Factors Influencing Hunter Participation, Harvest, Satisfaction, and Landscape Preference in an Urban Archery Deer Program

A Thesis Presented to the Faculty of the Graduate School
University of Missouri-Columbia

In Partial Fulfillment of the Requirements for the Degree
Master of Science

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JULY 2010
The undersigned, appointed by the Dean of the Graduate School, have examined the thesis entitled

Factors Influencing Hunter Participation, Harvest, Satisfaction, and Landscape Preference in and Urban Archery Deer Program

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a candidate for the degree of Master of Science

and hereby certify that in their opinion it is worthy of acceptance.
ACKNOWLEDGEMENTS

I would first like to thank Tony St. Romaine who is an assistant city manager in Columbia, Missouri. His support for this research project allowed my access to the Columbia Deer Management Program’s orientation meetings and the population of hunters who attended the meetings. Additionally, I would like to thank John George, from MDC, for his insights into the program and how it fit into the greater goals of urban deer management for the state agency.

I also want to thank my advisor Charles Nilon for his guidance during the course of this project. I believe my conversations with Dr. Nilon and his advice throughout my graduate school experience not only made this project more insightful but also put me on a solid path to becoming a better and more well-rounded wildlife researcher. My committee members Dr. Joan Hermsen and Dr. Joshua Millsapugh deserve thanks for both how their comments on this project and courses that they taught shaped the foundation, formulation, and final outcome of this manuscript.

I would also like to thank my wife Jennifer for her support throughout this project. She helped me balance my time between school and family. Though earning a Master’s degree is many times hectic and stressful Jennifer made the last twenty months, which were the first of our son Trenton’s life, the best of mine.

Lastly, I would like to thank my parents for their support of my continued education during my change in career paths. Although, they deserve most of the credit/blame for raising a son with a one-track mind which is focused on anything that relates to thinking about or getting outdoors.
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CHAPTER 1
INTRODUCTION

The basis for this research project evolved out of my curiosity to try to understand the types of hunters participating in the Columbia Deer Management Program. Several articles from local media sources and conversations that I had with past participants not only made me aware of this program but also brought to my attention the uniqueness of the program. Urban deer management programs have existed for more than a decade, but the Columbia program was different from many others in that it did not employ a highly managed form of hunting. Additionally, because the program used Missouri’s general archery season methods and bag limits there was no extra benefit in hunting the program in terms of adding an extra weekend to hunt or increasing the number of tags available to hunters. This meant that the program was in direct competition with hunts taking place on private and public lands which were numerous in the immediate area. However, many hunters were attending the orientation and presumably hunting the program. I was introduced to hunting in a more traditional context and because I am an avid archery hunter who takes pride in hunting deer that have minimal contact with humans and in areas “off the beaten path” I could only perceive that individuals were hunting parks, landfills, and other city owned properties because they believed urban deer were easier to harvest. Yet, I believed my biased opinions concerning the motivations of these hunters were most likely not only biased, but untrue.

As this research project progressed into the construction phase it became evident that the program offered the foundation to answer a series of questions regarding not only the demographics, backgrounds, and motivations of the hunters but also influences on participation, harvest, and satisfaction. Additionally, because the program contained
properties that were diverse in terms of use and vegetation I adopted a strategy to try to discern what habitats were preferred by urban hunters. This idea originated from trying to understand how preferences affect hunter densities on urban lands, but after researching landscape preference this facet of the project became more emphasized on describing the qualities and reasons behind the hunters’ habitat scene preferences.

The results from this research project will also benefit the City of Columbia in its management of their urban deer program. While the city has collected information from the participants in the past this project should offer more insight into their hunting constituents and allow them to focus their management efforts more precisely. I added several additional questions to the hunter surveys that were not included in the chapters of this thesis but were meant to help the city in its management effort. These questions included information on wounded game, whether the hunters were satisfied with the program’s management, and if the hunters experienced any conflicts with others while on city owned properties.
Thesis Format

The construction of this thesis and the way it is formatted is intended to facilitate publication. Although the initial goal of this project was to compose a single chapter, it became evident during the analysis phase that separating the document into two individual documents would enhance the ability to spotlight participation, harvest success, and satisfaction of the hunters and the landscape preferences of the hunters.

