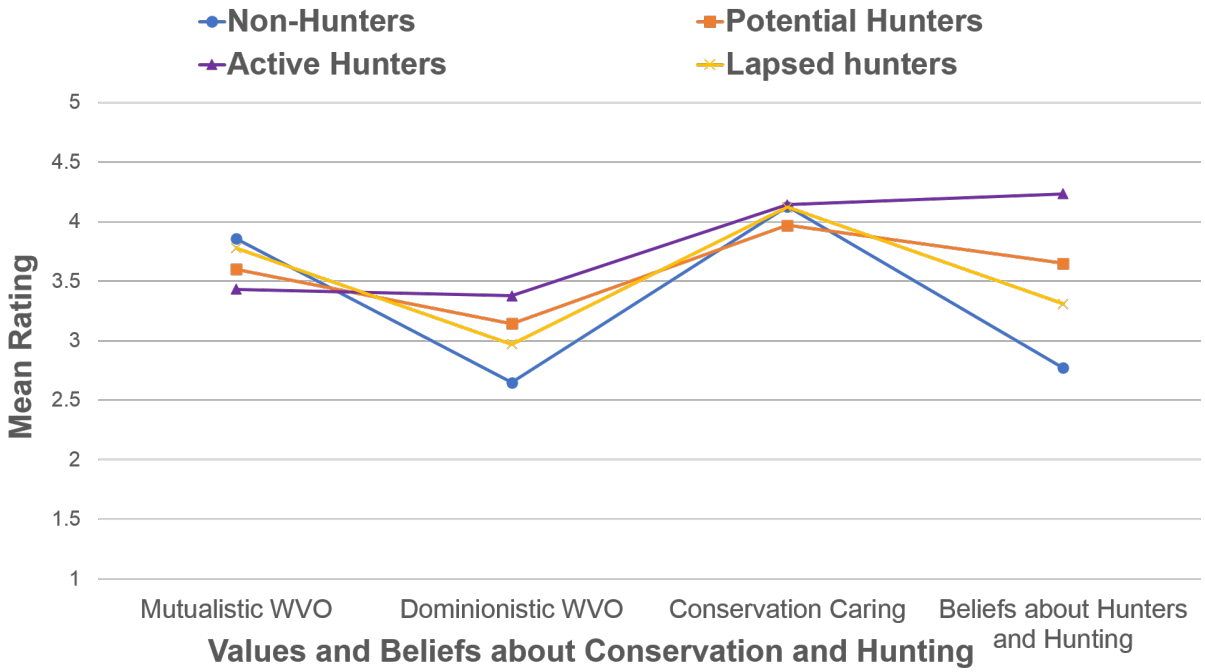

Figure 2.2. Mean ratings for all attitudes and beliefs variables (aggregate scales) rated on a scale from 1 = strongly disagree to 5 = strongly agree by future hunting group, among college students across 22 U.S. states (n = 16,531). See Table 2.1 for more scale details and Table 2.6 for information about significant differences.

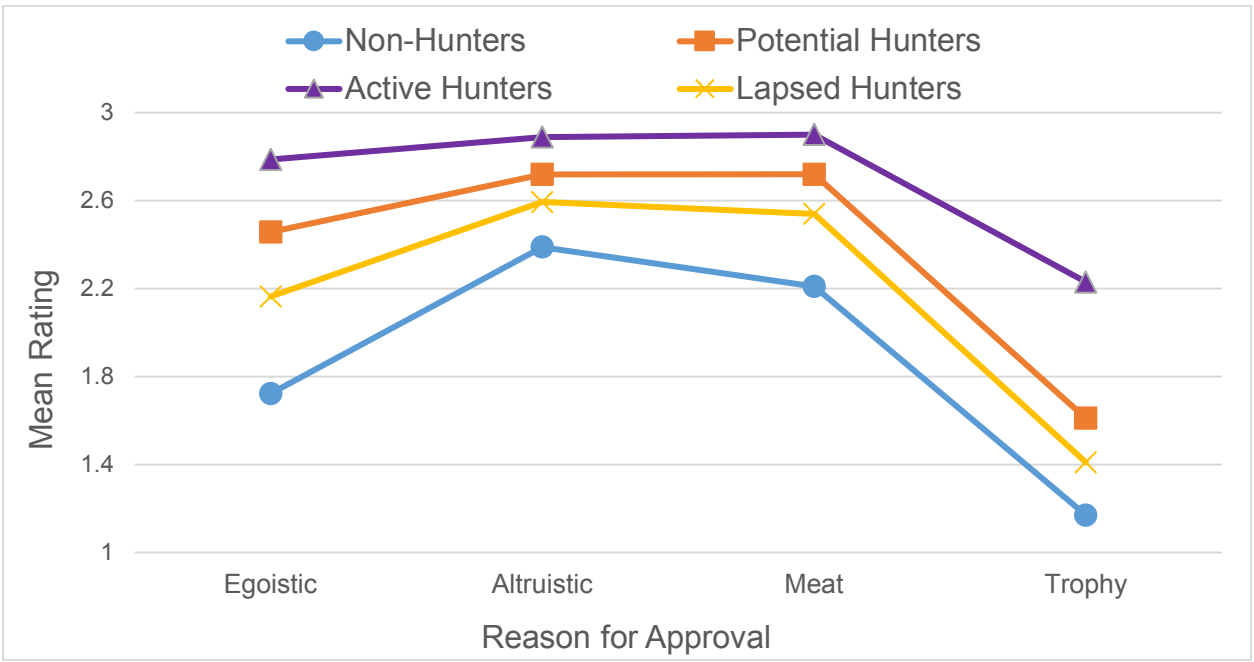

Figure 2.3. Mean ratings of reasons for approval of hunting by future hunting subgroup (n = 15,263). All items rated on a scale from 1 = Dissaprove to 3 = Approve. Aggregate variables used, see Table 2.1 for more information.

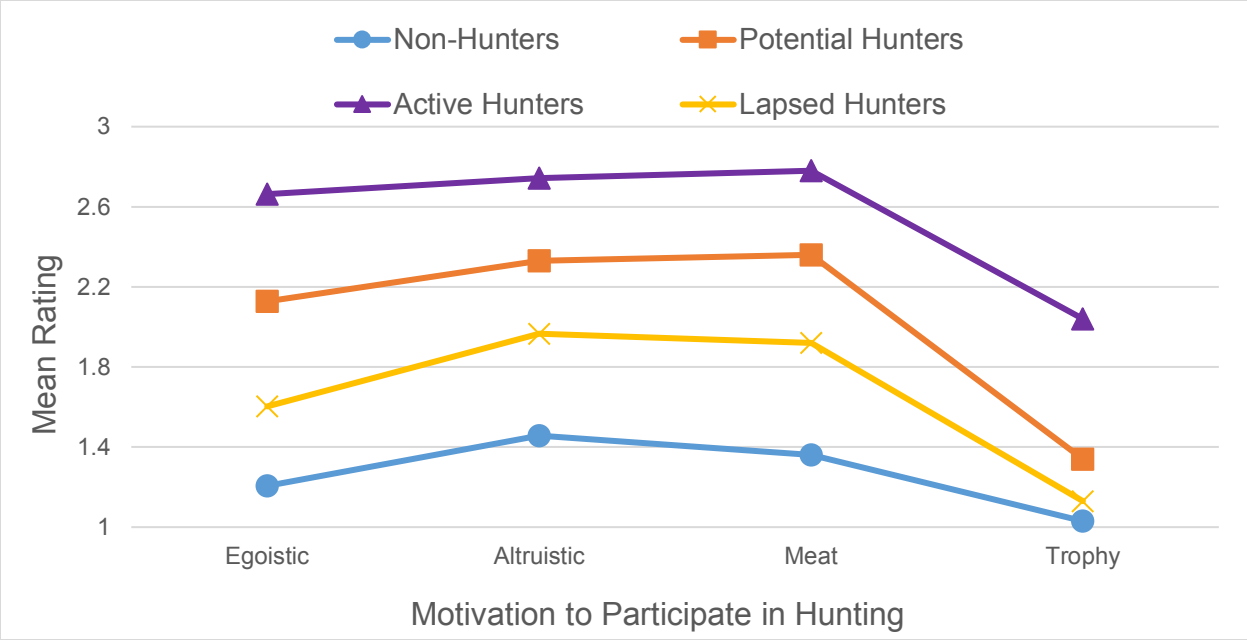

Figure 2.4. Mean ratings of motivations to participate in hunting by future hunting subgroup (n = 14,768). All items rated on a scale from 1 = No I would not hunt for this purpose to 3 = Yes I would hunt for this purpose. Aggregate variables used, see Table 2.1 for more information.

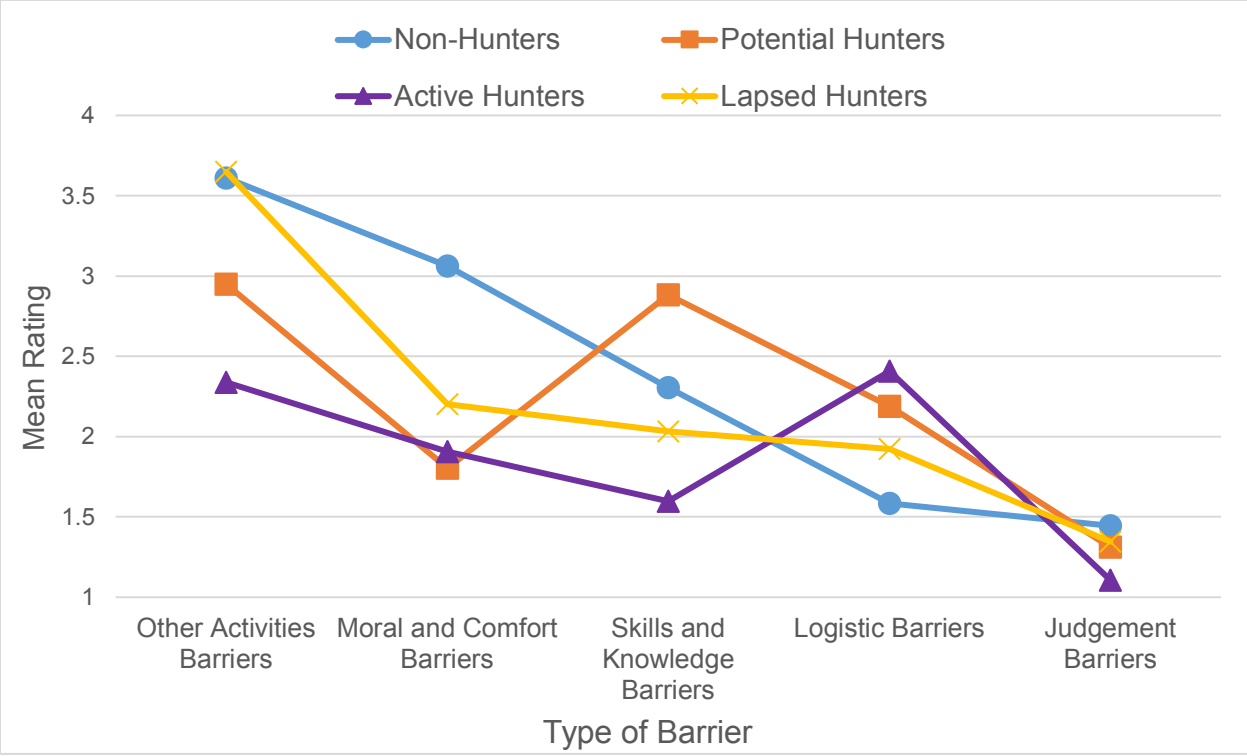

Figure 2.5. Mean ratings of type of barriers to hunting participation by future hunting subgroup (n = 15,667). All items rated on a scale from 1 = Not at all to 4 = Very much a barrier. Aggregate variables used, see Table X for more information.

Discussion

Our study of college students from across the United States suggested that a surprisingly large number of college students (29%) have some previous hunting experience, though only about 19% of students had been hunting in the past 12 months. Both numbers are much higher than national estimates of annual adult hunting license buyers in the United States, which typically approaches 5% (USFWS, 2016). Results support previous research revealing strong correlates of hunting participation: individuals who previously participated in hunting tended to be white men from rural areas (Tommy L. Brown et al., 2000; Responsive Management, 2017; Heberlein et al., 2008; Heberlein & Thomson, 1996; Mockrin et al., 2012; USFWS et al., 2016). However, 28% of college students would consider hunting in the future, and nearly half of these students (disproportionately more than white students) fall into the "non-traditional" demographic categories (e.g., womxn, racial/ethnic minority) defined by Quartuch et al. (2017). Our exploration of research questions related to correlates of past and future hunting behavior revealed several broader themes that could inform future R3 research and programming aimed at college students and NTPHs, in general. Our study also adds novel insights to the existing research on hunter segmentation (Dolnicar, 2002; Floyd & Gramann, 1994; Gigliotti, 2000; Miller, 2003; Schroeder et al., 2006) because no previous study has segmented hunters *and* non-hunters in this manner to identify strategies for recruiting new hunters.

Persistence of traditional pathways into hunting

Our results indicate that traditional pathways into hunting remain important, and they continue to form the foundation of hunter recruitment and tradition. Traditionally, white males from rural areas are socialized into a hunting community by fathers or grandfathers (Larson et al., 2014; Stedman & Heberlein, 2009). We found that, while social support from extended family members (grandparents, aunts/uncles, other relatives) and friends was important, the greatest impact on hunting participation came from immediate family relationships (mother, father, sibling). Immediate family relationships likely cultivate positive connections to hunting during respondents' formative years, where views, attitudes and beliefs of immediate family members are shared and adopted (Heberlein & Thomson, 1996; Stedman & Heberlein, 2009). Rural origins are important because they are associated with positive hunting attitudes and strong community approval of hunting behaviors. These positive beliefs are easily imbued in

family members and passed down from one generation to another, creating support for hunting culture and easy access to hunting mentors (Stedman & Heberlein, 2009). Having an immediate family member (father, mother, sibling) who hunts provided the largest increase in odds that a student had hunted in the past and was likely to continue hunting in the future. In fact, we found that most "traditional" hunter characteristics (e.g., rural hometown, male identifying, white, social support for hunting from immediate family) were strongly associated with past hunting participation. Therefore, our study supports previous findings (Heberlein & Thomson, 1996; Stedman & Heberlein, 2009) and lends more evidence that certain demographic and cultural attributes are effective predictors of past hunting behavior. Additionally, cultural contexts and social relationships that support hunting behaviors have always been key to recruitment, retention, and reactivation (Larson et al., 2014), and may be even more important among current and prospective hunters on college campuses.

Rise of non-traditional pathways into hunting

While traditional pathways into hunting were significant predictors of students' past hunting experience and future hunting likelihood, these patterns were less pronounced among potential hunters. Many students in the potential hunter group appeared to entering hunting from non-traditional pathways (Quartuch et al., 2017). For example, the population of potential hunters contained substantial population of womxn, non-white students, students from urban areas, and students who were not majoring in natural resources. We found that students who were potential NTPHs typically did not have the social support from immediate family members that most traditional hunters grow up with – support that is deemed essential by the outdoor recreation adoption model (Byrne & Dunfee, 2018). However, many potential hunters did acknowledge support from friends and extended family. These indirect connections to hunting may prove to be a fruitful avenue for NTPH-focused R3 efforts, providing a unique pool of mentors that has been viewed as important in other studies NTPHs (Quartuch et al., 2017). Following the principles of ORAM, efforts to create meaningful relationships between hunting mentors and NTPHs could be an effective recruitment and retention method, replacing the lack of social support these individual experienced in their early years. But the absence of social support was not the only barrier preventing students from hunting.

Barriers to hunting vary among future hunting groups

Among all groups (except active hunters), a desire to engage in other activities was typically a prominent barrier to hunting. Considering college students are exposed to a wide range of recreation activity choices across campus each day (Ravert, 2009), this is not surprising. Potential hunters, however identified lack of skills and knowledge second largest barrier after a desire to engage in other activities. This is promising for managers and agencies, who can directly address skill and knowledge deficiencies through strategic programming (Vayer et al., 2020). For non-hunters, time competition with other activities was the largest barrier, followed by moral and comfort barriers, highlighting the prominence of growing public discourse about the morality of hunting (Fischer et al., 2013). Like non-hunters, lapsed hunters find competition for available time was by far the greatest barrier to their hunting participation. Managers might have a more difficult time directly addressing barriers faced by non-hunters and lapsed hunters, as these are intrapersonal barriers that students have to navigate on their own. Unlike other groups, active hunters indicated that logistical barriers were their biggest reason for not hunting. These include things like moving away from normal hunting spots for college, lacking the free time to hunt, and the perception that hunting land is inaccessible or unavailable. Other studies of hunters have found similar results (Barro & Manfredo, 2008; Metcalf et al., 2015; Wright et al., 2001). These findings support the idea that constraints are hierarchical (Crawford et al., 1991; Shores et al., 2007; Wright et al., 2001), and that new barriers emerge and grow in importance and engagement with an activity increases. For hunting, logistical barriers may be irrelevant to students who are unable to negotiate moral and comfort barriers, lack of knowledge and skills, and interest in other activities first. Therefore, efforts to increase hunting participation by targeting logistical barriers would likely lead to greater retention of current hunters, but probably would not enhance recruitment of new hunters. These results also suggest that one R3 initiative will not effectively recruit or retain every student, and a variety of approaches are needed to help diverse subgroups of students overcome specific types of barriers. But, as our results show, many students – including NTPHs - do overcome barriers to hunting and express a desire to engage in the activity. Our study revealed some reasons why these individuals may hunt in the future.

Prevalence of meat-centered and altruistic hunting motivations

The most significant motivational force for college students across all future hunting groups was hunting to obtain ethically and locally sourced meat. Meat-centered motivations have consistently been recognized as a prominent reason for hunting (Duda et al., 2010), and may be particularly important for NTPHs (Tidball et al., 2013; Stedman et al., 2017). Potential hunters were particularly keen on hunting to procure free-range meat and supporting conservation (e.g., controlling overabundant wildlife populations for the benefit of ecosystems) or social goals (e.g., connecting with nature). These results build on evidence suggesting that capitalizing on conservation and civic-purpose reasons for hunting (Decker et al., 2015) and leveraging the locavore movement (Stedman et al., 2017; Tidball et al., 2013), where there is an emphasis on obtaining and consuming food that is ethically and locally caught or grown, can be popular among urbanites and young adults, many of whom are college students. Egoistic motivations for hunting such as to be closer to nature and the outdoors and to relax or escape from everyday life were particularly popular among active hunters, slightly less important among potential hunters, and minimally important to lapsed hunters and non-hunters. Hunting for trophies, on the other hand, was strongly opposed by every group except for a portion of active hunters. Other studies have revealed similar trends in hunting motivations (Decker et al., 2015; Larson et al., 2014), which might influence the way managers communicate about hunting and attempt to recruit new hunters from non-traditional hunting populations.

Shifting attitudes towards wildlife and conservation

All college students in our sample, whether or not they hunt or would consider hunting, generally reported pro-conservation attitudes and mutualistic wildlife value orientations. These patterns may be indicative of a shift in wildlife and conservation orientations among young adults, mirroring trends that have been reported in the larger U.S. population (Manfredo et al., 2016). The fact that most college students express a mutualistic and conservation-centered mindset has implications for hunting participation and support. For example, approval of hunting for altruistic and meat-focused reasons was high among all groups, suggesting that even non-hunters might be willing to support hunting for these purposes. Stronger emphasis on the broader conservation value of hunting might attract new groups inspired by these pro-conservation motives (Larson et al., 2014; Stayton et al., 2017). Emphasis on connections between

conservation and hunting could might also help to alleviate perceived conflicts between hunters, environmental advocates, and the general population (Knezevic, 2009). Lastly, these beliefs and values indicate strong interest in conservation among diverse college students that might translate into future support for conservation funding – including innovative strategies that may or may not be linked to the conventional hunting and angling-focused sources of revenue (Serfass et al., 2018).

Thinking beyond hunting participation

Although 59% of our sample of college students approved of hunting, this proportion was significantly lower than the 70-80% of the public that has reported approval of hunting in other national studies (*Americans' Attitudes towards Hunting, Fishing, Sport Shooting, and Trapping*, 2019). Building positive beliefs about hunting is likely to lead to more consistent and sustained participation in hunting (and likely more support for hunting too), so it is critical to frame hunting in a way that resonates with a diverse public (Byrd et al., 2017; Larson et al., 2014). These positive beliefs are often associated with strong familial role models that reflect community beliefs about hunting – building on social support that is absent for most college students.

However, college students are in an age group and social situation where they are willing to explore new activities and develop new beliefs based on their social interactions with peers. Emerging adulthood is a life stage characterized by identity development, activity experimentation, self-assessment, and boundary testing (Arnett, 2000a; Arnett, 2007; Nelson & Barry, 2005). College students, as emerging adults, have freedom from the constraints and supervision often faced by adolescents, but are not fully burdened by the responsibilities associated with adulthood (Johnson & Goldman, 2011). This creates an environment where exploration in encouraged and the influence by friends and other mentors can be most impactful. College campuses present an ideal combination of nature (considering the developmental characteristics of emerging adults) and nurture (considering the unique social aspects of university life) among the college-aged population that makes them the ideal target group for R3 interventions. In short, our results demonstrate that students who were not directly exposed to hunting culture as children might be open to trying it in college. Finding and sustaining social support may be key to shifting from potential to active hunters, but simply building more

positive views of hunters and hunting might persuade some of the current non-hunters (many of whom morally oppose hunting) to become hunting advocates. Even among past hunters, such efforts might help influence who slips from the active to the lapsed hunter category and who does not. For all of these reasons, our findings illustrate why college campuses might be a great place to focus R3 efforts.

Limitations and Future Research

Future research could address several limitations of this study. Despite using binary categories for many demographic predictor variables, our model revealed many strong correlates of future hunting participation. Yet, there is immense diversity across our study sample and across college students in general, and we acknowledge that R3 efforts will not reach or resonate with every student. Future research can, and should, look at more nuanced differences within future hunting subgroups to aid managers' marketing and recruitment methods. This might include, for example, examination of potential variation across non-white racial and ethnic groups (Shinew et al., 2006) and a wider range of college majors and fields of study, in addition to interactions among different demographic groups (e.g., women from urban areas, Latinx students who are non-natural resource majors). Such interactions may be particularly important when considering constraints to hunting participation (Shores et al., 2007).

Although our quantitative analytical approach enabled us to cover a wide geographical area and identify broad relationship between demographic, cultural, cognitive, affective, and behavioral variables of interest, a qualitative approach could be used to better understand the causal mechanisms behind some of the patterns observed in our analyses. For example, our study only discerned if immediate or extended family members had hunting experience, but did not explore the influence of how many family members had hunting experience, the relationship between the college student participant and their family member, or the nature and extent of each family members' hunting experience. Nor did we delve deeply into why students felt a particular way about hunting. Inferences drawn are based solely on quantitative interpretations.

Another limitation was the key outcome variables: self-reported past hunting behavior and intent to engage in future hunting. Although self-reported behavior and behavioral intent are widely viewed as effective measures of actual behavior (Ajzen & Driver, 1992), particularly in hunting studies (Hrubes et al., 2003; Larson et al., 2014), this approach did not preclude the

potential for response bias if respondents perceived the "correct" and socially desirable answer was to claim past/future hunting. Even though our survey instrument was designed to decrease response bias, self-reported participation intent is not actual behavior and we could not determine whether reported behavioral intent is consistent with actual hunting behavior. Additionally, while we focused specifically on hunting participation, exploring other hunting-related behaviors (beyond just participating in a hunt) could lead to a deeper understanding of past engagement with hunting on various levels.

Our used of post-stratification weighting based on enrollment and student demographic data provided by the National Center of Education Statistics (2019), multiplying weights independently calculated for each variable at each institution to calculate the total weight per respondent based on their school, their gender (men vs. women), and their race/ethnicity (white vs. non-white) (Vaske, 2008). These weights allowed us to account for, in some capacity, potential sampling bias and develop more accurate estimates when reporting sample proportions to better represent all of the 532,735 students enrolled at the universities that we sampled around the country. However, some research (Vaske, 2008; Vaske et al., 2011) suggests that weighting using population proportions does not fully compensate for lack of comprehensive population representation with online surveys. However, our non-response check suggested the survey was generally representative of the sample population, both demographically and behaviorally. Future studies could use non-response data to help weight samples to better compensate for the known shortcomings of online questionnaires.

While our sample is large and diverse, it is important to note this study only included public universities in only 22 states. While this sample did capture a substantial range of geographical and social contexts across all regions of the country, some states and certain types of institutions (e.g., private schools, smaller public schools) were excluded. Furthermore, our primary focus on land grant universities, which might be uniquely pro-hunting (given their strong connection to natural resources), might yield different results in other settings. Future studies could expand on this sample and include more states as well as more diverse educational institutions in each state to develop more comprehensive conclusions about the potential value of R3 efforts targeting college students.

Management Implications

In addition to the larger themes related to non-traditional pathways into hunting described above, our study revealed four subgroups of college students based on their likelihood of future hunting: non-hunters, potential hunters, active hunters, and lapsed hunters. Enhanced knowledge of the specific characteristics and attributes of these market segments could help R3 managers decide where limited resources are best allocated and how to design and disseminate R3 marketing materials for each distinct population.

The segment of college students of greatest interest to R3 managers focused on recruitment may be potential hunters – students who have never hunted in the past but are interested in hunting in the future. Not only was this group large (22% of all students), but it was more diverse than other hunting subgroups. To connect with the significant portion of NTPHs in this group, managers should develop messages and communication strategies that resonate with diverse populations. For example, approximately half the potential hunter group was womxn, suggesting that R3 spaces where female voices are amplified and welcomed may help to recruit more womxn from the potential hunter pool (Metcalf et al., 2015). It is important to recognize that, for the most part, potential hunters rarely experience social support for hunting. Therefore, R3 efforts that are sustained, as opposed to onetime events, may be needed to not only recruit but also retain new hunters by creating a sense of membership in the larger hunting community (Byrne & Dunfee, 2018; Larson et al., 2014). On college campuses, where student organizations and socialization opportunities abound, those existing networks might be a great place to start.

Considering factors beyond demographics when assessing each of these groups is also important. The accessibility of food processing or game meat cooking classes may be a way to initiate many potential hunters into hunting communities (Tidball et al., 2013). For potential hunters (and many active hunters), obtaining sustainably sourced meat and altruistic motivations, such as controlling wildlife that are damaging to ecosystems or contributing to wildlife conservation, were among the top reasons for hunting.; suggesting that these groups are invested in conservation and care about hunting for broader reasons. Explicit connections in R3 materials between hunting, meat, and conservation would appeal to all groups, and especially potential hunters. Additionally, connecting new hunters with information about hunting skills, techniques, laws and regulations, and places to hunt – with meat and conservation goals in mind – could help foster a more inclusive hunting community that might appeal more to NTPHs. Such a

community would help new hunters from non-traditional backgrounds overcome skills and knowledge barriers and find the peer support needed for sustained participation. However, as noted previously, it should be reiterated that the potential hunter group is very diverse and a tactic that may work for some members of this group may not work for others.

Only a small fraction of college students were lapsed hunters (3%), but this group should be considered if the goal is hunter reactivation. When many hunters from traditional hunting backgrounds go to college, the social support (and pressure) to continue participating in hunting that they previously experienced often diminishes. For examples, lapsed hunters are more likely than other groups to list interest in other activities as a primary barrier to hunting participation. Yet, lapsed hunters are similar to active and potential hunters in many ways, suggesting that Overall, the similarities between potential hunters and lapsed hunters is encouraging because R3 initiatives might find ways to target members of both groups simultaneously (e.g., by focusing on meat or conservation connections). Our findings also suggest that a key to reactivating college students who are lapsed hunters may be rekindling the social support for hunting they once enjoyed. To do this, R3 managers could work with university partners to connect lapsed and potential hunters with active hunters through campus groups and organizations, therefore providing a peer network that supports and promotes pro-hunting behaviors which may help lapsed hunters to re-prioritize hunting as a primary leisure activity.

Although active hunters (26%) may be less important from an R3 standpoint, they should not be overlooked. This population of students is an important part of the conservation community, and they may continue to be hunting ambassadors for generations to come. Our data suggest that traditional pathways into hunting are important for many students, but these hunters also face constraints that threaten their future hunting participation. Providing college students who are active hunters with more resources to help overcome structural and logistics barriers would likely help retain this population. For example, providing transportation to public game lands, facilitating equipment storage on campus, fostering peer networks of active hunters, and offering information about access to local and campus-proximate hunting opportunities. However, if the goal is recruitment of new hunters (e.g., NTPHs), then scarce R3 resources might be better spent addressing other challenges more pressing for potential and lapsed hunters.

While most of our focus here has been on active or potential hunters, it is important to remember that almost half of college students (50%) are non-hunters. While converting non-

hunters to active hunters is likely an unreasonable goal, modifying non-hunters' views on hunting could be achievable and may result in more broad-based public support and recognition for the value and importance of hunting. Non-hunters may never hunt, but considering their overarching passion for wildlife (as seen in mutualistic wildlife value orientations and conservation caring) is on par with the other future hunting subgroups. Thus, non-hunters might still become hunting advocates with positive views of hunters and hunting if the activity is framed appropriately. Managers could therefore produce and disseminate hunting-related content and that informs non-hunters of the connections between hunting and conservation and describes indirect ways to support hunting beyond actual hunting participation such as befriending hunters (possibly through socialization with different groups on campus), and learning to prepare and cook game meat. In the long term, it is imperative to recognize that hunting advocates are important because they will contribute positively to policy, advocacy, and communication, as well as help to advance agency missions, policies, and conservation goals. This helps to create a more cohesive base of conservation support among non-hunters and hunters. By ensuring that a larger segment of the population has a voice and a space in the hunting community, agencies will be better equipped to create a more cohesive base of conservation support among non-hunters and hunters. However, managers must weigh the high resource investment required to influence the beliefs and attitudes of non-hunters against the relatively lower investment for more immediate R3 results within programming focused on other hunting subgroups.

Ultimately, our study reveals several key findings that should help to inform R3 efforts moving forward. Results demonstrated significant interest in hunting among diverse college students, highlighting the growing importance of non-traditional pathways into hunting. Many potential hunters shared similar values, beliefs, and motivations as active hunters but they lacked the social support to participate in hunting and the ability to negotiate additional barriers. College campuses provide a largely untapped pool of potential new or lapsed hunters that might be recruited or reactivated. For managers hoping to find ways to engage more diverse audiences in hunting, university settings provide a number of unique advantages. They contain millions of 18-25-year-olds that are emotionally primed to explore new activities and forge new identities, and they cultivate a social atmosphere where these new activities can flourish. Yet, like all populations, these groups of college students are not homogenous. Market segmentation analyses reveals audiences with distinct attributes (such as the potential hunters identified in this study) to

whom R3 investment might be tailored and directed. Using similar approaches to the one we have outlined here, managers can develop more effective tools and strategies as they seek to reverse declines in hunting participation and change the contemporary face of hunting in America.

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CHAPTER 3: CAN R3 PROGRAMS CREATE NEW HUNTERS? EVALUATING IMPACTS OF HUNTING WORKSHOPS ON COLLEGE STUDENTS ACROSS THE UNITED STATES

Abstract

Persistent declines in hunter numbers across the United States have made hunter recruitment, retention, and reactivation (R3) a high priority within the North American wildlife management community. Acknowledging these new trends, state wildlife agencies around the United States are introducing a variety of R3 programs designed to foster mentoring opportunities and skill development for individuals with little or no previous hunting experience. Despite a proliferation of such R3 initiatives in recent years, little research has systematically evaluated the effects of special hunting programs on the knowledge, attitudes, and behaviors (short-term and long-term) of new hunters. We designed, implemented, and evaluated a "Getting Started Outdoors: Hunting 101" workshop specifically targeting college students. Using quantitative and qualitative analysis of surveys conducted before and after the workshop, we assessed the impacts of the R3 effort on college students at 13 universities in 13 states across the United States. Across all states, 16 workshops attracted 271 total participants, with 227 completing both a pre and post workshop assessment. We successfully recruited a diverse group of undergraduates (72%) and graduate students (25%), including many who were womxn (42%) and non-white (27%), and 84% were first-time hunters. Registrants were highly motivated to hunt for food and conservation-related purposes (44% and 46% rated very important), and they were primarily constrained by barriers related to inadequate skills and knowledge related to things such as use of firearms (57%) and game meat preparation (70%). The workshop significantly reduced most barriers to hunting. Additionally, the workshop significantly increased participants' confidence and skills related to hunting, including knowledge of hunting regulations, field recovery and dressing of game, and ethical shot placement. Overall, 99% of students rated their workshop experience as "good" or "very good." After the workshop, most participants said they would definitely (50%) or probably (34%) hunt in the future. 83% said they would likely (or very likely) purchase a hunting license, and 94% said they would eat game meat obtained through hunting. Increases in positive attitudes towards hunters and hunting also suggested the workshop fostered more positive views of hunters and hunting among participants, regardless of future hunting intent. Overall, results show that the workshop was effective in

attracting a diverse pool of potential hunters, increasing interest in future hunting, and creating hunting advocates. Findings highlight the potentially powerful impact that R3 programs focused on diverse college students can have on the future of hunting across the United States.

Introduction

Hunting is an important recreation activity and cultural practice across many communities in the United States, but its value extends beyond tradition. Hunting is also valuable ecologically, as a wildlife management tool (Loveridge et al., 2006), and economically, as a major source of revenue for both conservation and rural economies (Mahoney & Jackson III, 2013; Winkler & Warnke, 2013). Current declines in hunting participation (Larson et al., 2014; USFWS et al., 2016) are therefore concerning to wildlife management agencies, who are increasingly taking action to address the problem (Responsive Management, 2017).

The Rise (and flaws) of R3 (Recruitment, Retention, and Reactivation)

Agencies and NGOs around the United States are working to develop and implement hunter recruitment, retention, and reactivation (R3) programs in an attempt to combat steady declines in hunting participation. Recently, there have been more formal attempts to identify best R3 practices and improve methodologies for implementing successful programs (Responsive Management, 2017; Price Tack et al., 2018). However, despite growing emphasis on R3, systematic scientific evaluation of R3 programming is minimal and its efficacy remains uncertain.

Seng et al. (2007) and Larson et al. (2013) discuss reasons why R3 programs fail. These include only providing opportunities as single events, managers' reluctance to adapt and change and instead embrace a "we've always done it this way" attitude, inadequate evaluation of program effectiveness, lack of staff, budget, expertise and support, and misunderstanding of the market and marketing tactics. Many agency efforts have a tendency to attract invidiuals who might be categorized as "traditional hunters" (Quartuch et al., 2017), typically white males from rural areas who would likely be socialized into the hunting community (Ryan & Shaw, 2011; Stedman & Heberlein, 2009). Accordingly, workshops typically recruit people that had already dabbled in hunting or shooting sports, yet do not have much success recruiting new members from outside existing hunting circles (Responsive Management, 2017). Continued emphasis on

youth recruiting programs (as opposed to those focused on adults new to hunting), a staple for many wildlife agencies, has also proven to be cost ineffective (Price Tack et al., 2018). Many of these youth have been introduced to hunting via immediate family members (Decker et al., 1984), and are likely to purchase a license later in life whether or not they attend a workshop. As a result, current iterations of R3 often struggle to expand the social habitat for hunting in a way that resonates across diverse cultures – an expansion that is needed to increase the overall number of hunters as traditional hunting populations decline (Larson et al., 2014).

Contributions of Non-Traditional Path Hunters (NTPHs)

The hunting community has always been predominantly male and rooted in rural settings where hunting is an important part of the community identity and culture (Stedman & Heberlein, 2009). Most hunters are typically recruited and initially introduced to hunting via immediate family members, specifically fathers (Decker et al., 1984). Yet hunters initiated in this "traditional" manner are no longer sufficient to offset the declining trend of overall hunters, and the programs designed for these traditional hunting populations often fall short when trying to expand interest to new groups where social support for hunting is lacking. Therefore, it is imperative for wildlife managers to move beyond the traditional white, masculine conceptualization of hunting – a group which is unlikely to yield substantial gains with respect to hunter recruitment and retention (Hinrichs et al., 2020) - and recognize the potential impact of non-traditional path hunters (NTPHs) (Lee et al., 2014; Quartuch et al., 2017).

To broaden the base of participation in and support for hunting, agencies are increasingly turning to non-traditional audience (Lee et al., 2014; Quartuch et al., 2017; Ringelman et al., 2020). Quartuch et al. (2017) define NTPHs as hunters who are initiated into the hunting community as adults, have limited previous hunting experience, have little or no familial or social support for hunting, and/or are a part of a typically underrepresented group with-in the hunting community (e.g. women and racial/ethnic minorities). In the face of declining numbers of hunters, the NTPH population is an important target for R3 programs. In order to recruit NTPHs, managers must recognize the strategies and messaging that will promote hunting and align with the beliefs and motivations of individuals who are new to the activity (Ryan & Shaw, 2011). A key question therefore becomes, are NTPHs recruited and retained through different mechanisms than traditional hunters? Limited available research suggests that while both

NTPHs and traditional hunters acknowledge several similar motivations (e.g., obtaining local, free-range meat) and barriers (e.g., perceived lack of skill and access), social support and relationships may be critical to recruiting and retaining NTPHs (Quartuch et al., 2017; Larson et al., 2014). However, identifying and fostering social support for hunting among diverse and geographically dispersed segments of potential NTPHs has proven to be a monumental challenge. But there is one group that contains many possible NTPHs and can be easily identified and reached, yet has been widely overlooked in the R3 agenda: college students (Larson et al., 2017; Stayton et al., 2017).

College Students: An Ideal Focus for R3 Efforts

Nearly 41% of young adults ages 18-24 (about 23 million people) currently attend college, and that number has increased steadily since 1980 (NCES, 2016). Of those 23 million students, 56% identify as female, 59% identify as non-white, and about 50% are from urban hometowns (NCES, 2016). Land-grant universities in particular, which often feature wildlife and natural resource-oriented majors and courses, collectively enroll about 2 million diverse students across the United States; many of these students constitute potential hunters or hunting advocates (NCES, 2016).

To date, college students have not been a frequent target of R3 programming. Perhaps, due to many logistical challenges presented by the campus environment and historically low rates of hunting participation among young adults, R3 managers have opted to overlook this population (with a few exceptions, see (Larson et al., 2017; Ringelman et al., 2020). However, many of these apparent challenges also represent opportunities for either recruiting new hunters or retaining/reactivating individuals whose hunting participation may be waning in the college years.

Leveraging the construct of emerging adulthood may be one effective approach to recruiting and retaining college students as NTPHs. In 2000, (Arnett, 2000a) Arnett (2000b) coined the term “emerging adulthood” to represent a developmental stage (i.e., 18-28 years old) that is between adolescence and young adulthood and embodies a time period of experimentation and independence. This developmental period is characterized by identity development, activity experimentation, self-assessment, and boundary testing (Arnett, 2007). Due to a new autonomy, emerging adults have ample opportunities to explore, create, test, and re-identify themselves

during college years. For many Americans, the college experience represents the prime period of leisure activity experimentation (Luyckx et al., 2006). College students are promising targets for R3 efforts because college provides dynamic opportunities to alter behavior while also fostering a social context where outdoor recreation (including hunting) adoption can occur. The forgiving college environment is the ideal place for emerging adults to experiment with leisure activities; it is nurturing, protective, and permissive, fostering additional cognitive and spiritual development (Johnson & Goldman, 2011). The amalgamation of the post-adolescent brain with the unique social setting of college campuses creates a perfect opportunity for development of new attitudes, beliefs, and behaviors regarding leisure and recreation. In short, college students may be naturally inclined to try new activities such as hunting, and the college atmosphere may help to nurture that type of exploratory behavior.

The Need for Theory and Research in R3 Programming

R3 efforts have typically suffered from a general absence of theoretical grounding and scientific research and evaluation (Larson et al., 2014). For example, R3 programs intuitively designed to minimize potential barriers to hunting rarely account for the full array of constraints identified by previous leisure research (Crawford et al., 1991; Metcalf et al., 2015; Miller & Vaske, 2003; Stodolska et al., 2019; Wright et al., 2001). Crawford (1991) and colleagues describe a hierarchal model of constraints (Crawford et al., 1991) where intrapersonal, interpersonal, and structural constraints are nested, and individuals must negotiate intrapersonal constraints before other barriers can be addressed (Crawford et al., 1991). Other theories consider motivations and constraint negotiation simultaneously (Hubbard & Mannell, 2001; Metcalf et al., 2015), highlighting the many interacting factors that might influence an individual's desire and ability to hunt. For hunters these motivations can vary, and might include egoistic, altruistic, meat-oriented, and trophy-oriented reasons (Decker et al., 2015). The Theory of Planned Behavior (TPB) offers additional explanations for hunting adoption, suggesting that beliefs, attitudes, norms, and behavioral controls drive an individual's intent to perform a behavior (Ajzen, 1991). TPB also demonstrates strong linkages between behavioral intent and actual behavior (Ajzen, 1991). Perhaps the most relevant theory that can be used to guide R3 program design is the Outdoor Recreation Adoption Model (ORAM). The ORAM is a theoretical framework designed with R3 programs in mind; it is specifically aimed at helping the R3

community better understand how individuals join new activities (Byrne & Dunfee, 2018). The center piece of ORAM is social support, a key aspect of hunting (Larson et al., 2014), and the model posits that participants need this support at every activity adoption level (recruitment, retention, and reactivation) to decide whether or not to continue an action or behavior. Collectively, these theories highlight key antecedents to hunting behavior (e.g., beliefs and attitudes about hunting, motivations, constraints, perceived behavioral control, social support, behavioral intent) that can help managers design R3 programs that address barriers to hunting and cultivate the interest and social support needed for long-term success.

Working with teams of university and state wildlife agency collaborators across the United States, we created an R3 program for college students designed to accomplish all of these goals. Our program model was based previous research and interventions specially designed for NTPHs. Our program evaluation process, which assessed changes in the theoretical constructs described above, was developed to fill another key gap in the R3 literature: the need for science and data-driven decision making to improve program efficacy.

Research Objectives

To examine the potential benefits of R3 programming targeting college students, we asked three research questions: (1) Who registers for a beginners' hunting workshop and why, (2) How does the R3 workshop experience impact participants' confidence, attitudes and beliefs, perceived barriers, and intended hunting behavior, and (3) what did students like the most and the least during the workshop experience. Through this evidence-based approach, we aimed to see if an R3 workshop for college students who were first-time hunters could effectively recruit new hunters and create more effective hunting advocates.

Methods

"Getting Started Outdoors: Hunting 101" Workshops

To evaluate the efficacy of hunting workshops for novice hunters, we leveraged an Association of Fish and Wildlife Association Multi-state Conservation Grant to partner with university researchers and state wildlife agencies around the United States to design, implement and evaluate "Getting Started Outdoors: Hunting 101" workshops for college students. Workshops were designed specifically for college students without previous hunting experience.

The purpose of each workshop was to teach students the basics of hunting, to highlight the broader benefits of hunting, and to inspire students to adopt positive hunting-related beliefs, attitudes and behaviors. Workshop content and format (see Appendix 3.1) were modeled after successful R3 programs around the country, with a particular emphasis on those that had demonstrated success attracting NTPHs (Wisconsin DNR Hunt for food, Wisconsin DNR Learn to Hunt, Georgia Field to Fork) and those teaching non-traditional college students (e.g., women, urbanites, non-natural resource majors) about the benefits of hunting (DJ Case & Associates, 2019; *Conservation Leaders for Tomorrow*; Ringelman et al., 2020; Stayton et al., 2017) (clft.org).

In most states, the workshop was implemented as a one-day (~ 8 hour) event at a local hunting club or state game lands close to campus. However, some collaborators – especially those that had previously established programs for college students and/or NTPH - chose to alter workshop structure to suit their needs. Most workshops centered on deer hunting, but the focal species varied by state/season (e.g. waterfowl and turkey in the spring). Workshop content remained similar across all sites, however. The workshop covered a variety of hunting related topics that are appropriate for an entry level audience, including hunters' role in conservation and hunting ethics, scouting/tracking tips and hunting scenarios, proper use of hunting stands, gear, and equipment, firearm safety, shooting practice, and game recovery and processing. In most cases, a mentored hunt experience for interested participants was offered at a later date after completion of the workshop. Workshop implementation was coordinated and directed by agency partners in each state, with support from collaborators at the associated universities. Partnership funds provided by each state agency was used to support workshop implementation, including staffing and supplies. Volunteers from state wildlife agencies, hunting NGO's, and local community members were key to staffing the workshops. Overall, workshops introduced approximately 300 students without any (or with very little) previous hunting experience to hunting.

Data Collection

Collaborators at participating universities coordinated recruitment of students to participate in R3 workshops, targeting individuals without any (or with very little) previous hunting experience. Recruitment efforts varied at each university, but the most effective

approaches generally involved the following steps. First, we invited students who had expressed interest in hunting on a campus-wide survey. Second, we publicized the event by posting flyers around campus, talking with large lecture classes, meeting with student organizations, and distributing information about the workshop via College and Departmental listservs. We aimed to recruit a diverse array of participants based on gender, race/ethnicity, and academic major.

Sixteen workshops were implemented from Fall 2018 through Spring 2020 at 13 large public universities in 13 different states (Table 3.1.1). Workshops ranged in size from 9 to 24 participants per institution. At most universities, workshop leaders sent a standardized web survey link via Qualtrics (see Appendix 3.2 for pre-survey) to students as a part of the workshop registration process about one week before the event. Participants were sent another standardized web survey link via Qualtrics (see Appendix 3.3 for post-survey) in the week following the workshop. In a few cases, paper surveys were completed on-site. Both pre and post surveys contained similar themes and nearly identical questions designed to examine participants' beliefs, attitudes, and behaviors at different points in time. If student registrants did not a respond to a pre or post survey, they were sent an additional email reminder.

Survey Instruments (Appendix 3.2 – Pre, Appendix 3.3 – Post, Appendix 3.4 – Delayed Post)

Survey instruments were developed by project leaders at NC State University with input from all project collaborators. The instruments were designed to assess the impacts of R3 workshops on student participants across the following themes. For constructs consisting of multiple items, we conducted a Principal Component Factor Analysis (PCF) with orthogonal rotation to confirm factor structure.

Hunting Motivations and Barriers to Participation. To assess motivations for hunting, we synthesized items from previous studies to identify a range of possible hunting motivations (Decker et al., 2015; Responsive Management, 2017). Possible reasons included to engage in sport and/or recreation, to obtain local, free-range meat, to spend time with friends or family, and to control wildlife populations that are damaging to ecosystems. Participants answered questions about these potential reasons for hunting. We asked students to rank the importance of each potential reason for hunting with response options of: (1) "not at all important", (2) "slightly

important", (3) "moderately important", and (4) "very important". Motivations to hunt were only assessed before the workshop.

The PCF analysis (see Appendix 3.5) identified four categories of motivations that matched the hunting motivation structure identified by (Vayer et al., 2020): egoistic motivations focused on personal reasons for hunting such as spending time with friends and family and connecting with nature (6 items, Cronbach's alpha = 0.832), altruistic reasons focused on community benefits of hunting such as controlling wildlife that are damaging ecosystems or causing problems for people (3 items, Cronbach's alpha = 0.917), hunting to obtain meat (1 items), and hunting to obtain a trophy (1 item).

To assess barriers to hunting, we synthesized items from previous studies to identify a range of hunting constraints (Metcalf et al., 2015; Responsive Management, 2017). We listed 18 potential barriers designed to cover intra-personal (individual), inter-personal, and structural (context) constraints (Stodolska et al., 2019), using hunting-related items that matched the 5-factor constraint structure described in Vayer et al. (2020). These factors were: individual constraints focused on morality and comfort such as a reluctance to personally kill an animal and discomfort around firearms and hunting equipment (4 items); skills and knowledge constraints such as lacking the knowledge/skills to prepare game meat to eat and unsure of how/where to store equipment and firearms (6 items); logistical constraints such as lacking transportation to hunting areas and unsure of where to hunt (6 items); judgement and experience constraints such as feeling discouraged by past negative experiences in the outdoors and feeling uncomfortable due to a lack of racial and ethnic diversity associated with hunting (3 items,); and alternative activities constraints such as I would rather do other activities (1 item). All items were rated as a "yes/no" binary variable from a "check all that apply" question. Identical items regarding barriers were asked on the pre and post surveys.

Confidence in Hunting Related Skills and Knowledge. This theme focused on participants' confidence in their skills and knowledge related to hunting. We asked one question about overall confidence in hunting skills on a scale from (1) "not at all confident" to (5) "extremely confident." We also asked participants to report their level of confidence with respect to specific hunting skills such as firearm safety, shooting skills, ethical shot placement,

field recovery, and game meat preparation on the same scale. Identical items were used on both the pre and post workshop surveys.

Beliefs and Attitudes about Hunters and Hunting. In this section, participants were asked to rank their level of agreement on nine items on a scale from (1) strongly disagree to (5) strongly agree, measuring attitudes and beliefs about hunters and hunting – such as hunting is a safe activity, hunters behave responsibly and follow hunting laws, and hunters financially contribute to conservation. These items and question format following approaches used in previous studies (e.g., Responsive Management, 2017; Vayer et al., 2020). Identical items were used on both the pre and post workshop surveys.

PCF analysis (see Appendix 3.5) revealed a single overarching category (9 items, 0.871) A composite score was created for the factor based on the mean of the items. Higher scores indicated greater positive beliefs about hunters and hunting.

Hunting Participation. This theme focused on participants' previous hunting experience (before the workshop) and future intent to hunt (following the workshop). On the pre survey we also asked participants "have you ever hunted before?" Response options included (1) yes, (2) I have accompanied someone hunting but did not personally hunt, or (3) no. If students answered we followed up with additional questions about how old they were, how many times they've been hunting, and what type(s) of game they have hunted. Students were also asked about their involvement in hunting related activities such as viewing media about hunting (social media, YouTube videos, blogs) and talking to family and friends about hunting, with response options on a scale from (1) "never" to (5) "very often". Pre-survey items also evaluated participant's social support for hunting. For example, we asked participants to indicate if any of the following people in their lives hunt: father, mother, brother/sister, Grandparent, other family member, friends, or other (specify).

On the post survey, to gauge participants' future intent to hunt, we asked participants "how likely are you to hunt in the future?", with response options of (1) "I will definitely not hunt", (2) "I will probably not hunt", (3) "not sure", (4) "will probably hunt", or(5), "I will definitely hunt." If a participant answered (3), (4), or (5), we asked a question regarding how

often they predict they would hunt: the response options were (1) “might try it once”, (2) “Rarely (once every few years)”, or (3) “Regularly (at least once per year)”. To explore intent to participate in other hunting-related behaviors, we asked students how likely, on a scale from (1) very unlikely to (5) very likely, they were to engage in various actions such as purchasing a hunting license, hunting deer, or becoming friends with a hunter.

Workshop Experience. Within this theme, we examined participants’ expectations for the workshop in the pre survey and their satisfaction with the workshop experience in the post survey. For example, on the pre-survey, we used an open-ended response question to ask participants to list two things they hoped to get out of the workshop experience.

On the post survey, we asked participants to evaluate and provide feedback on their overall workshop experience using open-ended question responses where they described aspects of the workshop they liked the most and least. We also assessed workshop experiences with quantitative items, asking participants to rank their overall experience on a scale from (1) very negative to (5) very positive. Similarly, we asked about participants to rate specific aspects of the workshop – from perceptions of content and instructor to satisfaction with particular workshop components - on a scale from (1) very poor to (5) very good.

Demographic and Background Information. The final survey theme assessed participants’ background characteristics, including their participation in outdoor recreation activities and their general beliefs about wildlife conservation. We collected demographic information such as gender identity, race and ethnicity, college major, and population size of the area where a participant grew up (e.g., urban vs. rural). We also measured participants’ other outdoor recreation activities with a checklist including adventure sports, bird watching, camping, canoeing/kayaking, hiking, jogging/running, off-road vehicles, swimming, wildlife viewing/photography, and others. Additionally, we measured students’ involvement with conservation and environmental organizations. Because a growing body of research highlights links between hunting and the local food movement (Stedman et al., 2017; Tidball et al., 2013), we assessed previous engagement with local food using a checklist including participating in cooking classes, edible gardening, foraging, and shopping at farmer’s markets.

Data Analysis

To address RQ1 (workshop recruitment) and better understand participants, we used descriptive statistics to explore demographic attributes, past hunting participation, past hunting-related activities, outdoor recreation involvement, motivations to hunt, and barriers to hunting reported by college students who registered for the R3 workshops. When presenting data related to RQ1, our analysis focuses on all workshop registrants, including those who completed the pre-survey but chose not to attend the actual event (Table 3.1.1). To address RQ2 (workshop outcomes), we used paired t-tests to compare responses on both the pre and post workshop surveys for themes related to beliefs about hunters and hunting, confidence in hunting-related skills, and barriers to hunting. We focused on significant positive gains following the workshop. Within RQ2, we also used descriptive statistics to assess post-survey only responses to items focused on future hunting likelihood and intent to engage in a variety of hunting-related behaviors following the workshop. To address RQ3 (workshop experience), we used descriptive statistics to examine workshop ratings from all individuals that attended the workshop (both pre-post and post only). All results are based on data pooled from R3 workshops across all participating states.

For open ended questions related to RQ1 (workshop expectations) and RQ3 (general workshop feedback), we used a qualitative approach to identify, examine, and interpret themes reported by students (Creswell & Clark, 2017; Thornberg & Charmaz, 2014). First, we used open coding to create discrete categories within qualitative responses. We continued this process until we reached data saturation without new themes being created (after about 150 responses); we then coded all responses based on these open codes. Next, we used axial coding to examine relationships among open codes and synthesize them into a set of broader themes to describe larger patterns in the data.

Results

Across all states, a total of 302 registrants completed the pre-workshop survey as a part of the registration process, but only 271 of these individuals attended an actual workshop (Table 3.1.1). Out those 271 participants, 237 of them completed the post-workshop survey. Overall, 91% of workshop attendees (227 total) completed both a pre-workshop survey and a post-workshop survey.

Table 3.1.1. Overview of R3 workshops for college students held across 13 states from fall 2018 through spring 2020.

Date	State (School)	Focal Species	Total Workshop Participants	Survey Respondents		
				Pre Only	Post Only	Pre & Post
Oct 2018	NC (NC State Univ.)	Deer	20	26	21	20
Oct 2018	SC (Clemson Univ.)	Deer	22	22	22	22
Feb 2019	GA (Univ. of Georgia)	Squirrel	21	18	20	16
Mar 2019	MI (Michigan Technical University)	Deer	21	20	11	11
Apr 2019	KS (Kansas State Univ.	Pheasant	11	15	9	9
Apr 2019	NY (Cornell Univ.)	Pheasant	16	18	15	13
Aug 2019	WI (University of Wisconsin Madison)	Deer	9	7	6	6
Oct 2019	KY (Univ. of Kentucky)	Deer	12	12	6	5
Oct 2019	NC (NC State Univ.)	Deer	24	36	25	25
Oct 2019	OR (Oregon State Univ.)	Duck	20	14	15	13
Oct 2019	SD (South Dakota State Univ.)	Pheasant and Deer	11	11	11	11
Oct 2019	SC (Clemson Univ.)	Deer	17	17	17	17
Nov 2019	SC (Clemson Univ.)	Deer	22	22	22	22
Nov 2019	CO (Univ. Northern CO)	Deer	17	19	17	17
Nov 2019	TX (Texas A&M)	Deer	13	21	12	12
Feb 2020	VA (Virginia Tech)	Squirrel	15	24	8	8
		Total	**271**	**302**	**237**	**227**

Note: Web-based pre-workshop surveys were available to all individuals who registered for the workshop in advance. Not everyone who registered attended the clinic, however, resulting in cases where the number of completed pre-workshop surveys were higher than the number of actual participants. Additionally, not everyone who attended the workshops completed a pre and/or post survey, also leading to differences in the respective sample sizes.

Workshop Participants (RQ1)

Description of Participants

According to the pre-workshop surveys, a majority (72%) of individuals who registered for the workshops were undergraduate students, 25% were graduate students, and 3% were recent graduates, university employees, or partners/spouses of current students. About 30% of registrants were 21 years or younger, 74% were under age 25, and 90% were younger than 30 years old. Almost half (42%) of registrants were womxn. Only 17% of registrants were from small towns or rural areas, with many coming from large cities (28%), medium-sized cities and suburbs (21%), and small cities (31%). About three quarters (73%) of registrants were white. Other racial/ethnic groups that were represented in our sample were Black students (4%), Latinx students (9%), Asian students (15%), and Middle Eastern, Indigenous American, mixed race and Pacific Islander students (6%). Only 21% of registrants were members of some type of environmental organization (e.g., The Nature Conservancy, Sierra Club), and only 14% were members of wildlife specific hunting or fishing organizations (e.g., Ducks Unlimited, NWTF). However, registrants did engage in a variety of other outdoor recreation activities including hiking (83%), camping (68%), canoeing/kayaking (54%), jogging (54%), adventure sports (e.g., snowboarding, rock climbing) (50%), and wildlife viewing and photography (40%). Over half (62%) of the registrants had shopped at local farmers' markets and 32% engaged in edible gardening, highlighting the interest in local and ethically sourced food products among many participants. Student registrants came from a variety of academic disciplines. Unsurprisingly, about half (45%) of registrants were in majors focusing on agriculture or natural resource management related fields (e.g. wildlife and fisheries, parks recreation and tourism management, agriculture). However, 38% of students were studying other STEM disciplines (e.g. engineering, life sciences, math, tech), 8% were majoring in social sciences or humanities (e.g., anthropology, communication, psychology, health and human sciences), and 4% were majoring in business or management related disciplines (e.g., accounting, business, economics).

Hunting Participation (Before Workshops)

Over three quarters (84%) of workshop registrants had never been hunting before (including 7% that had accompanied a hunter into the field previously). Only 16% had been hunting prior to the workshop experience (in most cases, the participant had not hunted the focal

species of the workshop). Of the 49 students that had previous hunting experience, 40% had their first hunting experience at 16 years or older. Only 4% of those with previous experience had been hunting more than 10 times in the 12 months prior to the hunting workshop, with 70% hunting either only one time or not at all.

Overall, registrants had relatively little previous exposure to hunting through their families (e.g., 24% had parents/guardians or siblings who hunt, 21% had grandparents who hunt, 39% had aunts, uncles or other extended relatives who hunt). However, over half the registrants (53%) reported having friends who hunt. Students that hunted in the past had higher proportions of immediate, extended, and non-relative social support; however, 49% of students with no hunting experience still reported having friends who hunt.

Few registrants engaged in activities related to hunting prior to the workshop experience. Participating in recreational shooting (16% participated often or very often) followed by viewing media about hunting (e.g., blogs, social media posts, YouTube videos) (14%), though rare, were the most common activities. Regardless of previous hunting experience, few registrants watched TV shows or play video games related to hunting (12%), talk to family or friends about hunting (12%), eat game meat through hunting (12%), or read magazines about hunting (3%). Past hunters were significantly more likely than non-hunters to participate in all of those activities except watch TV shows or play video games about hunting. Overall, regardless of previous hunting experience, registrants reported relatively limited previous engagement with hunting and the hunting community.

Confidence in Hunting Knowledge and Skills (Before the Workshop)

Entering the workshops, registrants reported low levels of confidence in most hunting-related skills, with the exception of firearm safety (Table 3.2.1). Only 6% of students were "confident" or "extremely confident" in their overall hunting-related skills and knowledge. About 41% of students were "confident" or "extremely confident" in their ability to safely handle firearms; however, only 27% were confident in their shooting skills. About 21% were confident in their ability to cook and prepare game meat. Initial confidence rates were much lower in other areas. Less than 10% of students felt confident in their knowledge of hunting regulations (8% confident or extremely confident), their ability to choose the right hunting gear

(8%), scout (6%), recover game from the field (5%), and their ability to butcher and preserve game meat (5%).

Motivations for hunting participation

Student registrants' strongest motivation for hunting was to be closer to nature (50% rated it as "very important"). To contribute to wildlife conservation (46%), to obtain local, free-range meat (44%), and to control wildlife populations that are damaging to ecosystems (43%) were the next most popular motivations (Table 3.1.2). The least important motivations appeared to be to harvest a trophy animal (4%) and to engage in sport and recreation (14%) (Table 3.1.2). Overall, college student participants were highly motivated to participate in hunting for altruistic and food related motivations. Significant differences in motivations between individuals with and without previous hunting experience were observed for two items: Harvest a trophy (students who have been hunting were more strongly motivated to hunt for this reason, $\chi^2(6) = 23.55$ $p = 0.001$), and seek a new adventure (students who have no previous hunting experience were more strongly motivated to hunt for this reason, $\chi^2(6) = 14.19$ $p = 0.028$).

Table 3.1.2. Mean ratings of motivations for hunting reported by students who registered to attend a "getting started outdoors" hunting workshop (n=298)

Motivations for Hunting	% Very Important	Mean Rating
Food Motivations[a]	**45%**	**3.03**
To obtain local, free range meat	44%	3.08
To connect more closely to sources of food	39%	2.98
Altruistic Motivations[a]	**39%**	**3.01**
To contribute to wildlife conservation	46%	3.14
To control wildlife populations that are damaging ecosystems	43%	3.03
To control wildlife populations that are causing problems for people	33%	2.85
Egoistic Motivations[a]	**23%**	**2.87**
To be closer to nature and the outdoors	50%	3.27
To seek a new adventure	41%	3.17
To test and challenge my outdoor skills	33%	2.97
To relax or escape from everyday life	24%	2.69
To spend time with family and friends	24%	2.70
To engage in sport and/or recreation	14%	2.43
Trophy Motivations	**4%**	**1.57**
To harvest a trophy animal	4%	1.57

Rated on a scale from 1 = "Not at all important" to 4 = "Very important"; Includes pre-workshop survey data only (n = 298).

[a]% of index score greater than 3.5

Barriers to Hunting Participation (Before the Workshop)

Participants were also asked about potential barriers to hunting participation before the workshop. Prior to the workshop experience, the most common barrier was lacking the skills and knowledge required to hunt (78%) (Table 3.2.2). The next most commonly referenced barriers were not having anyone to go hunting with (73%), lacking the skills and knowledge to prepare game meat (70%), and not knowing where to go hunting (63%). Overall, barriers related to skills and knowledge were cited the most, followed by logistics-related barriers. Constraints related to moral dilemmas, comfort in the outdoors, and judgement from others did not appear to affect many registrants.

Beliefs about Hunters and Hunting (Before the Workshop)

Participants generally expressed positive views of hunting and hunters prior to the workshop (Table 3.2.3). The highest levels of agreement related to the statements about hunting: "Hunting provides a direct way to connect with nature and ecosystems" (92% agreeing or strongly agreeing), and "Hunting can be an ethical means to acquire locally sourced meat" (89%). Positive views about hunters were slightly less pronounced but most students still agreed with statements like "Hunters financially contribute to wildlife conservation" (80% agreeing or strongly agreeing) and "Hunters care about conserving wildlife and natural resources" (65%).

Student Expectations and Learning Goals

Open ended questions allowed participants to articulate expectations and identify topics of interest before the workshop, enabling managers and staff to have a deeper understanding of how to workshop agendas to align with participants' learning goals. Most registrants (72%) expressed interest in learning basic and general hunting knowledge and skills (Table 3.1.3). General knowledge and skills inquiries included topics such as learning about rules, laws and regulation, how to get started, and learning the entirety of the hunting process from scouting and gear preparation to field dressing and meat processing. Interest in learning more about game meat processing and preparation (25%) and firearm skills and safety (22%) were also popular responses. Some registrants also sought deeper awareness of hunting culture and ethics (15%) and conservation connections (9%), two threads that traditional R3 workshops might not regularly emphasize.

Table 3.1.3. Workshop expectations and learning goals (by theme) listed by college students participating in R3 workshops (n = 302).

Themes	% mentioned	Example Quotes
General hunting knowledge and skills	72%	• Learning about how to get started with hunting (state/federal laws, what gear I would need, seasons) • Gain a better understanding of the in's and out's of licenses, where to hunt, etc. • I hope to gain more knowledge on technique, locations, and tips for hunting. As well as hopefully get a couple of buddies to come with me. • I want to gain knowledge about what the process of hunting is like, from gear, to technique, to harvesting and preparation. I have never been on a hunt or deliberately killed an animal for food, and I think this workshop looks like a wonderful opportunity
Game meat processing and preparation	25%	• I am also curious about how local game meat could be regulated, so it could be distributed on a broader scale. I have an interest in social justice and food insecurity issues, and a lot of times those who are food insecure are lacking sufficient protein in their diet. I wonder how controlled hunting of deer could be managed on policy level to address this issue while also of addressing the wellbeing of the deer, the ecological problems associated with the overpopulation of deer and the safety risks Der overpopulation poses for people. • How to properly clean and prepare game • An understanding of how to dress and cook game meat • I'm excited to also learn how to preserve and cook wild game.
Firearm skills and safety	22%	• To learn better firearm safety • Learn firearm laws and learn about the ethics of hunting. • I would like to learn more about how to properly handle a hunting rifle and proper hunting practices. • Learning about firearm regulations in NC and trying to balance that with my personal aversion to firearms.
Logistics	17%	• Learn where I can hunt. Learn about local hunting methods. • Knowledge about and access to hunting • Gain understanding of how people actually hunt- where, when, how, etc. • Mainly how a beginner can start getting involved in hunting and if there are groups that I can hunt with
Hunting culture and ethics	15%	• To gain knowledge about hunting and hunting culture. To understand the reasoning around hunting • Understanding utilitarian perspectives better • More understanding of the how hunting is viewed through multiple view points • Learn how individuals who come from a non-hunting background can get started hunting • Having an honest, real, conversation/interaction with a hunter with no fear of judgement on either side.

Table 3.1.3. (Continued).

Conservation connections	9%	• How hunting contributes to wildlife conservations and how to hunt in general • I want to learn more about how hunting helps protect the environment and our ecosystems • I would also like to hear more about hunters' contribution to wildlife conservation. • I would like to learn how hunting locally helps in wildlife conservation. • Experience and understand hunting as a tool for conservation/connection to nature
Other	10%	• I want a new reason to get outside • Hunting certification • Have a fun Saturday • I am a fly-fisher, so I am excited to learn about another way to connect to the outdoors.

Workshop Outcomes and Impacts (RQ2)

Confidence in Hunting Knowledge/skills (Before and After Workshop)

Entering the workshops, registrants reported low levels of confidence in most hunting-related skills except firearm safety (Table 3.2.1). Participants were significantly more confident in every hunting-related skill after completing the workshop (Table 3.2.1). Following the workshop, 40% of participants said they were confident (or extremely confident) in their overall hunting-related skills and knowledge; 73% of students were confident in ethical shot placement, 69% were confident in their ability to safely handle a firearm, and 57% of students were confident in shooting skills. Substantial confidence increases were made with other skills such as cooking and preparing game meat (65% confident or extremely confident), knowledge of hunting regulations (50%), and choosing the right hunting gear (43%). Fewer participants expressed confidence with respect to field recovery (39%), butchering and preserving game meat (37%), and scouting hunting locations (30%), though all of these ratios were significantly higher than those on the pre-workshop survey.

Table 3.2.1. Mean ratings of confidence in various hunting-related skills reported by college students before and after attending hunting workshops (n=222)

Hunting-Related Skill	Pre-Workshop (Mean)	Post-Workshop Change (Mean Difference)	% "Confident" or "Very Confident" Pre-Workshop	% "Confident" or "Very Confident" Post-Workshop
Overall Confidence	**1.67**	**+1.6*** **	**6%**	**40%**
Ethical shot placement	2.00	+1.84***	15%	73%
Hunting regulations (seasons, license requirements, etc.)	1.73	+1.71***	8%	50%
Field recovery/dressing of game	1.46	+1.69***	5%	39%
Choosing the right hunting gear	1.69	+1.64***	8%	43%
Butchering and preserving game meat	1.40	+1.54***	5%	37%
Scouting and selecting good hunting spots	1.48	+1.52***	6%	30%
Cooking harvested game meat	2.21	+1.52***	21%	65%
Shooting skills	2.49	+1.03***	27%	57%
Firearm safety	2.89	+0.95***	41%	69%

Rated on a scale from 1 = "Not at all confident" to 5 = "Extremely confident"; Includes pre and post-workshop survey data.
Note: Means were calculated using only pre/post paired sample (n = 222), percentages using individual samples (n = 295 for pre, n=237 for post). *, **, *** denote statistically significant paired t-test at $\alpha = 0.05$, 0.01, and 0.001, respectively.

Barriers to Hunting

Participants were also asked about potential barriers to hunting participation before and after the workshop. As noted above, prior to the workshop experience, the most common barriers to hunting centered on a lack of knowledge and skills (Table 3.2.2). The workshops successfully minimized almost all barriers to hunting, and especially barriers related to knowledge and skills. Only about a quarter of participants believed these were still barriers to hunting participation after the workshop experience (Table 3.2.2). However, three other patterns emerged. There was not a significant difference between pre and post-workshop perception of costs as a barrier to hunting, suggesting that even with a workshop, college students still perceive financial barriers to participating in hunting. While there was a significant decrease in students referencing not having anyone to hunt with as a barrier to participation, 51% of students still noted this as problematic after the workshop, making it the second most prominent post-workshop barrier. Additionally, following the workshop, more students were likely to report lacking free time required to hunt.

Table 3.2.2. Barriers to hunting reported by college students before and after attending hunting workshops (n = 223)

Potential Barriers to Hunting[a]	% of Respondents Reporting Barrier		Sig. Diff?
	Pre-Workshop	Post-Workshop	
Time Competition			
Would rather do other activities	17%	19%	
Moral Objections and Comfort			
Have a moral/ethical objection to hunting	5%	1%	**
Don't feel comfortable around hunters and hunting culture	11%	3%	***
Don't feel comfortable around firearms or hunting equipment	12%	8%	**
Reluctant to personally kill an animal	18%	16%	**
Lack Skills and Knowledge			
Unsure of how/where to store equipment and firearms	34%	27%	**
Costs associated with hunting (license, tags, equipment, firearms, travel, etc.)	51%	50%	
Lack of knowledge about hunting and firearm laws	57%	17%	***
Have not completed a hunter education course	61%	28%	***
Lack knowledge/skills required to prepare game meat to eat	70%	26%	***
Lack knowledge/skills required to hunt	78%	27%	***
Logistics			
Moved away from the area I typically hunt to attend college	10%	10%	
Lack transportation to get to hunting areas	13%	11%	
Lack of available hunting land where I currently live	30%	18%	**
Lack free time required to hunt	46%	61%	***
Don't know where I'm allowed to hunt	63%	25%	***
Don't have anyone to go hunting with	72%	51%	***
Judgement and Experiences			
Feel discouraged or frightened by negative experiences I've had in the outdoors	1%	0%	
Worried non-hunting family and friends may judge me	7%	7%	
Don't feel comfortable due to the lack of racial/ethnic diversity associated with hunting	9%	4%	*

*, **, *** denote statistical significance of pre-post paired t-test comparison a $\alpha = 0.05, 0.01, 0.001$, respectively (n = 223).

[a]Barriers rated as yes/no binary variable from a "check all that apply" survey question.

Beliefs about Hunters and Hunting (Before and After the Workshop)

After the workshop, the beliefs about hunters and hunting that participants expressed before the workshop became even more positive (Table 3.2.3). For example, 97% of students agreed or strongly agreed that "Hunters financially contribute to conservation," 96% thought people who want to hunt should be provided an opportunity to do so, and 94% agreed that hunting has a positive impact on wildlife conservation. After the workshop, at least 84% of students agreed or strongly agreed with any of the statements regarding beliefs about hunters and hunting, with 89% reporting positive or very positive beliefs overall. All pre-post changes were significant, meaning that while students did enter the workshop with generally positive beliefs about hunters and hunting, the workshop significantly increased/amplified those beliefs.

Table 3.2.3. Mean ratings for perceptions of hunters and hunting reported by college students before and after attending hunting workshops[a] (n = 233)

Statement About Hunting[a]	Pre-Workshop (Mean)	Post-Workshop Change (from Pre) (Mean Diff)	Sig. Diff?	% Agree or Strongly Agree Pre	% Agree or Strongly Agree Post
Overall Beliefs[b]	**4.05**	**+0.38**	***	**58%**	**89%**
Wildlife conservation is very important to me	4.48	+0.20	***	89%	96%
Hunting can be an ethical means to acquire locally sourced meat	4.41	+0.25	***	89%	98%
Hunting provides a direct way to connect with nature and ecosystems	4.38	+0.27	***	92%	98%
Hunters financially contribute to wildlife conservation	4.23	+0.43	***	80%	97%
People who want to hunt should be provided an opportunity to do so	4.12	+0.33	***	84%	96%
Hunting is a wise use of natural resources	4.06	+0.38	***	79%	95%
Hunting has a positive impact on wildlife conservation	4.01	+0.40	***	70%	94%
Hunters care about conserving wildlife and natural resources	3.81	+0.57	***	65%	91%
Hunters behave responsibly and follow hunting laws	3.75	+0.38	***	60%	84%
Hunting is a safe activity	3.61	+0.42	***	59%	87%

Means based on pre and post workshop survey data. *, **, and *** denote statistically significant of pre-post paired t-test comparison at $\alpha = 0.05, 0.01, 0.001$, respectively (n = 223). % strongly agree pre based on all registrants who completed a pre-survey (n=295). % strongly agree post was based on all respondents to post survey (n = 233).

[a]Rated on a scale from 1 = "Strongly Disagree" to 5 = "Strongly Agree."

[b]% of index score greater than 4

Hunting Participation (After the workshop)

Following the workshop experience, 50% of participants said they would definitely hunt in the future, 34% said they would probably hunt in the future, and 13% said they're not sure about hunting in the future (Figure 3.2.4). Additionally, a majority of students indicated that they were likely or very likely to participate in hunting related behaviors following the workshop experience. For example, 94% said they would eat game meat obtained through hunting, 91% said they would befriend a hunter, 83% said they would take an additional hunter's education course, and 82% said they would purchase a hunting license (Table 2.3.4). About 74% said they would likely hunt deer after the workshop and 71% said they would hunt another species (e.g., turkey, pheasant, grouse, elk). About 52% of participants said they would likely hunt with another participant from the workshop.

Table 3.2.4. College students' self-reported intent to participate in hunting-related behaviors based on survey responses following r3 workshops (n = 232)

Hunting Related Behavior	Mean	SD	% Likely to Do It	% Very Likely to Do It
Hunt[a]	**4.29**	**0.84**	**34%**	**50%**
Purchase a hunting license[b]	4.63	0.91	32%	51%
Attend a hunter education course or another workshop[b]	4.20	0.87	39%	43%
Hunt deer[b]	4.04	0.98	36%	39%
Hunt any other species (turkey, waterfowl, small birds or game, etc.)[b]	3.98	0.99	35%	36%
Go on any type of hunt with another participant from the workshop[b]	3.63	1.11	24%	29%
Become friends with someone who is a hunter[b]	4.46	0.67	36%	56%
Eat game meat obtained through hunting[b]	4.64	0.70	22%	72%

[a]Rated on a scale from 1 = "I will definitely NOT hunt" to 5 = "I will definitely hunt" based on all respondents to post workshop survey (n = 232).
[b]Rated on a scale from 1 = "Very Unlikely" to 5 = "Very Likely." Means and % likely and very likely based on all respondents to post workshop survey (n = 232).

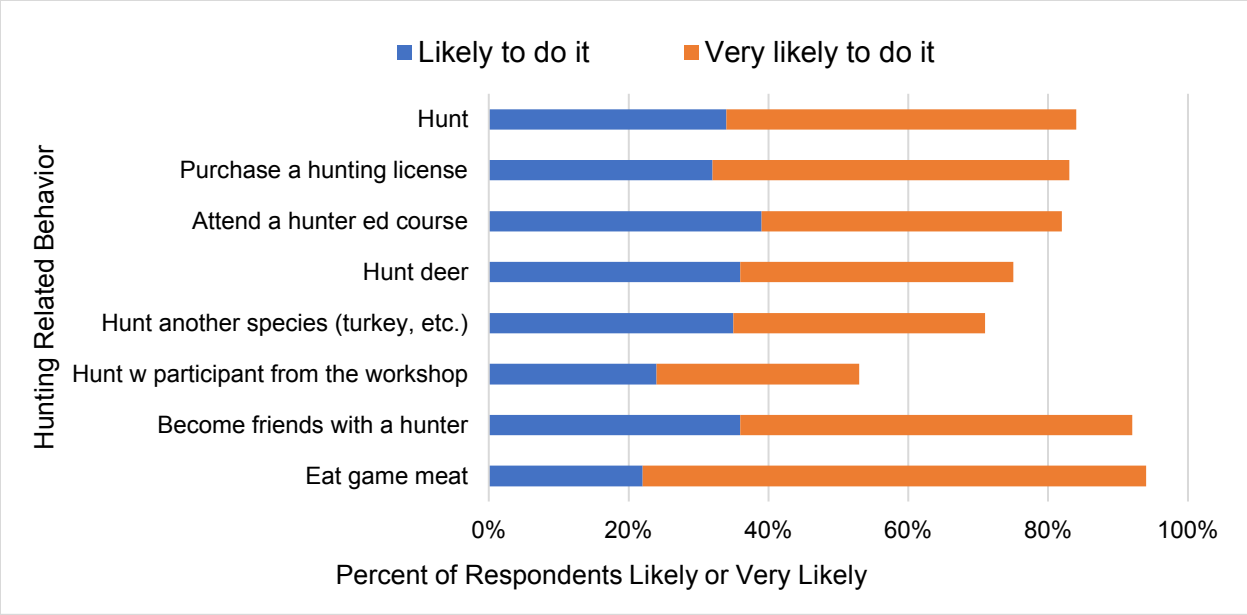

Figure 3.2.1. College students' self-reported intent to participate in hunting-related behaviors based on survey responses following R3 workshops. Rated on a scale from 1 = "Very Unlikely" to 5 = "Very Likely." % likely and very likely based on all respondents to post workshop survey (n = 232). Note: "Hunt" item was rated on a scale from 1 = "I will definitely NOT hunt" to 5 = "I will definitely hunt" based on all respondents to post workshop survey (n = 232).

Participant Feedback and Evaluation (RQ3)

Overall Ratings of Workshop and Specific Workshop Components

College student participants rated their overall experience in the workshops as very positive, reporting a mean score of 4.75 (on a scale ranging from 1 = Very negative to 5 = Very positive); 99% of students said their overall experience was positive or very positive (77% very positive). A majority (80%) of students also indicated that each aspect of the workshop was "good" or "very good" (Table 3.3.1), with the highest ratings for items related instructors' knowledge and experience, quality of information, and instructors' ability to explain and demonstrate. Most participants also indicated that the skill level of the program, program length, and the number of participants was about right, with 96%, 95%, and 87% agreeing with each aspect, respectively. While all specific workshop components were highly rated, the two generally receiving lowest scores (though about half of students still rated them as very good) were the discussion of scouting and game recovery and the discussion of cooking and game meat preparation (Table 3.3.1).

Most college students agreed that workshops were effective or very effective in achieving their intended goals with respect to increasing the likelihood of future hunting participation,

increasing interest in hunting, and providing participants with skills needed to hunt (Table 3.3.2). Though generally effective, it appears that there is additional room for growth with respect to two outcomes: building knowledge/skills relating to game meat preparation, helping facilitate hunting with friends and family.

Table 3.3.1. College student mean ratings of specific elements of hunting workshops

Element of Hunting Workshop	Mean Rating	% Good	% Very Good
Overall experience	**4.75**	**22%**	**77%**
Instructors' knowledge and experience	4.89	11%	89%
Instructors' ability to explain and demonstrate	4.74	18%	78%
Quality of information/instruction	4.67	30%	69%
Usefulness and practicality of information/instruction	4.57	32%	63%
Amount of information/instruction	4.52	38%	57%
Discussion of firearm safety and marksmanship	4.55	30%	63%
Discussion of hunting gear and equipment	4.50	30%	60%
Discussion of hunting rules and regulations	4.46	36%	56%
Discussion of hunting-conservation connections	4.40	32%	55%
Discussion of game meat processing	4.37	32%	54%
Discussion of cooking, game meat preparation	4.31	30%	51%
Discussion of scouting and game recovery	4.25	35%	46%

Rated on a scale from 1 = Very Poor to 5 = Very Good; based on post-workshop survey data (n = 236).

Table 3.3.2. College students' mean ratings of hunting workshops' efficacy in achieving various intended outcomes

Intended Outcome	Mean Rating	% Effective	% Very Effective
Increasing your interest in hunting	3.60	27%	67%
Increasing your knowledge of the role hunters play in conservation	3.39	33%	54%
Providing you with the skills/knowledge needed to begin hunting safely	3.36	41%	48%
Providing opportunities to meet and connect with fellow hunters	3.27	36%	46%
Providing you with the skills/knowledge needed to clean and prepare wild game meat	3.10	42%	35%
Helping you facilitate hunting with your family and friends	2.96	36%	33%

Rated on a scale from 1 = Not at all Effective to 4 = Very Effective; Based on post-workshop survey data (n = 235).

Positive Feedback Regarding the Workshop

Open-ended questions allowed students to highlight aspects of the workshop they enjoyed the most (Table 3.3.3). Participants generally loved the array of hands-on activities, the chance to talk open and honestly with current hunters, and appreciated the wealth of new information and knowledge gained from the experience. For many students, the most enjoyable aspects of the workshop were skills sessions on general hunting skills and knowledge (noted by about 57% of respondents), firearm skills and safety (35%) and game meat and food preparation (31%). Participants also cited workshop structure and design favorably. For example, around 19% of participants mentioned that simply having demographically diverse volunteers that were enthusiastic and knowledgeable, or getting the opportunity to talk with current hunters and confront stereotypes, were highlights of the workshop. Some also mentioned that, compared to classroom lessons, the workshop structure and design featuring hands-on activities and small group sessions (especially those occurring outdoors) were particularly effective in increasing interest and confidence in hunting.

Overall, many participants seemed to enjoy everything. As one participant from NY noted: "I enjoyed the entire experience. The comprehensive nature of the workshop provided me with a new perspective on hunting." This student's reflection summarizes the importance of a comprehensive workshop for new hunters that takes students through the entire hunt process. A newcomer from NC highlighted a specific benefit: "I liked the connections with current hunters the most and I thought the open Q&A was one of the most helpful sessions of the workshop. The Q&A helped to summarize what we had learned and understand how it all applied to us as 'new hunters'" and another NC student noted, "I think the very safe space for two groups that usually don't interact in a casual and comfortable way to do so comfortably; I think it was a very good group of people instructing, and that they did a great job of breaking hunting stereotypes." Many participants appreciated the culinary connections, a sentiment captured by comments like: "I really enjoyed cleaning the pheasant! I have never done that before. And of course, cooking with it was really enjoyable!" Others simply enjoyed interacting with others who share similar values and getting to spend time outdoors.

Table 3.3.3. Aspects of workshops that student participants enjoyed the most (n = 237)

Theme	% mentioned	Example Quotes
General Skills and Knowledge	57%	• Explaining the basics of every area really helped. • Tracking and scouting were two skills that I thought were very helpful and super engaging. • What I enjoyed most was being able to walk my way through the entire process so that I never felt overwhelmed at all. The most helpful skills I think I learned were listening for the sounds of squirrels and identifying areas they would be present, which is something I don't think I would have been able to do if I had just learned it in a classroom. • Rules and Regs. Enjoyed learning tactics and info on how to actually hunt
Firearm Skills and Safety	35%	• The part I enjoyed the most was the marksmanship where I got to shoot a crossbow and a rifle. • I enjoyed the shooting range aspect of it. I personally would have enjoyed more time at the range. • I liked the one on one help in learning how to handle a shotgun
Game Meat and Food Prep	31%	• I really liked the cooking portion; it was nice to see the end product of hunting. • My favorite part was processing the pheasant and learning how to process game birds. This was one thing that I've always been anxious of when considering hunting. • The part that got me the most excited to go hunting was the butchering demonstration at the end because it showed the end result of the hunt.
Workshop Structure and Design	22%	• The opportunity to spend time in a outdoor environment while learning about conservation practices. I found every aspect of the learn to hunt program was helpful and I thought it was interesting that each mentor and instructor had different personal experiences with hunting and could each offer their own advice for hunting. • Course was hands on and I liked being broken into smaller groups. I was interested in all the topics covered so it was a great overview from the basics of finding deer to shooting, decision making, and finally meal prep. • I really enjoyed being able to do hands on activities like tracking the deer or field dressing the pheasant because most of what I knew hunting wise was just information but to be able to apply it to real situations was very helpful.
Social Connections to Hunting Community	19%	• The volunteer hunters were very knowledgeable, approachable, and gave great insights to what hunting means to them. • I enjoyed getting to converse with the local hunters and how they felt about hunting. It was nice to see so many aspects of society (hunters, biologists, state wildlife commissioners) together talking about the benefits of hunting. • Also, all the instructors were terribly friendly and approachable, and may have broken some expectations about what a "hunter" looks like. • I appreciated the vibrancy of the staff's personalities. It was clear they were having fun and wanted us to as well. I think that strategy was effective in my learning process as I felt less intimidated.

Table 3.3.3. (Continued).

Conservation Connections	7%	• It was a great opportunity to get out of my comfort zone… This also taught me that the stereotypes for hunters are wrong. I liked that we talked about conservation and hunting, how they go hand in hand. • Really learning the connection between conservation and hunting was very helpful and useful information since I went in not really knowing anything about hunting. • I loved the conversations and discussions about hunting and conservation, and the role hunters play in wildlife management.
Other	3%	• While I do not know if I will actively pursue hunting as a hobby or a personal means of food supply, I understand ways that I can still become involved and support it (organizations to join and policies to support). The ethics related to shooting and recovery as well as meat preparation was most useful and interesting to me. • I enjoyed it all! It's really difficult to pick a favorite topic. You guys covered every question I would have thought to ask, right before I asked them.

Areas for Improvement

When asked if there was "anything else we could have done to make the experience more effective or enjoyable", most respondents said "I thought this course was great. There really isn't anything I would change" and "I loved it; I can't think of anything to change." While feedback from the workshop was largely positive, some participants commented on aspects of the workshop that they disliked. Overall, more than half of respondents made suggestions on areas for improvement.

Some students (13%) noted factors outside the control of managers, which naturally varied between workshops. Many of these complaints were weather-related, especially in cases where sheltered (or indoor) spaces for cleaning and prepping wild game meat were not available. Weather conditions and the time of season also impacted the harvest opportunities. A student from GA effectively summarized this sentiment: "The time of year at which the program was held hindered the quality of the hunt, no game was harvested. Despite this, the entire program was helpful and informative, as well as incredibly enjoyable!"

Commonly cited "things liked the least" also included critiques about workshop format and the general timing of activities, which naturally varied based on workshop format. In general, participants seemed to favor hands-on, participatory learning over more conventional lecture-style teaching. For example, one student from VA said, "I would have liked some more in-person and physical examples of things. While the short videos and in-person discussions

were good, personally I learn almost solely from physical and visual tools." Another student, from SC, said, "There was nothing I disliked about this course, but if there was a way to make things even more hands on, that would be great. I honestly just wish I could have spent more time shooting, cleaning the animal, etc." Some individuals with little or no hunting experience craved more details and felt the course moved too quickly, while others wanted more time to practice outside of the classroom or thought there was too much information covered in a short time period. For example, another student from SC noted, "The regulations section could be more organized. The info was good, but a bit confusing when it was a lot of info. The other sections had less info so they were easier to digest."

Beyond workshop format and design, a number of students expressed a desire for more diverse instructors, both in terms demographic characteristics and previous hunting experiences. About 10% of respondents reported discomfort or disappointment with instructors and/or content delivery. Some of these students found it hard to relate to instructors who were law enforcement officers, and they expressed interest in instructors that could better identify and empathize with participants' backgrounds and experiences. As one student from SC said, "Not a huge fan of cops so I was a little wary of them the whole time. That being said, they were very good at making me as comfortable as possible. Would like to see more diversity among instructors and participants." Another student, from VA, referenced a similar case, "Hearing the police officers tell stories about their childhood was not very applicable." Many students were apprehensive about learning a new skill as an adult and expressed discomfort when experienced but insensitive instructors made them feel incompetent. As one student from KS put it, "Felt a little stupid sometimes because of how little I did know before the course. [But] I understand it can be a hard balance between helping people understand without making them feel belittled." Most workshop instructors, who were volunteers from state agencies, partnering NGOs, or hunting club community members, were not trained as teachers. This led to comments about instructors' delivery of information and cultural sensitivity, summarized perfectly by one NC participant: "I think if the goal here is to convince a lot of college kids to go hunting, there needs to be more of a focus on bringing in instructors that are culturally closer to the students." It was reported that one of the instructors said "now girls, don't you worry, we scared all the snakes out of the woods this morning so there's nothing to be worried about," to which a female identifying student from NC responded, "We wouldn't have minded seeing a snake, actually." She further reflected, "This

is a clear demonstration of the cultural distance between these groups in interpreting a statement like that (paternalistic chivalry vs. sexism)". Future workshop planners should invest considerable effort to find instructors that can relate to and communicate more effectively with the college population.

Some students (11%) did not have any complaints about the workshop they attended, but still provided suggestions for the future. For example, they wanted more take-home resources, an additional intermediate level workshop, or future opportunities for mentored hunts, shooting practice, or other follow-up discussions. One student from SC said, "Providing more external resources where we can find all this info again or find more in-depth info. Also, provide more resources for groups to go hunting with or land where hunting is allowed," suggesting that continued support after the workshop is important. Another student from SC asked for external resources in the form of a "good beginner's kit (gun, stand, knife, etc.) that we could buy for cheap or where to rent these things. And a list of places to hunt/opportunities." Many students emphasized the importance of a mentored hunt opportunity and the ability to find hunting mentors after the workshop. These comments indicated that although attendees may not be ready to hunt on their own after the workshop, they remain interested in learning more about hunting and hunting culture.

About 8% of students provided comments that did not align with previously mentioned categories. Some spoke to the process of recruiting student participants in the workshops. A student from GA mentioned, "I think an information session for those who aren't sure if they're interested [in attending a workshop] might be a good idea at the start of the program." Another student (NC) thought limiting the workshop to novice hunters would be preferable: "Not that having a few people there who have hunted before detracted majorly, but there were definitely instances where I felt frustrated having people who clearly knew more than I did speak up before I had an opportunity too."

Overall Impact of Workshop Experience

A final set of open-ended questions allowed participants to reflect on the experience and highlight lasting impacts of the programs. Many students talked about how the workshop increased their hunting-related knowledge, skills, and confidence, ultimately leading to future pro-hunting behaviors. For example, one student from the CO noted "I was more curious than

anything about hunting, but after this workshop I've decided I want to get my small game license and hunt with some of the people I met in the workshop." Other participants discussed how much they had learned (and retained) about hunting skills and knowledge. As one student from GA put it: "Before entering this program I had no knowledge at all about hunting, but this program has shaped be into being a safe hunter and having proper techniques while aiming and holding a firearm. I have noticed a lot about wildlife and how it is very important to conserve it." Several students noted that they now felt more prepared, confident, and excited to hunt in the future (many mentioning mentored hunt experiences). Of these students, some mentioned that they've been previously interested in hunting and the workshop gave them a perfect starting place for pursuing hunting; other students said they've never been highly motivated to hunt, but the workshop changed their views so much that they were now interested in pursuing hunting opportunities.

Many students recognized cognitive changes and benefits that went beyond tangible hunting skills and knowledge. Several students mentioned how much their views on ethical hunting changed and how they exited the workshop with a more solidified understanding of the connections between hunters and conservation. This pattern was effectively summarized by one participant from NY: "I thought that hunting was for people who simply liked to kill things. I realized there is a philosophy to hunting and that hunters have a huge respect for all of the animals they hunt and the environment they hunt in." Some students reflected that after learning in the workshop, they'd like to try hunting, like this student from NY who said, "Before I was on the fence about hunting, with mostly negative opinions towards it; now I would like to receive my hunter's license."

Some students reported a similar change in attitudes yet still expressed apprehension about hunting: "While I still do not have the want to ever hunt, the workshop definitely drastically changed my outlook on hunting culture for the better (NY)." One student from GA summarized the ideal workshop impact: "I went from being a non-hunter to an enthusiastic hunter. I am vocal about supporting hunting and conservation, and I have gotten family members into hunting because of this program. This program helped me connect my love of nature and conservation with locally-sourced food and my love of cooking. I will be participating in future hunting seasons, and I will advocate for hunting/fishing and wildlife conservation."

Despite these important gains, however, several participants also lamented the fact that they had not been hunting following the workshop. In most cases, this resulted from a lack of confidence and lack of social support. One NC student noted, "I feel empowered and ready to try hunting with a mentor." Another student from NC admitted, "I am more open to a shadowing hunting experience but I still don't think I want to shoot an animal myself. But I do definitely support hunting more, I would consider buying a license even if I don't want to hunt." These comments underscore the fact that, no matter how effective a hunting workshop is for any population of prospective hunters, additional forms of socialization and support are typically needed to ensure that new hunters are effectively recruited and retained.

Discussion & Implications

Our R3 workshops for college students attracted substantial interest among a diverse array of students, helped them build their knowledge and skills, and increased their likelihood of hunting in the future. Students also noted increases in interest in other pro-hunting related behaviors such as purchasing a hunting license, befriending a hunter, and eating game meat obtained through hunting. Overall, our study provided much needed-evidence to inform growing attempts to recruit new hunters and hunting advocates from non-traditional hunting backgrounds (Quartuch et al., 2017; Ringelman et al., 2020), revealing specific recommendations to improve recruiting and program design.

Recruiting Diverse Participants

From a recruiting standpoint, we found that workshop participants looked much different than the typical hunting population, supporting previous research indicating college students represent a diverse pool of potential hunters (Stayton et al., 2017). Compared to traditional hunters who are typically white males from rural areas (Larson et al., 2014), participants in our workshops were often womxn, non-white, and from urban areas. These numbers might be influenced by campus recruiting strategies, but they also suggest a strong interest in hunting among non-traditional hunting populations (Quartuch et al., 2017). Managers who hope to connect with NTPHs may need to adapt their traditional recruiting strategies to appeal to a more diverse audience. For example, with approximately half the participants identifying as female, creating an atmosphere where womxn's voices are central and amplified may help to recruit

more womxn and gender non-conforming individuals from the pool of potential hunters (Griffith, 2010). Another way to increase participant diversity is to increase instructor diversity, both in terms of demographic characteristics and hunting experiences (Dee, 2005; Holmes et al., 2007). While feedback on instructor quality and ability was largely positive, several impactful/compelling comments emerged. Most pervasive was the request for culturally sensitive and relatable instructors. Students from non-traditional hunting backgrounds wanted instructors that understood that they, unlike many hunters, did not grow up with positive views of hunting and the hunting community. Students found it easier to relate to instructors who were closer in age and who did not start hunting until later in life. Heterogeneity in the pool of instructors and mentors welcomes and includes participants of all backgrounds. Representation of students in instructors impacts the students' expectations, experiences, and ultimately learning outcomes (Dee, 2005). The Q&A and discussion sessions were highly valued, as they gave students a chance to get to know the instructors more intimately and led to positive perspective changes on views of hunters. To successfully recruit diverse participants (who may go on to become hunters), it is crucial that managers carefully consider who is staffing R3 programs and what messages and images they reinforce or disseminate.

Being close to nature and contributing to wildlife conservation were the top two motivations for hunting participation among workshop registrants, ranked just above obtaining local meat. These motivations are more altruistic than those seen in traditional hunting populations, yet may be more likely to resonate among non-hunters (Blascovich & Metcalf, 2019; Decker et al., 2015). The shift in motivations from personal, social, and egoistic reasons to more conservation-centered, altruistic, and ecology-focused reasons might reflect a change in public perceptions of hunting in general (Decker et al., 2015; Manfredo et al., 2016). These highly ranked motivations – coupled with participants' high levels of engagement in other forms of outdoor recreation such as hiking, camping, and adventure sports – underscore college students' desire to connect with nature. A majority of registrants also shopped at local farmers markets and over a quarter engaged in edible gardening, highlighting their desire for local and ethically sourced food products and illuminating potential connections between hunting and the local food movement (Stedman et al., 2017; Tidball et al., 2013).

These findings emphasize a potentially rich pool for recruiting new hunters: environmentally conscious outdoor recreation and nature-based groups on campus (e.g., outing

clubs, rock climbing clubs, wilderness experience courses, gardening courses and clubs). Other studies have shown that recruiting efforts focused on crossover outdoor recreation activities (RBFF, 2020) and local food connections (Stedman et al., 2017; Tidball et al., 2013) could be a fruitful gateway for recruiting new hunters and hunting advocates, and our findings suggest they may be especially important on college campuses. Reaching more diverse participants, including college students, may require similar recruiting strategies that go beyond traditional hunting spaces.

Past efforts to examine constraints to hunting participation have typically focused on existing sportspersons (Hinrichs et al., 2020; Metcalf et al., 2015; Schummer et al., 2020), but our study highlighted different barriers for individuals considering the activity for the first time. Other than a general absence of social support, limited hunting-related knowledge and skills were the primary obstacle to participation for NTPHs in our college student sample. Most workshop registrants held generally positive views of hunters and hunting and did not report being constrained by moral or ethical concerns. Assumptions that non-hunters universally objecting to hunting might therefore be misguided (Knezevic, 2009), for many non-hunters (such as college students in our study) may appreciate hunting in different contexts and for different purposes, and some might even be willing to try it.

Improving R3 Workshop Design for NTPHs

Overall, the workshops fueled students' desire to hunt and positively contribute to the hunting community. Student's strong intent to purchase a hunting license after the workshop suggests they may be poised to become future financial contributors to conservation, a primary goal of R3 initiatives (Price Tack et al., 2018). But their increasingly positive views of hunters and hunting and their growing connections to the broader hunting community (via eating game meat, befriending hunters, etc.) highlights the program's broader capacity to transform non-hunters into hunting supporters (Vayer et al., 2020), even if they never hunt in the future. Improving non-hunters attitudes towards conservation is a critical mechanism for generating public support for conservation and wildlife management (Blascovich & Metcalf, 2019; Decker et al., 2015). A workshop that effectively addresses these broader conservation benefits of hunting may therefore be critical to recruiting and retaining not just new hunters, but also

hunting advocates, helping to ensure that a larger and more diverse segment of the U.S. population will have a voice and space in the hunting community.

We observed significant post-workshop gains in students' confidence with respect to every hunting related skill that was assessed. In our programs, instructors were able to directly address existing skill and knowledge deficiencies through strategic design of sessions focused on topics such as: where to hunt, local laws and regulations, selecting and using hunting-related gear, scouting and game recovery, and firearms training (see Appendix 3.1). Sessions on butchering, processing, preparing, and cooking game meat, though slightly less effective in our current workshops, could be revised and addressed in the same manner – covering topics in more depth and allowing more time for hands-on practice. For example, students still emerged with some misconceptions and uncertainty about hunters' role in the conservation and hunting's connection to natural resource management, something that could be addressed in the future. Efforts to highlight conservation connections and effectively confront pre-existing beliefs about hunters and hunting might require deeper discussion and reflection. In addition to general hunting skills and knowledge, R3 managers could dive more deeply into these complex themes by facilitating Q&A sessions or informal conversations where students are free to interact with instructors and volunteers, learn more about their unique pathways into hunting, dissect assumptions about hunting culture, and reflect on the days experiences.

Workshops effectively helped address students' most significant barrier to hunting prior to the workshop – a lack of knowledge and skills. This included enhanced understanding of hunting rules and regulations (minimizing another prominent barrier), something that also influences participation of existing hunters (Barro & Manfredo, 2008; Hinrichs, 2019; Metcalf et al., 2015; Wright et al., 2001). It therefore appears that well-designed R3 workshops can effectively minimize key barriers to hunting for college students without previous hunting experience. However, the workshops did not significantly influence three constraints: costs associated with hunting, lacking someone to hunt with, and lacking free time to hunt. The shift from skills and knowledge barriers being most prominent before the workshop to logistical barriers being most prominent after the workshop (combined with the positive feedback we got about workshop content) suggests a hierarchal, nested model of barriers (Crawford et al., 1991; Shores et al., 2007). This means that once novice hunters overcome one set of barriers, they are faced with others that were not known previously. These trends have multiple implications for

R3 workshops targeting college students. First, financial barriers to hunting (e.g., equipment costs) are, and will continue to be, prominent for college students. When possible, we suggest offering workshops as free or low-cost opportunities for college students and strategically featuring gear and resources that are cost efficient to help college students negotiate financial barriers after the workshop when they go to acquire gear on their own. Second, negotiating prominent time constraints for college students (the most cited barrier post-workshop) will remain a persistent challenge. Third, while students were less likely to list lacking someone to hunt with as a barrier on the post-workshop survey, it remained the second highest overall barrier (after lack of free time). On open ended responses, several students mentioned they were ready to hunt, but not yet on their own. This aligns with the ORAM (Byrne & Dunfee, 2018) and underscores the critical value of sustained social support for college student NTPHs (Larson et al., 2014; Larson et al., 2017; Stayton et al., 2017; Stedman et al., 2017). Such support could be provided during workshops by allowing time for critical discussion and reflection about challenges and potential moral/ethical dilemmas. It might also be fostered post workshop through cultivated mentoring experiences, including mentored hunts (Enck et al., 1996; Hinrichs, 2019; Ringelman et al., 2020) and opportunities for students to connect with fellow hunters on campus.

While college students were highly satisfied with all aspects of the workshops, it was the session on firearm safety and marksmanship that students enjoyed the most. For example, 35% of students wrote specifically about marksmanship, many of them mentioning they would have even enjoyed more shooting practice. Students also enjoyed the game meat processing and food preparation sessions, often mentioning desiring more hands-on activities and more time for butchering and processing. Given the widespread interest in these food-centered themes among workshop attendees, these topics could be more strongly emphasized in future programs. Varying student feedback on the timing of sessions and depth of information highlights the importance of pre-workshop assessments for NTPHs. These assessments can help managers make adjustments to program content and structure based on the needs of specific audiences. For example, some participants requested slower paced sessions with more in depth information while others suggested more unstructured hands-on practice time. Rather than embracing a "one-size-fits-all" design, timing and depth of sessions could be adapted to align with audience needs,

integrating flexibility that will help R3 managers connect more effectively with diverse subpopulations of NTPHs.

Limitations and Future Research

Future research of R3 efforts could address several limitations of this study. Our pooled approach to analysis did not adequately account for variable responses among subgroups of participants (e.g., womxn, non-natural resource majors, first-time hunters lacking social support) in terms of their response to workshops and key outcome variables. Within-group differences and interactions among different groups (e.g., women from urban areas, Latinx students who are non-natural resource majors) may be particularly important when considering ways to make future workshops more culturally sensitive (Bixler et al., 1994; Floyd et al., 1994; Metcalf et al., 2015; Shinew et al., 2006).

Our data pooling approach did not account for variation across states and programs either. Despite efforts to standardize student recruitment, actual methods varied and yielded slightly different results. For example, the fact that many registrants were natural resource majors and some had previous hunting experience suggests that certain collaborators had trouble recruiting non-hunters and expanding beyond traditional hunting spheres. Because collaborators in each state exerted substantial freedom and flexibility with respect to workshop implementation, variability among workshop instructors and volunteers was another limitation. Our study did not investigate best practices for selecting and training instructors and volunteers – a critical component of any successful R3 effort (Quartuch et al., 2020). Future research could examine training strategies to find ways to enhance cultural sensitivity and raise the pedagogical prowess of R3 staff and volunteers. We also observed variability across workshops in terms of program timing and structure (e.g., content delivery format, location, season, focal species), and the impact of those differences could also be explored.

Potential social desirability bias might have influence participants' responses (King & Bruner, 2000), particularly on the post-workshop questionnaire. To reduce this risk, we waited to administer post-workshop surveys until several days after the program, providing participants with more time to reflect on their experience and respond without instructors present. Future research might consider other options (e.g., anonymous feedback mechanisms, third-party researchers) to reduce possible response bias.

Based on student responses and previous studies highlighting the importance of social support for hunter retention (Enck et al., 1996; Hinrichs, 2019; Larson et al., 2014; Ringelman et al., 2020), we believe that mentored hunt experiences could be a significant factor influencing retention of new hunters. Additional research should explore the impact of post-workshop mentored hunts on hunting participation and support. Additional longitudinal studies would illuminate the longer-term impacts of R3 interventions on workshop participants, enabling researchers to see if self-reported intent to hunt translated into future hunting behavior. We planned to do this as part of the current study (Appendix 3.4), but the COVID-19 pandemic made longitudinal research with college students difficult.

While our sample is large and diverse, it is important to note this study only included public universities in 13 states. Although this sample did capture a substantial range of geographical and social contexts across all regions of the country, some states and certain types of institutions (e.g., private schools, smaller public schools) were excluded. Furthermore, our primary focus on land grant universities, which might be uniquely pro-hunting (given their strong connection to natural resources), could conceivably yield different results in other types of institutional settings.

Our quantitative analytical approach enabled us to cover a wide geographical area and identify broad relationships between demographic, cultural, cognitive, affective, and behavioral variables of interest, but a qualitative approach could be used to better understand the deeper impacts of participation on participants. Nevertheless, qualitative coding of open-ended responses on our surveys enabled us to capture some of these more complex and comprehensive reactions to the R3 workshop experience. Overall, our study highlights the need for more comprehensive, mixed methods evaluation of the short and long-term impacts of R3 efforts targeting diverse audiences.

Conclusion

College students represent an enormous, untapped pool of potential hunters that may be receptive to R3 efforts (Stayton et al., 2017; Ringelman et al., 2020). College campuses house millions of emerging adults with diverse backgrounds, attitudes, and motives regarding hunting and outdoor recreation – students that are emotionally primed to explore new activities, forge new identities, and cultivate a social atmosphere where these new activities can flourish (Johnson

& Goldman, 2011; Luyckx et al., 2006; Schwartz & Pantin, 2006). With the help of university partnerships, managers can find ways to engage more diverse audiences in hunting.

Our study, one of the first to conduct a systematic evaluation of hunting workshops across multiple geographic contexts, revealed many key insights to help inform future R3 efforts targeting non-traditional hunting populations. Results demonstrated significant interest in hunting among diverse college students, highlighting the growing importance of non-traditional pathways into hunting. Findings also demonstrated many positive impacts on participants' hunting-related knowledge, attitudes, and behaviors. Our R3 workshops effectively built skills, instilled confidence, and inspired future pro-hunting behaviors in the college students we studied. However, additional emphasis could be placed on two outcomes of particular interest to the college student audience: connections to local food and conservation. Sustaining social support among first-time hunters was also a persistent challenge, underscoring the need for additional trainings, resources, and mentored hunt opportunities following workshops. As student feedback suggests, integration of amplification of the voices of instructors and mentors historically underrepresented within the hunting community (e.g. womxn, racial/ethnic minorities, college-aged hunters, locavores), individuals who might better relate to contemporary college students' background and experiences, could yield the best results.

We recognize that not every student who attends a workshop will go on to become a hunter. But our results suggest that many might become more vocal hunting advocates – individuals who will support pro-hunting policies, discuss the broader benefits of hunting with friends and family, and financially support hunting and conservation. If R3 workshops embrace and emphasize broader conservation connections in addition to basic hunting skills, they will increase their capacity to achieve R3 goals. Finally, our study confirmed what others have suggested: college students represent an enormous, untapped pool of potential hunters that may be receptive to R3 efforts (Stayton et al., 2017; Ringelman et al., 2020). Utilizing lessons learned and employing methods used in our study, managers can develop more effective R3 tools and strategies as they seek to reverse declines in hunting participation. With the help of university partnerships, R3 managers can find ways to engage more diverse audiences and change the contemporary face of hunting in America.

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APPENDICES

Appendix 2.1 – List of university collaborators and state agency partners

Project Leaders:

NC - Lincoln Larson, Nils Peterson, Kangjae Lee, NC State Univ.; **Deet James**, NC Wildlife Resources Comm.

Participating States & Partners (Year 1 Cohort):

CO – Chelsie Romulo, Univ. of Northern Colorado.; **Michael Quartuch**, CO Dept. of Parks and Wildlife

GA - Kris Irwin, Kyle Woosnam, Univ. of Georgia; **Charles Evans**, GA Dept. of Natural Resources

IN - James Farmer, Indiana Univ.; **Jack Basiger**, IN Dept. of Natural Resources

KS - Ryan Sharp, Adam Ahlers, Kansas State Univ,; **Aaron Austin**, KS Dept. of Wildlife, Parks, & Tourism

KY - Matt Springer, Univ. of Kentucky, **Becky Wallen**, KY Dept. of Fish & Wildlife

MI – Matt Kelly, Richelle Winkler, Michigan Tech Univ.; **Steve Beyer**, MI Dept. of Natural Resources

NY - Richard Stedman, William Siemer, Cornell Univ,; **Kelly Stang**, NY Dept. of Environmental Conservation

OH - Jeremy Bruskotter, Ohio State Univ,; **Eric Postell**, OH Dept. of Natural Resources

PA - Alan Graefe, Pennsylvania State Univ.; **Coren Jagnow**, PA Game Commission

MT - Elizabeth Metcalf, Univ. of Montana; **Greg Lemon**, MT Fish, Wildlife & Parks

SC - Shari Rodriguez, Clemson Univ.; **Billy Downer**, SC Dept. of Natural Resources

WI - Tim Van Deelen, Univ. of Wisconsin; **Keith Warnke**, WI Dept. of Natural Resources

Participating States & Partners (Year 2 Cohort):

AL - Wayde Morse, Auburn Univ.; **Marisa Futral**, AL Dept. of Conservation & Nat. Resources

CA - Jason Whiting, California State University, Fresno; **Robert Pelzman**, CA Dept. of Fish & Wildlife

FL - Taylor Stein, Univ. of Florida; **Tyler Allen**, FL Fish & Wildlife Conservation Comm.

NE - Chris Chizinski, Univ. of Nebraska, Lincoln; **Jeff Rawlinson**, NE Game & Parks Commission

OR - Mark Needham, Oregon State Univ.; **Allen Molina**, OR Dept. of Fish & Wildlife

SD - Larry Gigliotti, South Dakota State Univ.; **Taniya Bethke**, SD Game, Fish & Parks

TN - Neelam Poudyal, Univ. of Tennessee; **Randy Huskey & Michael May**, TN Wildlife Resources Agency

TX - Gerard Kyle & Denise Harmel-Garza, Texas A&M Univ.; **Steve Hall**, TX Parks & Wildlife Dept.

VA - Ashley Dayer, Virginia Tech; **Brian Moyer**, VA Dept. of Game & Inland Fisheries

Appendix 2.2 – Survey instrument used in Chapter 2 study

Wildlife Conservation, Hunting & Fishing: College Student Survey

Our team of researchers at multiple universities around the country is working with state wildlife agencies to learn more about college students' beliefs about wildlife conservation, hunting, and fishing. **Whether or not you hunt or fish, your perspectives about these activities and conservation are important to us.** Your participation in this study is voluntary, but we sincerely hope you will take a few minutes to answer our questions. All of your responses will be kept completely confidential. If you respond, your name will be entered for a chance to win one of ten $100 Amazon gift cards. Thank you for your help!

Before you begin, please provide the following information:

What university are you currently attending?

_____

In what state is this university located? _____

Section 1: Your Outdoor Recreation and Beliefs about Conservation

1.1. Which of the following outdoor recreation activities do you participate in?
(Check ALL that apply.)

- ☐ Adventure sports *(climbing, mountain biking, skiing, surfing, etc.)*
- ☐ Bird watching
- ☐ Camping
- ☐ Canoeing/kayaking
- ☐ Hiking
- ☐ Jogging/running
- ☐ Off-road vehicles *(4WDs, ATVs, etc.)*
- ☐ Swimming
- ☐ Wildlife viewing/photography
- ☐ Other (*specify)*_____

1.2. How do you feel about the following statements related to wildlife?
(Circle ONE response for each item.)

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Humans should manage fish and wildlife populations so that humans benefit	1	2	3	4	5
I view all living things as part of one big family	1	2	3	4	5
I feel a strong emotional bond with animals	1	2	3	4	5
The needs of humans should take priority over fish and wildlife protection	1	2	3	4	5
Wildlife conservation is very important to me	1	2	3	4	5

Wildlife conservation and habitat protection should be one of society's highest priorities	1	2	3	4	5
Wildlife should be conserved for future generations	1	2	3	4	5
I am willing to voluntarily spend my own money on wildlife conservation	1	2	3	4	5

1.3. Do you belong to any of the following organizations? *(Check ALL that apply.)*

☐ Hunting or wildlife conservation organizations
(Ducks Unlimited, NWTF, Rocky Mountain Elk Responsive Management, QDMA, etc.)

☐ Other environmental or nature-based organizations
(The Nature Conservancy, The Audubon Society, Sierra Club, etc.)

☐ I am not a member of any hunting, conservation, or environmental organizations

1.4. To what extent do you identify with each of the following groups?
(Circle ONE response for each item.)

	Not at all	Slightly	Moderately	Strongly	Very strongly
Wildlife advocate	1	2	3	4	5
Animal rights advocate	1	2	3	4	5
Hunter	1	2	3	4	5
Gun rights advocate	1	2	3	4	5
Environmentalist	1	2	3	4	5
Conservationist	1	2	3	4	5
Farmer/rancher	1	2	3	4	5

Section 2: Your Previous Experience with Hunting

2.1. Do any of the following people in your life hunt? *(Check ALL that apply.)*

☐ Father
☐ Mother
☐ Brother/sister
☐ Grandparent
☐ Other family member (uncle, aunt, cousin, etc.)
☐ Friends
☐ Other: _____

2.2. How often do you participate in the following activities related to hunting?
(Circle ONE response for each item.)

	Never	Rarely	Some-times	Often	Very often
Watch TV shows or videos about hunting	1	2	3	4	5
Play video games about hunting	1	2	3	4	5
Read websites, blogs, or social media posts (such as Facebook or Instagram) about hunting	1	2	3	4	5
Read magazines about hunting	1	2	3	4	5
Talk to family and friends about hunting	1	2	3	4	5
Eat game meat obtained through hunting	1	2	3	4	5
Help process or prepare wild game meat to eat (field dress, cut/package, or cook game)	1	2	3	4	5
Recreational shooting	1	2	3	4	5
Archery	1	2	3	4	5

2.3. Have you ever been hunting? *(Check ONE response.)*

☐ Yes ☐ I have accompanied someone hunting, but did not personally hunt.

☐ No ***(If you have NEVER been hunting, skip to Question #1.9.)***

If you HAVE been hunting yourself or if you have accompanied someone hunting, continue with Question #2.4. If you HAVE NOT, please skip to Question #2.9…

2.4. About how old were you when you first went hunting?

_____ years old

2.5. How many times have you gone hunting in the last 12 months?

_____ separate hunting trips in the last 12 months

2.6. Which of the following types of animals, if any, have you harvested at some point in your life? *(Check ALL that apply. If you have NEVER harvested game, move on without checking a box.)*

☐ Deer ☐ Upland birds (quail, pheasants, etc) ☐ Furbearers (coyotes, foxes, etc.) ☐ Turkey ☐ Small game (rabbits, squirrels, etc.) ☐ Feral hog

☐ Waterfowl ☐ Other (please specify):

_____

2.7. Where do you typically hunt? *(Check ALL that apply.)*

☐ Private land owned by family or friends

☐ Other private land (hunting clubs, leases, lands with permission to hunt, etc.)

☐ Public land (State WMA's, BLM Land, National Forest Land, etc.)

☐ Other (specify): _____

2.8. How has your participation in hunting changed since you started college?

☐ Decreased ☐ Stayed about the same ☐ Increased

If you HAVE been hunting before, please continue. If you have NEVER been hunting before, begin answering questions again below...

2.9. To what extent have the following factors been a barrier to hunting or a reason you do not hunt? *(Circle ONE response for each item.)*

	Is this a barrier for you?			
	Not at all	**Very little**	**Some-what**	**Very much**
Would rather do other activities	1	2	3	4
Lack the free time required to go hunting	1	2	3	4
Don't have anyone to go hunting with	1	2	3	4
Don't know where I'm allowed to hunt	1	2	3	4
Lack of available hunting land where I currently live	1	2	3	4
Moved away from the area I typically hunt to attend college	1	2	3	4
Lack transportation to get to hunting areas	1	2	3	4
Lack knowledge/skills required to hunt	1	2	3	4
Lack knowledge/skills required to prepare game meat to eat	1	2	3	4
Lack knowledge about hunting and firearm laws	1	2	3	4
Costs associated with hunting (licenses, tags, equipment, firearms, travel, etc.)	1	2	3	4
Have not completed a hunter education course	1	2	3	4
Have moral/ethical objections to hunting	1	2	3	4
Reluctant to personally kill an animal	1	2	3	4
Don't feel comfortable around firearms or hunting equipment	1	2	3	4
Don't feel comfortable around hunters and hunting culture	1	2	3	4
Worried non-hunting friends and family may judge me	1	2	3	4
Feel discouraged or frightened by negative experiences I've had in the outdoors	1	2	3	4
Don't feel comfortable due to the lack of racial and ethnic diversity associated with hunting	1	2	3	4

Other (please describe): _____	1	2	3	4

2.10. How likely are you to hunt in the future? *(Check ONE response.)*

☐ I will definitely NOT hunt

☐ I will probably NOT hunt

☐ Not sure

☐ I will probably hunt

☐ I will definitely hunt

2.10a. If you might go hunting in the future, how often do you think you will hunt? *(Check ONE response.)*

☐ Might try it once

☐ Rarely (once every few years)

☐ Regularly (at least once a year)

Section 3: Your Attitudes about Hunting and Hunters

3.1. Please indicate the extent to which you disapprove or approve of legal, regulated hunting in general? *(Check ONE response)*

☐ Strongly disapprove

☐ Moderately disapprove

☐ Neither approve nor disapprove

☐ Moderately approve

☐ Strongly approve

3.2. People hunt for a variety of reasons. First, (1) indicate whether you disapprove or approve of hunting for the following purposes. Then, to the right, (2) indicate how likely YOU would be to hunt for those same purposes. *(Circle TWO responses for each item.)*

	(1) Do you approve of hunting for this purpose?			(2) Would YOU hunt for this purpose?		
	Disapprove	Neutral	Approve	No	Maybe	Yes
To engage in sport and/or recreation	1	2	3	1	2	3
To relax or escape from everyday life	1	2	3	1	2	3
To be closer to nature and the outdoors	1	2	3	1	2	3

To harvest a trophy animal	1	2	3	1	2	3
To spend time with family and friends	1	2	3	1	2	3
To seek a new adventure	1	2	3	1	2	3
To obtain local, free-range meat	1	2	3	1	2	3
To control wildlife populations that are causing problems for people	1	2	3	1	2	3
To control wildlife populations that are damaging ecosystems	1	2	3	1	2	3

3.3. How do you feel about the following statements related to hunting and hunters?
(Circle ONE response for each item.)

	Strongly disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
Hunting is a safe activity	1	2	3	4	5
Hunting is a wise use of natural resources	1	2	3	4	5
Hunters behave responsibly and follow hunting laws	1	2	3	4	5
Hunters care about conserving wildlife and natural resources	1	2	3	4	5
Hunting can be an ethical means to acquire locally sourced meat	1	2	3	4	5
Hunting provides a direct way to connect to nature and ecosystems	1	2	3	4	5
Hunters financially contribute to wildlife conservation	1	2	3	4	5
Hunting is cruel and inhumane to the animals	1	2	3	4	5
People who want to hunt should be provided the opportunity to do so	1	2	3	4	5

Section 4: Your Previous Experience with Fishing

4.1. Do any of the following people in your life fish? *(Check ALL that apply.)*

☐ Father ☐ Other family member (uncle, aunt, cousin, etc.)

☐ Mother ☐ Friends

☐ Brother/sister ☐ Other: _____

☐ Grandparent

4.2. Have you ever been fishing? *(Check ONE response.)*

☐ Yes

☐ No ***(If you have NEVER been fishing, skip to Question #8.)***

If you HAVE been fishing yourself, continue with Question #4.3. If you HAVE NOT, please skip to Question #4.7…

4.3. About how old were you when you first went fishing?

_____ years old

4.4. How many times have you gone fishing in the last 12 months?

_____ separate fishing trips in the last 12 months

4.5. What types of fishing have you participated in? (Check ALL that apply.)

☐ Coldwater fishing (trout, etc.)

☐ Warm-water fishing (bass, sunfish, catfish, etc.)

☐ Saltwater fishing (ocean or coastal marshes)

4.6. How has your participation in fishing changed since you started college?

☐ Decreased ☐ Stayed about the same ☐ Increased

If you HAVE been fishing before, please continue. If you have NEVER been fishing before, begin answering questions again below...

4.7. How likely are you to go fishing in the future? *(Check ONE response.)*

☐ I will definitely NOT go fishing

☐ I will probably NOT go fishing

☐ Not sure

☐ I will probably go fishing

☐ I will definitely go fishing

4.7a. If you might go fishing in the future, how often do you think you will go fishing? *(Check ONE response.)*

☐ Might try it once

☐ Rarely (once every few years)

☐ Regularly (at least once a year)

Section 5: Your Thoughts about Funding Conservation

5.1. How do you think your state fish and wildlife agency <u>is currently funded</u>? Rank the potential conservation funding sources below from the one you think is (1) most important to (3) least important. *(Use each number – 1, 2, and 3 – only once.)*

_____ Public tax funds (income taxes, property taxes, general sales taxes, etc.)

_____ Park entrance fees

_____ Hunting & fishing license fees and equipment sales

5.2. Would you oppose or support the following potential strategies to help fund wildlife conservation <u>in the future?</u> *(Circle ONE response for each item.)*

Potential strategy to help fund wildlife conservation efforts:	**Strongly Oppose**	**Oppose**	**Neutral**	**Support**	**Strongly Support**
Portion of state sales tax dedicated to conservation	1	2	3	4	5
Portion of state lottery proceeds dedicated to conservation	1	2	3	4	5
State and local bonds that support conservation	1	2	3	4	5
Licenses and fees associated with hunting and fishing	1	2	3	4	5
Licenses and fees associated with other types of outdoor recreation activities (*not just hunting and fishing*)	1	2	3	4	5
Excise or special sales tax on hunting and fishing equipment purchases *(guns, ammunition, rods and reels, tackle, etc.)*	1	2	3	4	5
Excise or special sales tax on other types of outdoor recreation equipment purchases *(hiking gear, tents, kayaks, bikes, binoculars, etc.)*	1	2	3	4	5
Outdoor recreation outfitters *(Cabela's, Bass Pros Shops, REI, etc.)* contribute a portion of their annual revenue to conservation	1	2	3	4	5
Companies that profit from natural resource extraction *(oil/gas, timber, etc.)* contribute a portion of their annual revenue to conservation	1	2	3	4	5

<u>Section 6: Background Information</u>

6.1. In what year were you born? Year: _____

6.2. With what gender do you identify? ☐ Female ☐ Male ☐ Not listed (specify): _____

6.3. Which of the following best describes your racial/ethnic background? (*Check ALL that apply.)*

☐ White
☐ Hispanic/Latino
☐ Black or African American
☐ Asian
☐ American Indian or Alaska Native
☐ Middle Eastern or North African
☐ Native Hawaiian or Pacific Islander
☐ Other (specify): _____

6.4. Which of the following BEST describes your college major or field of study (or likely major, if you are currently undecided)? *(Check ONE response.)*

☐ Agriculture & Natural Resources (Agriculture, Ecology, Conservation Biology, Environmental Science, Crop & Soil Science, Animal Science, Natural Resource Management, Parks and Recreation, etc.)
☐ Science & Math (Biology, Physics, Chemistry, Math, Statistics, Public Health, etc.)
☐ Engineering & Technology (Engineering, Materials Science, Computer Science, etc.)
☐ Business & Economics (Accounting, Economics, Finance, Management, etc.)
☐ Social Science & Humanities (Psychology, Sociology, Anthropology, Political Science, History, English, Religion, Language & Linguistics, Education, etc.)
☐ Arts (Architecture, Design, Performance Arts, etc.)
☐ Other (please specify) _____

6.5. How would you best describe the area where you grew up? (*Check ONE response.)*

☐ A large city or urban area (more than 250,000 people)
☐ A medium-sized city (50,000-250,000 people)
☐ A small city (10,000 to 50,000 people)
☐ A small town or rural area (10,000 people or less)
☐ Other (describe): _____

6.6. What is the ZIP code of the place where you grew up?

ZIP: _____

6.7. Are you interested in learning more about hunting opportunities through instructional hunting clinics and/or mentored hunting programs? *(Check ONE response.)*

☐ Not at all interested ☐ Somewhat interested ☐ Very interested

*For additional information about these opportunities, please provide your email address below:

_____

Appendix 2.3 – Principle Component Factor Analysis Tables for Chapter 2

Table 2.3.1. Exploratory factor analysis via principal component factor analysis depicting the structure of items[a] describing reasons to approve of hunting

			Factor Loadings[b]		
Factor (with Items)	**Mean**	**SD**	**1**	**2**	**3**
1. Altruistic Motivations (2 items, Cronbach's α = 0.8233)	**2.616**	**0.590**			
To control wildlife populations that are damaging ecosystems	2.705	0.580	0.9045		
To control wildlife populations that are causing problems for people	2.527	0.695	0.8507		
2. Meat (1 item)					
To obtain local, free-range meat	**2.553**	**0.698**	**0.5971**	0.5415	
3. Egoistic motivations (5 items, Cronbach's α = 0.9375)	**2.212**	**0.732**			
To spend time with friends or family	2.348	0.785		0.8559	
To be closer to nature and the outdoors	2.373	0.790		0.8552	
To seek a new adventure	2.222	0.823		0.8317	
To relax or escape from everyday life	2.091	0.844		**0.7626**	0.4639
To engage in sport/recreation	2.030	0.847		**0.6553**	0.5860
3. Trophy (1 item)					
To harvest a trophy animal	**1.577**	**0.780**			0.8888

[a]Items rated on scale ranging from 1 = "Disapprove" to 3 = "Approve"

[b]Only Varimax (orthogonal) rotated factor loadings ≥ 0.400 are reported

Meat loaded onto factor 1 and factor 2. As a result, we pulled it out as its own factor.

Note: PCf indicated an optimal two-factor solution that accounted for 81.60% of the variance, with 3 factors containing Eigenvalues ≥ 0.5 and explaining ≥ 10% of the cumulative variance. KMO = 0.904 and Bartlett's test of spherecity $\chi^2(36) = 1.02e05$, $p < 0.001$. A composite score was created for the factor, based on the mean of the items. Higher scores indicated a greater degree of alignment with the reason for approval.

Table 2.3.2. Exploratory factor analysis via principal component factor analysis depicting structure of motivations for participating in hunting items[a]

			Factor Loadings[b]		
Factor (with Items)	**Mean**	**SD**	**1**	**2**	**3**
1. Altruistic Motivations (2 items, Cronbach's α = 0.9394)	**2.020**	**0.859**			
To control wildlife populations that are damaging ecosystems	2.078	0.882	0.8962		
To control wildlife populations that are causing problems for people	1.963	0.887	0.8697		
3. Meat Motivations (1 item)	**2.011**	**0.896**			
To obtain local, free-range meat	2.011	0.894	0.6845	0.5078	
3. Social Motivations (5 items, Cronbach's α = 0.9455)	**1.842**	**0.800**			
To be closer to nature and the outdoors	1.927	0.907		0.8013	
To seek a new adventure	1.890	0.885		0.7985	
To spend time with friends or family	1.981	0.897		0.7971	
To relax or escape from everyday life	1.725	0.873		0.7646	
To engage in sport/recreation	1.694	0.854		0.6855	
4. Trophy Motivations (1 item)	**1.391**	**0.712**			
To harvest a trophy animal	1.391	0.712			0.9104

[a]Items rated on scale ranging from 1 = "No" to 3 = "Yes"

[b]Only Varimax (orthogonal) rotated factor loadings $\geq$ 0.400 are reported

Note: PCF indicated an optimal three-factor solution that accounted for 86.1% of the variance, with 3 factors containing Eigenvalues $\geq$ 0.5 and explaining $\geq$ 6% of the cumulative variance. Initial factor analysis showed 1 factor with all motivations similar, to discern more differences we chose a more liberal cut off point with min Eigenvalues of 0.5. Meat cross-loads so we pulled it out and made it its own factor. KMO = 0.923 with Bartlett's test of sphericity $\chi^2(36) = 1.29e05$, $p < 0.001$. A composite score was created for the factor, based on the mean of the items. Higher scores indicated a greater degree of alignment with the motivation.

Table 2.3.3. Exploratory factor analysis depicting five-factor structure of items[a] describing perceived barriers to hunting participation

			Factor Loadings[b]			
Factor (with Items)	**Mean**	**SD**	**2**	**3**	**4**	**5**
1. Other Activities 1 item	**3.108**	**1.087**				
Other Activities: Would rather do other activities	3.108	1.087		0.5760		
2. Moral Objections and Comfort (4 items, Cronbach's α = 0.9079)	**2.220**	**1.089**				
Have moral/ethical objections to hunting	2.249	1.218		0.8864		
Reluctant to personally kill an animal	2.559	1.298		0.8680		
Don't feel comfortable around hunters and hunting culture	2.029	1.191		0.8302		
Don't feel comfortable around firearms or hunting equipment	2.044	1.211		0.8116		
3. Lacking Skills & Knowledge & resources plus structural barriers (6 items, Cronbach's α = 0.9346)	**2.215**	**1.084**				
Lack knowledge/skills to hunt	2.325	1.233	0.9087			
Lack knowledge about hunting and firearm laws	2.095	1.200	0.9033			
Lack knowledge/skills required to prepare game meat to eat	2.312	1.257	0.8897			
Have not completed a hunter education course	2.260	1.348	0.8543			
Unsure of how/where to store equipment and firearms	1.863	1.143	0.7994			
Costs associated with hunting (licenses, tags, equipment, firearms, travel, etc.)	2.228	1.197	0.7496			
4. Logistical (6 items, Cronbach's α = 0.8050)	**1.933**	**0.782**				
Lack of available land where I currently live	1.805	1.048			0.771	
Moved away from the area I typically hunt to attend college	1.762	1.144			0.6733	
Lack transportation to get to hunting areas	1.422	0.834			0.6538	
Don't know where to go	2.005	1.142			0.6334	
Don't have anyone to hunt with	2.061	1.131			0.6164	
Lack the free time required to go hunting	2.588	1.217			0.5379	
5. Judgement and experiences	**1.291**	**0.560**				

3 items, Cronbach's α = 0.7345)						
Feel discouraged or frightened by negative experiences I've had in the outdoors	1.209	0.580				0.8131
Don't feel comfortable due to the lack of racial and ethnic diversity associated with hunting	1.318	0.762				0.7578
Worried non-hunting friends and family may judge me	1.344	0.716				0.7561

[a]Items rated on scale ranging from 1 = "Not at all" to 4 = "Very Much"

[b]Only Varimax (orthogonal) rotated factor loadings ≥ 0.400 are reported

Note: PCF indicated an optimal four-factor solution that accounted for 68.61% of the variance, with 4 factors containing Eigenvalues ≥ 1.0 and explaining ≥ 5% of the cumulative variance. Initial factor analysis showed four factors retained, we decided to pull out one item that did not fit well into any other factor, creating five factors total. KMO = 0.903 with Barlett's test of sphericity $\chi^2(190) = 1.24e05$, $p < 0.001$. A composite score was created for each factor, based on the mean of the items. Higher scores indicated a greater degree of perceived constraint.

Table 2.3.4. Exploratory factor analysis depicting one-factor structure of respondents' beliefs about hunters and hunting

			Factor Loadings[b]
Factor (with Items)	**Mean**	**SD**	**1**
1. Beliefs about hunters and hunting (9 items, Cronbach's α = 0.9364)	**3.416**	**0.906**	
Hunting is a wise use of natural resources	3.307	1.131	0.8770
Hunting provides a direct way to connect to nature and ecosystems	3.497	1.177	0.8545
Hunters care about conserving wildlife and natural resources	3.214	1.117	0.8471
Hunters financially contribute to wildlife conservation	3.416	1.152	0.8331
Hunting can be an ethical means to acquire locally sourced meat	3.861	1.018	0.8162
People who want to hunt should be provided the opportunity to do so	3.651	1.031	0.8131
Hunting is a safe activity	3.132	1.105	0.7946
Hunters behave responsibly and follow hunting laws	3.195	1.048	0.7541
Hunting is cruel and inhumane to the animals (reverse coded)	3.480	1.218	0.7489

[a]Items rated on scale ranging from 1 = "Strongly disagree" to 5 = "Strongly agree"

[b]Only Varimax (orthogonal) rotated factor loadings $\geq$ 0.400 are reported

Note: PCF indicated an optimal single-factor solution (Eigenvalue = 5.999) that accounted for 66.66%% of the cumulative variance. KMO = 0.949 with Bartlett's test of sphericity χ^{2}(36) = 1.00e05, $p < 0.001$. A composite score was created for the factor, based on the mean of the items. Higher scores indicated greater positive beliefs about hunters and hunting.

Table 2.3.5. Exploratory factor analysis depicting two-factor structure of items used to assess wildlife value orientations

			Factor Loadings[b]	
Scale (with Items)	**Mean**	**SD**	**1**	**2**
1. Mutualistic (2 items, Cronbach's α = 0.6469)	**3.676**	**0.876**		
I view all living things as part of one big family	3.672	1.020	0.8594	
I feel a strong bond with animals	3.679	1.016	0.8385	
2. Dominionistic (2 items, Cronbach's α = 0.5924)	**2.956**	**0.951**		
Humans should manage fish and wildlife populations so that humans benefit	3.284	1.116		0.8774
The needs of humans should take priority over fish and wildlife protection	2.626	1.140		0.7848

[a]Items rated on scale ranging from 1 = "Strongly disagree" to 5 = "Strongly agree";
[b]Only Varimax (orthogonal) rotated factor loadings ≥ 0.400 are reported
Note: PCF indicated an optimal two-factor solution that accounted for 73.04% of the variance, with 2 factors containing Eigenvalues ≥ 1.0 and explaining ≥ 20% of the cumulative variance. KMO = 0.594 with Bartlett's test of sphericity $\chi^2(6) = 9233.137$, $p < 0.001$. A composite score was created for each factor, based on the mean of the items. Higher scores indicated a greater degree of agreement with the WVO.

Table 2.3.6. Exploratory factor analysis depicting one-factor structure of items used to assess conservation caring

			Factor Loadings[b]
Scale (with Items)	**Mean**	**SD**	**1**
1. Conservation Caring (4 items, Cronbach's α = 0.7993)	**4.074**	**0.667**	
Wildlife conservation is very important to me	4.239	0.777	0.8421
Wildlife conservation and habitat protection should be one of society's highest priorities	3.946	0.922	0.8205
I am willing to voluntarily spend my own money on wildlife conservation	3.505	0.995	0.7740
Wildlife should be conserved for future generations	4.574	0.609	0.7571

[a]Items rated on scale ranging from 1 = "Strongly disagree" to 5 = "Strongly agree";
[b]Only Varimax orthogonal rotated factor loadings ≥ 0.400 are reported
Note: PCA indicated an optimal single-factor solution (Eigenvalue = 2.55) that accounted for 63.87% of the variance. KMO = 0.797 with Bartlett's sphericity $\chi^2(6) = 21593.097$, $p < 0.001$. A composite score was created for the factor, based on the mean of the items. Higher scores indicated a greater degree of conservation caring.

Appendix 2.4 – Survey instrument used to check for response bias in Chapter 2 study

Wildlife Conservation, Hunting & Fishing: SHORT SURVEY for College Students

Our team of researchers at multiple universities around the country is working with state wildlife agencies to learn more about college students' beliefs about wildlife conservation, hunting, and fishing. **Whether or not you hunt or fish, your perspectives about these activities and conservation are important to us.** Your participation in this study is voluntary, but **we sincerely hope you will take 2-3 minutes to answer our questions**. All of your responses will be kept completely confidential. If you respond, your name will be entered for a chance to win one of ten $100 Amazon gift cards. Thank you for your help!

Before you begin, please provide the following information:

What university are you currently attending?

_____

In what state is this university located? _____

1. How do you feel about the following statements related to wildlife?
(Circle ONE response for each item.)

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Wildlife conservation is very important to me	1	2	3	4	5

2. Have you ever been hunting? *(Check ONE response.)*

☐ Yes ☐ I have accompanied someone hunting, but did not personally hunt ☐ No

2a. If YES, how many times have you gone hunting in the last 12 months?

_____ separate hunting trips in the last 12 months

3. Please indicate the extent to which you disapprove or approve of legal, regulated hunting in general? *(Check ONE response)*

☐ Strongly disapprove

☐ Moderately disapprove

☐ Neither Approve nor disapprove

☐ Moderately approve

☐ Strongly approve

4. How likely are you to hunt in the future? *(Check ONE response.)*

☐ I will definitely NOT hunt

☐ I will probably NOT hunt

☐ Not sure

☐ I will probably hunt

☐ I will definitely hunt

5. Which of the following BEST describes your college major or field of study (or likely major, if you are currently undecided)? *(Check ONE response.)*

☐ Agriculture & Natural Resources (Agriculture, Ecology, Conservation Biology, Environmental Science, Crop & Soil Science, Animal Science, Natural Resource Management, Parks and Recreation, etc.)

☐ Science & Math (Biology, Physics, Chemistry, Math, Statistics, Public Health, etc.)

☐ Engineering & Technology (Engineering, Materials Science, Computer Science, etc.)

☐ Business & Economics (Accounting, Economics, Finance, Management, etc.)

☐ Social Science & Humanities (Psychology, Sociology, Anthropology, Political Science, History, English, Religion, Language & Linguistics, Education, etc.)

☐ Arts (Architecture, Design, Performance Arts, etc.)

☐ Other (please specify) _____

6. With what gender do you identify? ☐ Female ☐ Male ☐ Not listed (specify): _____

7. How would you best describe the area where you grew up? (*Check ONE response.)*

☐ A large city or urban area (more than 250,000 people)

☐ A medium-sized city (50,000-250,000 people)

☐ A small city (10,000 to 50,000 people)

☐ A small town or rural area (10,000 people or less)

☐ Other (describe): _____

8. Are you interested in learning more about hunting opportunities through instructional hunting clinics and/or mentored hunting programs? *(Check ONE response.)*

☐ Not at all interested ☐ Somewhat interested ☐ Very interested

*For additional information about these opportunities, please provide your email address below:

_____

Appendix 3.1 – Getting Started Outdoors: Hunting 101 Workshop Overview (NC State)

North Carolina Wildlife Resources Commission

Conservation Partner Facilitated

Getting Started Outdoors Workshops

"DEER HUNTING 101"

Instructor Guide

STATION 1: ALL PARTICIPANTS CLUBHOUSE (3 SEGMENTS)

SEG 1: (25 MIN)

INTRODUCTIONS / PURPOSE / OVERVIEW / AGENDA / GROUP ASSIGNMENTS

Begin with workshop purpose, overview, conservation partner recognition and Introductions. Clarify workshop logistics, provide agenda / map and mention both **whole group and split group rotations** as outlined.

ASSIGN PARTICIPANTS INTO THREE (3) GROUPS (1,2,3 method) indicating that participants **write name and group number on NAME TAG PROVIDED**. Workshop "timing" will be maintained via designated timekeeper(s) and airhorn.

SEG 2: (25 MIN)

HISTORY OF CONSERVATION / WHERE TO HUNT / ETHICS / SUCCESS IN THE FIELD

History of Conservation: The greatest story "never" told!

- ☐ Hunting and hunter influence on the North American Model of Conservation & Role of hunting in society.

Where to Hunt in NC:

- ☐ Public Land (*including Permit Hunting Opportunities*), website info & Basic Regs.
- ☐ Private Land (*Hunt NC Farmland*).
- ☐ Controlled Hunting Preserves.
- ☐ Current Deer Hunting Regulations (*mention digests*).

Ethics: rules of behavior for hunters, both written and unwritten.

- ☐ Respect natural resources.
- ☐ Respect other hunters.
- ☐ Respect landowners.
- ☐ Respect non-hunters.
- ☐ Get Involved (*Hunter Education & Indirect Mentoring*).
- REPLACE YOURSELF☺

Success in the field: taking of game animals is NOT the only measure success!

- ☐ Seeing deer.
- ☐ Seeing other wildlife.
- ☐ Time with family and friends.
- ☐ Killing a deer.
- ☐ Lack of interference with other hunters.
- ☐ Good weather.
- ☐ Making/telling STORIES!

SEG 3: (30 MIN)

Deer Hunting: Basics Facts for Hunters (Hunting 101 NCWF)

- ☐ **Getting Started Hunting:** firearms, ammo, clothing, misc. equip, treestands, etc.

☐ **Deer Senses:** (*why important to hunters & hunting*):
☐ **Deer Sent Communication:** (*why important to hunters & hunting*).
☐ **Deer Vocalizations:** (*why important to hunters & hunting*).

STATION 2: ALL PARTICIPANTS OUTDOORS (2 SEGMENTS)

SEG 1 LOC C: (60 MIN)

HUNTING STAND TYPES AND DEMONSTRATIONS

STAND TYPES

☐ **Stand Hunting**: a stationary location where deer are likely, or expected, via a natural travel corridor. MOST deer hunting is usually done via INTERCEPTION (waiting on stand) as deer travel between feeding and bedding areas during periods of dawn and dusk. The exception is during the breeding season (rut) when deer can be active throughout the day.
☐ **Still Hunting:** stopping often while moving in hopes of getting a shot at an unalarmed deer.
☐ **Deer Drives:** hunters moving through habitat in a strategic fashion to move deer toward other hunters located motionless on stand.
☐ **Dog Hunting:** the strategic use of dogs to move deer to waiting, semi-mobile human hunters.
☐ **Spot and Stalk:** the strategy of attempting to close the distance to game animals with the use of optics (binoculars/spotting scopes) usually done in very open or mountainous terrain.
☐ **Stationary Stand:** a random, or predetermined location usually next to a natural occurring feature like a tree, rock or thicket edge.
☐ **Ground Blind:** fully or partially concealed via natural or man-made materials.

ELEVATED STANDS AND DEMONSTRATIONS

☐ **Ladder Stands:** (*pros and cons*).
☐ **Hang On Stands:** (*pros and cons*).
☐ **Box Stand (towers):** (*pros and cons*).
☐ **Climbing Stands:** (*pros and cons*).
- **Permanent "home-made" Stands**: (*obsolete, dangerous and illegal on public land*).

SEG 2 LOC B: (40 MIN)

BASIC GEAR / TYPICAL HUNTING SCENARIO / Q&A

☐ **SHOW & TELL EQUIPMENT:** using personal (*or assigned*) deer hunting equipment including EVERYTHING you carry on a typical hunt.
☐ **Virtual Hunt:** describe all aspects of how you begin/end a typical hunt.

**LUNCH AT 11:20: Wild Game Sampling w/ Crockpot Chili, etc. (*begin by "briefly" sharing recipe*) ** (30 Min)

STATION 3: ALL PARTICIPANTS OUTDOORS (60 Min)

FIREARM SAFETY / CARRIES & CROSSINGS / BRIEF ARCHERY OVERVIEW / EYE DOMINANCE / NOMENCLATURE / RANGE DEMO

FIREARM SAFETY

- ☐ Point the muzzle in a safe direction
- ☐ Treat every firearm with the respect due to a loaded gun.
- ☐ Be sure of the target and what is in front of it and beyond it.
- ☐ Keep your finger outside the trigger guard until ready to shoot.

FOUR MAIN CAUSES OF HUNTING INCIDENTS

- ☐ Hunter judgement mistakes.
- ☐ Safety rule violations.
- ☐ Lack of control and practice.
- ☐ Mechanical failure

CARRIES & CROSSINGS

- ☐ Proper Field Carries (*with vs. without hunting partners*)
- ☐ Crossing Obstacles
- ☐ Loading / Unloading
- ☐ Transporting Firearms.
- Zones of Fire (*if know max effective range of gun you'll also know zone of fire*)

BRIEF ARCHERY OVERVIEW

- ☐ Bow Types (*traditional vs. contemporary*).
- ☐ Razor Head Types (*neck vs, body shots*).
- ☐ Preparing for the Hunt (*practice, practice, practice*)
- ☐ Misc. Equipment (*needed vs. nice*)

EYE DOMINANCE / NOMENCLATURE / RANGE DEMO

- ☐ **Eye Dominance:** establish per participant.
- ☐ **Guns / Actions / Ammo:** Mention common calibers, action types, loads, etc.
- ☐ **Firearm Demonstrations:** Instructors demonstrate shooting a few live rounds.

STATION 4: ALL PARTICIPANTS w/ ROTATIONS OUTDOORS (3 SEGMENTS)

SEG 1: (60 MIN)

PRE-VS. POST-SEASON SCOUTING (PUBLIC VS. PRIVATE)

- ☐ **Hunting Access** (Private) need written permission (Public) need game lands license.
- ☐ **Pre-vs. Post Season Scouting** (differences between the two including pros and cons).
- **Describe** suitable habitat (explain and demonstrate what is suitable habitat is and isn't).
- **Importance** of knowing "TRANSITION" zones between feeding and bedding areas (not just the corn bucket where legal via private land).
- ☐ **Look for sign** including (Direct) seeing deer (Indirect) scat, tracks, rubs, beds, etc.
- ☐ **The Whitetail Rut:** What to look for/expect and advantages to the hunter.

SEG 2: (60 MIN)

GAME RECOVERY: BEFORE & AFTER THE SHOT w/ Handout

- ☐ **Blood trailing:** with participant interaction (*Reflections both before and after the Shot*).

SEG 3: (60 MIN)

PARTICIPANT SHOOTING PRACTICE

- **Live Shooting: "**One-on-one" with instructors emphasizing safety throughout.

STATION 5: ALL PARTICIPANTS CLUBHOUSE (2 SEGMENTS)

SEG 1: (20 MIN)

WILD GAME PROCESSING

- ☐ **Practical Deer Processing, From Field to Freezer:** includes video demonstrations and discussions on how to process a deer from field to freezer. Topics include field dressing, taxidermy, skinning, safe meat handling, and basic home processing.
- ☐ **Where to find additional resources** (*i.e., additional recipes, processing videos, etc.*).

SEG 2: (15 MIN)

Q&A / R3 OVERVIEW / POST-WORKSHOP SURVEY

- ☐ **Address** lingering participant questions.
- **Mention** "next-steps" in the form of additional resources including deer processing.
- ☐ **R3 Pledge Overview** pledge to mentor / pledge to participate.
- ☐ **Post-Workshop Survey** via Qualtrics link.
- ☐ **Mention** 12-month follow up survey (*forthcoming*).

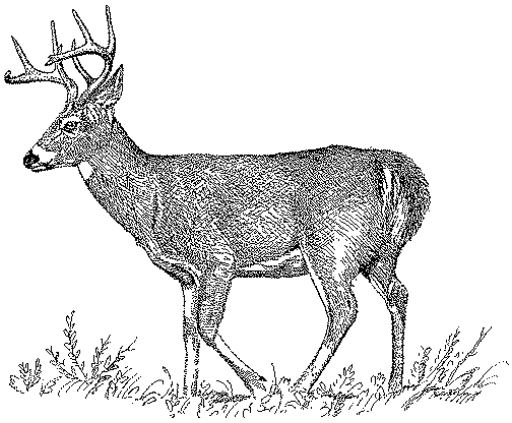
WORKSHOP WRAP UP

Final Q&A / Participants Depart / Instructor Post-Mortem

Appendix 3.2 – Pre-workshop survey instrument used in Chapter 3

Getting Started Outdoors: Hunting 101
Pre-Workshop Survey

Introduction and Instructions



Thank you for your interest in this hunting workshop for college students. Before the event, we'd like to learn more about you and your perspectives regarding hunting. We'll be asking some similar questions at the end of the program. Your responses to this survey will help us improve future workshops and gain a better understanding of the motivations driving first time hunters.

Your participation in this survey is voluntary, but we sincerely hope you will take the time to answer our questions. Although we need you to provide your contact information for workshop registration purposes, all of your responses will be kept completely confidential. **No data collected will ever be associated with your name.** The survey should take about 10 minutes to complete. Thanks in advance for your participation.

Registration Information

Your Name:

_____
First *Last*

Your Address:

_____
Street *City* *State* *ZIP*

Your Phone Number: _____

Your Email Address: _____

Which of the following best describes your current academic standing/position:

- ❑ Undergraduate student
- ❑ Graduate student
- ❑ Other (please specify): _____

Section 1: Your Connection to Hunting

1.1. Have you ever been hunting before? *(Check one.)*

- ❑ Yes
- ❑ I have accompanied someone hunting, but did not personally hunt.
- ❑ No *(Skip to Question 1.2)*

1.1a. About how old were you when you first went hunting? _____ years old

1.1b. How many times have you gone hunting in the last 12 months?

_____ separate hunting trips in the last 12 months

1.2. Do any of the following people in your life hunt? *(Check ALL that apply.)*

- ❑ Father
- ❑ Mother
- ❑ Brother/sister
- ❑ Grandparent
- ❑ Other relative (Aunt/uncle, cousin, etc.)
- ❑ Friends
- ❑ Other person (write answer below): _____

1.3. How often do you participate in the following activities related to hunting?
(Circle ONE response for each item.)

	Never	Rarely	Some-times	Often	Very often
Watch TV shows/videos or play video games about hunting	1	2	3	3	5
Read magazines about hunting	1	2	3	4	5
View websites, blogs, or social media posts about hunting (YouTube, Facebook, Instagram, etc.)	1	2	3	4	5
Talk to family and friends about hunting	1	2	3	4	5
Eat game meat obtained through hunting	1	2	3	4	5
Participate in recreational shooting or archery	1	2	3	4	5

1.4. People hunt for a variety of reasons. How important to you is each of the following potential reasons to hunt? *(Circle ONE response for each item.)*

	Not at all important	Slightly important	Moderately important	Very important
To engage in sport and/or recreation	1	2	3	4
To relax or escape from everyday life	1	2	3	4
To be closer to nature and the outdoors	1	2	3	4
To harvest a trophy animal	1	2	3	4
To spend time with family and friends	1	2	3	4
To seek a new adventure	1	2	3	4
To obtain local, free range meat	1	2	3	4
To control wildlife populations that are causing problems for people	1	2	3	4
To control wildlife populations that are damaging ecosystems	1	2	3	4
To contribute to wildlife conservation	1	2	3	4
To test and challenge my outdoor skills	1	2	3	4
To connect more closely to sources of food	1	2	3	4
Others (specify): _____	1	2	3	4

1.5. Have any of the following been a barrier to your previous hunting participation?
(Check ALL that apply.)

- ❑ Would rather do other activities
- ❑ Lack free time required to hunt
- ❑ Don't have anyone to go hunting with
- ❑ Don't know where I'm allowed to hunt
- ❑ Lack of available hunting land where I currently live
- ❑ Moved away from the area I typically hunt to attend college
- ❑ Lack transportation to get to hunting areas
- ❑ Lack knowledge/skills required to hunt
- ❑ Lack knowledge/skills required to prepare game meat to eat
- ❑ Lack of knowledge about hunting and firearm laws
- ❑ Unsure of how/where to store equipment and firearms
- ❑ Costs associated with hunting (license, tags, equipment, firearms, travel, etc.)
- ❑ Have not completed a hunter education course
- ❑ Have a moral/ethical objection to hunting
- ❑ Reluctant to personally kill an animal
- ❑ Don't feel comfortable around firearms or hunting equipment
- ❑ Don't feel comfortable around hunters and hunting culture
- ❑ Worried non-hunting family and friends may judge me
- ❑ Feel discouraged or frightened by negative experiences I've had in the outdoors
- ❑ Don't feel comfortable due to the lack of racial/ethnic diversity associated with hunting
- ❑ Other (specify): _____

1.6. How confident do you feel about your skills and knowledge in the following areas?
(Circle ONE response for each item.)

	Not at all confident	Slightly confident	Somewhat confident	Confident	Extremely confident
Firearm safety	1	2	3	4	5
Shooting skills	1	2	3	4	5
Hunting regulations (seasons, license requirements, etc.)	1	2	3	4	5
Choosing the right hunting gear	1	2	3	4	5
Scouting and selecting good hunting spots	1	2	3	4	5
Ethical shot placement	1	2	3	4	5
Field recovery/dressing of wild game	1	2	3	4	5
Butchering and preserving game meat	1	2	3	4	5
Cooking harvested game meat	1	2	3	4	5

1.7. Overall, how confident do you feel about your hunting skills and knowledge?
(Check ONE response.)

- ❑ Not at all confident
- ❑ Slightly confident
- ❑ Somewhat confident
- ❑ Confident
- ❑ Extremely confident

1.8. How do you feel about the following statements related to hunting and hunters?
(Circle ONE response for each item.)

	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
Hunting is a safe activity	1	2	3	4	5
Hunting is a wise use of natural resources	1	2	3	4	5
Hunters behave responsibly and follow hunting laws	1	2	3	4	5
Hunters care about conserving wildlife and natural resources	1	2	3	4	5
Hunting can be an ethical means to acquire locally sourced meat	1	2	3	4	5
Hunting provides a direct way to connect with nature and ecosystems	1	2	3	4	5
Hunters financially contribute to wildlife conservation	1	2	3	4	5
Hunting is cruel and inhumane to the animals	1	2	3	4	5
People who want to hunt should be provided an opportunity to do so	1	2	3	4	5
Wildlife conservation is very important to me	1	2	3	4	5
Hunting has a positive impact on wildlife conservation	1	2	3	4	5

1.9. What are TWO THINGS you hope to get out of this hunting workshop?
(Write answer in space provided.)

1.

2.

Section 2: Your Other Activities

2.1. What other outdoor-recreation activities do you participate in, if any?
(Check ALL that apply.)

- ❑ Adventure sports (climbing, mountain biking, skiing, surfing, etc.)
- ❑ Bird watching
- ❑ Camping
- ❑ Canoeing/kayaking
- ❑ Hiking
- ❑ Jogging/running
- ❑ Off road vehicles *(4WDs, ATVs, etc.)*
- ❑ Swimming
- ❑ Wildlife Viewing/Photography
- ❑ Other:_____

2.2. What cooking or food sourcing activities do you participate in, if any?
(Check ALL that apply.)

- ❑ Cooking classes
- ❑ Edible gardening
- ❑ Foraging
- ❑ Shopping at farmers' markets

2.3. Do you belong to any of the following organizations? *(Check ALL that apply.)*

- ❑ Hunting or wildlife conservation organizations
  (Ducks Unlimited, NWTF, Rocky Mountain Elk Foundation, QDMA, etc.)
- ❑ Other environmental or nature-based organizations
  (The Nature Conservancy, The Audubon Society, Sierra Club, etc.)
- ❑ I am not a member of any hunting, conservation, or environmental organizations

Section 3: Background Information

3.1. In what year were you born? Year: _____

3.2. With what gender do you identify?

- ❑ Female
- ❑ Male
- ❑ Not listed (specify): _____

3.3. Which of the following best describes your racial/ethnic background?
(*Check ALL that apply.)*

- ❑ White
- ❑ Hispanic/Latino
- ❑ Black or African American
- ❑ Asian
- ❑ American Indian or Alaska Native
- ❑ Middle Eastern or North African
- ❑ Native Hawaiian or Pacific Islander
- ❑ Other (specify): _____

3.4. How would you best describe the area where you grew up? (*Check ONE response.)*

- ❑ A large city or urban area (more than 250,000 people)
- ❑ A medium-sized city (50,000-250,000 people)
- ❑ A small city (10,000 to 50,000 people)
- ❑ A small town or rural area (10,000 people or less)
- ❑ Other (describe): _____

3.5. Which of the following BEST describes your college major or field of study (or likely major, if you are currently undecided)? *(Check ONE response.)*

- ❑ **Agriculture & Natural Resources** (Agriculture, Ecology, Conservation Biology, Environmental Science, Crop & Soil Science, Animal Science, Natural Resource Management, Parks and Recreation, etc.)
- ❑ **Science & Math** (Biology, Physics, Chemistry, Math, Statistics, Public Health, etc.)
- ❑ **Engineering & Technology** (Engineering, Materials Science, Computer Science, etc.)
- ❑ **Business & Economics** (Accounting, Economics, Finance, Management, etc.)
- ❑ **Social Science & Humanities** (Psychology, Sociology, Anthropology, Political Science, History, English, Religion, Language & Linguistics, Education, etc.)
- ❑ **Arts** (Architecture, Design, Performance Arts, etc.)
- ❑ **Other** (please specify)

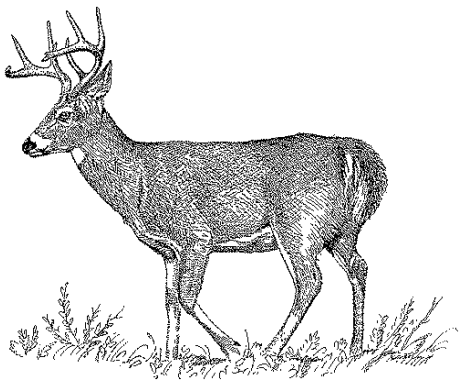
_____

Thanks again for registering for the workshop
and for taking the time to complete this questionnaire.

Appendix 3.3 – Post-workshop survey instrument used in Chapter 3

Getting Started Outdoors: Hunting 101
Post-Workshop Survey

Introduction and Instructions



Thank you for participating in our hunting workshop. We'd like to ask a few questions to gain a better understanding of how your participation in this event shaped your perceptions of and interest in hunting. Your responses will help us improve future workshops.

Your participation in this survey is voluntary, but we sincerely hope you will take the time to answer our questions. Although we ask you to provide your name, this will only be used to match your responses with the information you provided before the workshop. **All of your responses will be kept completely confidential. No data collected will ever be associated with your name.** The survey should take about 10 minutes to complete. Thanks in advance for your participation.

Your Name:

_____

First *Last*

Section 1: Your Workshop Experience

1.1. Overall, how would you rate your experience during today's hunting workshop? *(Check one.)*

- ❑ Very negative
- ❑ Negative
- ❑ Neutral
- ❑ Positive
- ❑ Very positive

1.2. Would you say the length of the program was (Check ONE)**…**

- ❑ Too long
- ❑ About right
- ❑ Too short

1.3. Would you say the number of participants in the program was (Check ONE)**…**

- ❑ Too many
- ❑ About right
- ❑ Too few

1.4. Would you say the skill level of the program was (Check ONE)**…**

- ❑ Too advanced
- ❑ About right
- ❑ Too novice

1.5. How would you rate each of the following aspects of the hunting workshop?
(Circle ONE response for each item.)

	Very poor	Poor	Fair	Good	Very good
Quality of information/instruction	1	2	3	3	5
Amount of information/instruction	1	2	3	4	5
Usefulness and practicality of information/instruction	1	2	3	4	5
Instructors' knowledge and experience	1	2	3	4	5
Instructors' ability to explain and demonstrate	1	2	3	4	5
Discussion of hunting rules and regulations	1	2	3	4	5
Discussion of firearm safety and marksmanship	1	2	3	4	5
Discussion of hunting gear and equipment	1	2	3	4	5
Discussion of scouting and game recovery	1	2	3	4	5
Discussion of game meat processing	1	2	3	4	5
Discussion of cooking & game meat preparation	1	2	3	4	5
Discussion of hunting-conservation connections	1	2	3	4	5

1.6. How effective was the hunting workshop in accomplishing each of the following? *(Circle ONE response for each item.)*

	Not at all effective	Somewhat effective	Effective	Very effective
Increasing your interest in hunting	1	2	3	4
Providing you with the skills/knowledge needed to begin hunting safely	1	2	3	4
Providing you with the skills/knowledge needed to clean and prepare wild game meat	1	2	3	4
Providing opportunities to meet and connect with fellow hunters	1	2	3	4
Helping you facilitate hunting with your family and friends	1	2	3	4
Increasing your knowledge of the role hunters play in conservation	1	2	3	4

1.7. What did you enjoy the most about this hunting workshop? What topics and skills covered did you find most helpful and/or interesting?

1.8. What did you like the least about this hunting workshop? Is there anything else we could have done to make your experience more effective and enjoyable? Are there any additional hunting skills that you would like to have learned or discussed?

1.9. Did your participation in the workshop impact your hunting participation, skills, or views in any way? Please explain.

Section 2: Your Future Hunting Participation

2.1. How likely are you to hunt in the future? *(Check ONE response.)*

- ❑ I will definitely NOT hunt *(Skip to 2.2)*
- ❑ I will probably NOT hunt *(Skip to 2.2)*
- ❑ Not sure
- ❑ I will probably hunt
- ❑ I will definitely hunt

2.1a. If you might go hunting in the future, how often do you think you will hunt? *(Check ONE response.)*

- ❑ Might try it once
- ❑ Rarely (once every few years)
- ❑ Regularly (at least once a year)

2.2. In the future, how likely are you to do the following…
(Circle ONE response for each item.)

	Very unlikely	Unlikely	Not sure	Likely	Very likely
Purchase a hunting license	1	2	3	3	5
Attend a hunter education course or another hunting workshop	1	2	3	4	5
Hunt deer	1	2	3	4	5
Hunt any other species (turkey, waterfowl, small birds or game, etc.)	1	2	3	4	5
Go on any type of hunt with another participant from the workshop	1	2	3	4	5
Become friends with someone who is a hunter	1	2	3	4	5

Eat game meat obtained through hunting	1	2	3	4	5

2.3. Do you expect any of the following to be a barrier to your future hunting participation? *(Check ALL that apply.)*

- ❑ Would rather do other activities
- ❑ Lack free time required to hunt
- ❑ Don't have anyone to go hunting with
- ❑ Don't know where I'm allowed to hunt
- ❑ Lack of available hunting land where I currently live
- ❑ Moved away from the area I typically hunt to attend college
- ❑ Lack transportation to get to hunting areas
- ❑ Lack knowledge/skills required to hunt
- ❑ Lack knowledge/skills required to prepare game meat to eat
- ❑ Lack of knowledge about hunting and firearm laws
- ❑ Unsure of how/where to store equipment and firearms
- ❑ Costs associated with hunting (license, tags, equipment, firearms, travel, etc.)
- ❑ Have not completed a hunter education course
- ❑ Have a moral/ethical objection to hunting
- ❑ Reluctant to personally kill an animal
- ❑ Don't feel comfortable around firearms or hunting equipment
- ❑ Don't feel comfortable around hunters and hunting culture
- ❑ Worried non-hunting family and friends may judge me
- ❑ Feel discouraged or frightened by negative experiences I've had in the outdoors
- ❑ Don't feel comfortable due to the lack of racial/ethnic diversity associated with hunting
- ❑ Other (specify): _____

2.4. How confident do you feel about your skills and knowledge in the following areas? *(Circle ONE response for each item.)*

	Not at all confident	Slightly confident	Somewhat confident	Confident	Extremely confident
Firearm safety	1	2	3	4	5
Shooting skills	1	2	3	4	5
Hunting regulations (seasons, license requirements, etc.)	1	2	3	4	5
Choosing the right hunting gear	1	2	3	4	5
Scouting and selecting good hunting spots	1	2	3	4	5
Ethical shot placement	1	2	3	4	5
Field recovery/dressing of game	1	2	3	4	5
Butchering and preserving game meat	1	2	3	4	5
Cooking harvested game meat	1	2	3	4	5

2.5. Overall, how confident do you feel about your hunting skills and knowledge? *(Check ONE response.)*

- ❑ Not at all confident
- ❑ Slightly confident
- ❑ Somewhat confident
- ❑ Confident
- ❑ Extremely confident

2.6. How do you feel about the following statements related to hunting and hunters?
(Circle ONE response for each item.)

	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
Hunting is a safe activity	1	2	3	4	5
Hunting is a wise use of natural resources	1	2	3	4	5
Hunters behave responsibly and follow hunting laws	1	2	3	4	5
Hunters care about conserving wildlife and natural resources	1	2	3	4	5
Hunting can be an ethical means to acquire locally sourced meat	1	2	3	4	5
Hunting provides a direct way to connect with nature and ecosystems	1	2	3	4	5
Hunters financially contribute to wildlife conservation	1	2	3	4	5
Hunting is cruel and inhumane to the animals	1	2	3	4	5
People who want to hunt should be provided an opportunity to do so	1	2	3	4	5
Wildlife conservation is very important to me	1	2	3	4	5
Hunting has a positive impact on wildlife conservation	1	2	3	4	5

2.7. Do you plan to attend the mentored hunting experience associated with the workshop?

- ❑ Yes *(Skip to 2.8)*
- ❑ No

2.7a. If NO, why not? *(Write answer is space provided.)*

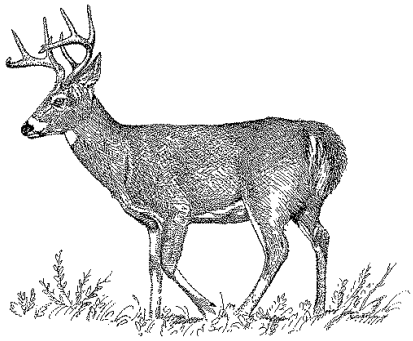
2.8. Please list any other suggestions or comments you have about this hunting workshop below:

Thanks again for participating in the hunting workshop and for taking the time to complete this questionnaire. If you indicated that you are interested in a mentored hunt experience, we will be in touch with more information about that soon..

Appendix 3.4 – Delayed-post workshop survey instrument used in Chapter 3

Getting Started Outdoors: Hunting 101
Follow-up Survey

Introduction and Instructions



Thank you for participating in our Hunting 101 workshop this past year. As you may recall, you completed a survey immediately after participating in the workshop. Today, we'd like to follow up with you one more time to collect information about your recent hunting-related experiences. Your responses will help us learn more about participants like you and improve our programs.

Your participation in this survey is voluntary, but we sincerely hope you will take the time to answer our questions. Although we ask you to provide your name, this will only be used to match your responses with the information you provided in earlier surveys. **All of your responses will be kept completely confidential. No data collected will ever be associated with your name.** The survey should take less than 5 minutes to complete. Thanks in advance for your participation.

Your Name:

_____

First *Last*

Section 1: Your Hunting Participation

1.1. Did you attend the mentored hunting experience associated with the Hunting 101 workshop?

❑ Yes ❑ No (*Skip to 1.2*) ❑ Not applicable (*Skip to 1.2*)

1.1a. Did the mentored hunting experience affect your likelihood of hunting on your own in the future? Please explain how.

1.2. Not counting the mentored hunt, have you gone hunting any other times since you attended the Hunting 101 workshop this past year? *(Check ONE response.)*

❑ Yes
❑ No *(Skip to 1.3)*

1.2a. How many times have you gone hunting in the past 12 months?

_____ separate hunting trips (including mentored hunt, if applicable)

1.3. Have you done any of the following things since you attended the Hunting 101 workshop this past year? *(Circle ONE response for each item.)*

	NO, and I'm not likely to do it	NO, but I'm likely to do it	YES, I've done it
Purchase a hunting license	1	2	3
Attend a hunter education course or another hunting workshop	1	2	3
Hunt deer	1	2	3
Hunt any other species (turkey, waterfowl, small birds or game, etc.)	1	2	3
Go on any type of hunt with another participant in today's clinic	1	2	3
Become friends with someone who is a hunter	1	2	3
Eat game meat obtained through hunting	1	2	3

1.4. Overall, how confident do you feel about your hunting skills and knowledge? *(Check ONE response.)*

- ❑ Not at all confident
- ❑ Slightly confident
- ❑ Somewhat confident
- ❑ Confident
- ❑ Extremely confident

1.5. How do you feel about the following statements related to hunting and hunters? *(Circle ONE response for each item.)*

	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
Hunting is a safe activity	1	2	3	4	5
Hunters care about conserving wildlife and natural resources	1	2	3	4	5
Hunting has a positive impact on wildlife conservation	1	2	3	4	5

Section 2: Your Future Hunting Participation

2.1. How likely are you to hunt in the future? *(Check ONE response.)*

- ❑ I will definitely NOT hunt *(Skip to 2.2)*
- ❑ I will probably NOT hunt *(Skip to 2.2)*
- ❑ Not sure
- ❑ I will probably hunt
- ❑ I will definitely hunt

2.1a. If you might go hunting in the future, how often do you think you will hunt? *(Check ONE response.)*

- ❑ Might try it once
- ❑ Rarely (once every few years)

❑ Regularly (at least once a year)

2.2. Do you expect any of the following to be a barrier to your future hunting participation? *(Check ALL that apply.)*

❑ Would rather do other activities
❑ Lack free time required to hunt
❑ Don't have anyone to go hunting with
❑ Don't know where I'm allowed to hunt
❑ Lack of available hunting land where I currently live
❑ Moved away from the area I typically hunt to attend college
❑ Lack transportation to get to hunting areas
❑ Lack knowledge/skills required to hunt
❑ Lack knowledge/skills required to prepare game meat to eat
❑ Lack of knowledge about hunting and firearm laws
❑ Unsure of how/where to store equipment and firearms
❑ Costs associated with hunting (license, tags, equipment, firearms, travel, etc.)
❑ Have not completed a hunter education course
❑ Have a moral/ethical objection to hunting
❑ Reluctant to personally kill an animal
❑ Don't feel comfortable around firearms or hunting equipment
❑ Don't feel comfortable around hunters and hunting culture
❑ Worried non-hunting family and friends may judge me
❑ Feel discouraged or frightened by negative experiences I've had in the outdoors
❑ Don't feel comfortable due to the lack of racial/ethnic diversity associated with hunting
❑ Other (specify): _____

2.3. If you have hunted since the Hunting 101 workshop (or if you would consider hunting in the future), what was (or would be) your <u>primary reason for hunting</u>? *(Write answer in the space provided.)*

2.4. Now that it has been a while since you attended the Hunting 101 workshop, take a moment to reflect on your experience. How did the workshop impact your views of and/or participation in hunting? Please explain.

Thanks again for participating in the hunting workshop and for taking the time to complete this questionnaire.

Appendix 3.5 – Principle component factor analysis tables used in chapter 3

Table 3.5.1. Exploratory factor analysis via principal component factor analysis depicting structure of motivations for participating in hunting items[a] (n = 298)

			Factor Loadings[b]		
Factor (with Items)	**Mean**	**SD**	**1**	**2**	**3**
Food (2 items, Cronbach's α = 0.766)	**3.03**	**0.90**			
To connect more closely to sources of food	2.97	1.00	0.826		
To obtain local, free range meat	3.07	1.00	0.725		
Altruistic (3 items, Cronbach's α = 0.917)	**3.01**	**0.92**			
To control wildlife populations that are damaging ecosystems	3.03	1.01		0.938	
To control wildlife populations that are causing problems for people	2.85	1.01		0.915	
To contribute to wildlife conservation	3.14	0.95		0.861	
Egoistic (6 items, Cronbach's α = 0.832)	**2.87**	0.68			
To engage in sport and recreation	2.43	0.95			0.794
To relax and escape from everyday life	2.69	0.98			0.794
To seek a new adventure	3.17	0.83			0.740
To spend time with family and friends	2.70	0.98			0.689
To test and challenge my outdoor skills	2.97	0.93	0.429		0.594
To be closer to nature and the outdoors	3.27	0.859	0.457		0.582
Trophy (1 item)	**1.56**	**0.82**			
To harvest a trophy animal	1.56	0.82			0.534

[a]Items rated on scale ranging from 1 = "Not at all" to 4 = "Very important"

[b]Only Varimax (orthogonal) rotated factor loadings $\geq$ 0.400 are reported

Note: PCF indicated an optimal three-factor solution, however following the factor analysis from chapter 2 (Appendix 2.3), to harvest a trophy was pulled out as it's own factor. This model accounted for 73% of the variance. To discern more differences, we chose a more liberal cut off point with min Eigenvalues of 0.8. KMO = 0.807 with Bartlett's test of sphericity $\chi^2(66) = 1671.661$, $p < 0.001$. A composite score was created for the factor, based on the mean of the items. Higher scores indicated a greater degree of alignment with the motivation.

Table 3.5.2. Exploratory factor analysis depicting five-factor structure of items[a] describing perceived barriers to hunting participation

			Factor Loadings[b]			
Factor (with Items)	**Mean**	**SD**	**2**	**3**	**4**	**5**
1. Time Competition 1 item	**3.108**	**1.087**				
Other Activities: Would rather do other activities	3.108	1.087		0.5760		
2. Moral Objections and Comfort (4 items, Chronbach's α = 0.9079)	**2.220**	**1.089**				
Have moral/ethical objections to hunting	2.249	1.218		0.8864		
Reluctant to personally kill an animal	2.559	1.298		0.8680		
Don't feel comfortable around hunters and hunting culture	2.029	1.191		0.8302		
Don't feel comfortable around firearms or hunting equipment	2.044	1.211		0.8116		
3. Lacking Skills & Knowledge & resources plus structural barriers (6 items, Chronbach's α = 0.9346)	**2.215**	**1.084**				
Lack knowledge/skills to hunt	2.325	1.233	0.9087			
Lack knowledge about hunting and firearm laws	2.095	1.200	0.9033			
Lack knowledge/skills required to prepare game meat to eat	2.312	1.257	0.8897			
Have not completed a hunter education course	2.260	1.348	0.8543			
Unsure of how/where to store equipment and firearms	1.863	1.143	0.7994			
Costs associated with hunting (licenses, tags, equipment, firearms, travel, etc.)	2.228	1.197	0.7496			
4. Logistical (6 items, Chronbach's α = 0.8050)	**1.933**	**0.782**				
Lack of available land where I currently live	1.805	1.048			0.771	
Moved away from the area I typically hunt to attend college	1.762	1.144			0.6733	
Lack transportation to get to hunting areas	1.422	0.834			0.6538	
Don't know where to go	2.005	1.142			0.6334	
Don't have anyone to hunt with	2.061	1.131			0.6164	
Lack the free time required to go hunting	2.588	1.217			0.5379	
5. Judgement and experiences	**1.291**	**0.560**				

3 items, Chronbach's α = 0.7345)						
Feel discouraged or frightened by negative experiences I've had in the outdoors	1.209	0.580				0.8131
Don't feel comfortable due to the lack of racial and ethnic diversity associated with hunting	1.318	0.762				0.7578
Worried non-hunting friends and family may judge me	1.344	0.716				0.7561

[a]Items rated 0 = "No" to 1 = "Yes"

[b]Only Varimax (orthogonal) rotated factor loadings ≥ 0.400 are reported

Note: Because barriers were "check all that apply" and not rated on a scale, factor analysis was less viable. Therefore, we used the same aggregate factors from chapter 2 (Appendix 2.3). Chapter 2 initial factor analysis showed four factors retained, we decided to pull out one item that did not fit well into any other factor, creating five factors total. Means, SD, and factor loadings represent data from chapter 2. Similar patterns were seen with items in this chapter (all items remained the same, only the response options differed). KMO = 0.752 with Barlett's test of sphericity $\chi^2(190) = 1017.488$, $p < 0.001$. A composite score was created for each factor, based on the mean of the items. Higher scores indicated a greater degree of perceived constraint. This remains the same for barriers assessed on the pre and post workshop questionnaires.

Table 3.5.3. Exploratory factor analysis depicting one-factor structure of respondents' beliefs about hunters and hunting (n = 294)

			Factor Loadings[b]
Factor (with Items)	**Mean**	**SD**	**1**
1. Beliefs about hunters and hunting (10 items, Cronbach's α = 0.8707)	**4.01**	**0.55**	
Hunting is a wise use of natural resources	4.03	0.72	0.7944
Hunters financially contribute to wildlife conservation	4.19	0.81	0.7836
Hunting has a positive impact on wildlife conservation	3.97	0.78	0.7827
Hunting can be an ethical means to acquire locally sourced meat	4.36	0.68	0.7613
Hunting provides a direct way to connect to nature and ecosystems	4.35	0.66	0.7547
Hunting is cruel and inhumane to the animals (reverse coded)	4.06	0.85	0.6808
Hunters care about conserving wildlife and natural resources	3.77	0.79	0.6441
People who want to hunt should be provided the opportunity to do so	4.14	0.69	0.6208
Hunting is a safe activity	3.60	0.85	0.5898
Hunters behave responsibly and follow hunting laws	3.70	0.78	0.5079

[a]Items rated on scale ranging from 1 = "Strongly disagree" to 5 = "Strongly agree"
[b]Only Varimax (orthogonal) rotated factor loadings ≥ 0.400 are reported
Note: PCF indicated an optimal single-factor solution (with a more conservative minimum eigen value of 2.0) that accounted for 67.70%% of the cumulative variance. KMO = 0.898 with Bartlett's test of sphericity $\chi^2(45) = 885.359$, $p < 0.001$. A composite score was created for the factor, based on the mean of the items. Higher scores indicated greater positive beliefs about hunters and hunting.

Table 3.5.4. Exploratory factor analysis depicting one-factor structure of respondents' beliefs about hunters and hunting (post workshop survey only) (n = 233)

			Factor Loadings[b]
Factor (with Items)	**Mean**	**SD**	**1**
1. Beliefs about hunters and hunting (10 items, Cronbach's α = 0.887)	**4.39**	**0.51**	
Hunting can be an ethical means to acquire locally sourced meat	4.66	0.58	0.8344
Hunting is a wise use of natural resources	4.45	0.65	0.8279
Hunting provides a direct way to connect to nature and ecosystems	4.65	0.58	0.8234
Hunting has a positive impact on wildlife conservation	4.42	0.61	0.7975
Hunters financially contribute to wildlife conservation	4.66	0.61	0.7750
Hunters care about conserving wildlife and natural resources	4.39	0.72	0.7086
People who want to hunt should be provided the opportunity to do so	4.45	0.64	0.6874
Hunters behave responsibly and follow hunting laws	4.13	0.74	0.6308
Hunting is a safe activity	4.02	0.86	0.5928
Hunting is cruel and inhumane to the animals (reverse coded)	4.09	1.02	0.3064

[a]Items rated on scale ranging from 1 = "Strongly disagree" to 5 = "Strongly agree"
[b]Only Varimax (orthogonal) rotated factor loadings ≥ 0.300 are reported
Note: PCF indicated an optimal single-factor solution (with a more conservative minimum eigen value of 2.0) that accounted for 70.61% of the cumulative variance. KMO = 0.890 with Bartlett's test of sphericity $\chi^2(45) = 774.635$, $p < 0.001$. A composite score was created for the factor, based on the mean of the items. Higher scores indicated greater positive beliefs about hunters and hunting.