CHAPTER 2

FACTORS INFLUENCING HUNTER PARTICIPATION, HARVEST AND SATISFACTION IN AN URBAN DEER MANAGEMENT PROGRAM

Abstract

Human dimensions literature concerning urban deer management has been more focused on assessment of community attitudes, assessment of deer habitats and use, and methods for establishing support for control of deer populations. We used an existing urban archery management program to assess the demographic and background characteristics of hunters, motivations for participating in the program, participation, harvest and success rates. We also defined the hunters’ typologies and used our hunter data to predict participation and harvest success. On August 16th, 2004 Columbia, Missouri opened three city parks, portions of the city landfill, and three sewer utility properties for hunting during Missouri’s general archery season (September 15 through January 15). This management program provides a foundation to determine what hunter types and which demographic segments are more likely to participate and harvest deer within the confines of Columbia, Missouri. Two self-administered mail surveys were sent to the participants (n=188) that attended the mandatory hunter orientation meetings for Columbia’s Deer Management Program. Initial surveys were mailed in October, 2008 and focused on demographic variables, hunter backgrounds, hunter experience, and motivations and a post hunt survey was mailed following the conclusion of the season to capture participation, harvest, and success rates. Hunters participated at a 61.1% rate (N=103) and, of those who participated, 15 hunters harvested a total of 28 deer. We found that Columbia’s program had more males, was younger, had lower incomes, and was more highly educated than Missouri’s typical hunters. The top motivations for participating were the expanded opportunity of the program, nature, and meat. The lowest ranked motivations were trophy and social. Additionally, we found that demographics had little significant influence on motivations. Most hunters scored high for appreciative values. This group was followed by those who were achievement oriented. The typologies rated the lowest were affiliated and out-group contact orientations. We found that motivations and typologies were not typically good determinants of participation and harvest. However, we found that those who scored higher for the appreciative orientation harvested at a higher rate ($X^2= 4.89, p=0.029$) and those who rated the trophy motivation harvested at lower rates ($X^2= 4.43, p=0.025$). Using binary logistic regression, we determined that place of residence and prior experience in the program had the most influence on participation and, using Nagelkerke R$^2$, we explained 19% of the overall variance of participation. The number of “days afield” had the most influence on harvest, while those with an appreciative-oriented typology also had a slightly significant affect on harvest. Our binary regression model accounted for 36.8% of the overall variation of predicted harvest determined by using our pseudo R$^2$. We determined that the formulation of motivations and predictive influences of demographics, characteristics, and hunter backgrounds was a multifaceted complex issue that supports the theory of multiple satisfactions for increasing hunter participation and success.
Introduction:

Importance of Understanding Urban Hunters

The use of public property inside urban areas to manage white-tailed deer has spawned a great amount of research related to the success of such strategies and their effects on deer densities. Most of this research rightly focuses on herd home-range size and habitat use (Henderson et al. 2000, Grund et al. 2002, Kilpatrick and Spohr 2000) or the costs associated with reducing the herd size (Stradtmann 1994, Ishmail and Rongstad 1984, Beringer et al. 2002). Another well studied component of urban deer management involves either determining or obtaining community support for control methods and hunting (Connelly et al. 1987, Decker and Gavin 1985, Lund 1997, O’Donnell and Van Druff 1983, Stout et al. 1993). But, little has been developed to describe why urban archery hunters participate, what types of hunters participate, how they perceive success, and/or how these characteristics relate to harvest, satisfaction and planned future participation in urban deer management programs. This information is vital for the implementation and future success of urban deer management programs and understanding hunter expectations, satisfactions, and tolerances for restrictive regulations (Glass and More 1992).

Understanding urban hunters has long been considered difficult under the traditional, contextual meanings of hunting. And because most natural resource managers tend to be more nature-focused it makes it especially difficult to determine what characteristics urban hunting programs must have to increase participation and satisfaction, as the following excerpt from Kennedy (1974) illustrates.
“I suspect we were a poor reference group to be making value judgments on the perception, reaction, and evaluation of Pocomoke deer hunters. For most of us were sophisticated woodsmen and purist hunters with strong orientation toward killing a nice buck, a low tolerance for crowding, a pessimistic perception of the care and courtesy of other hunters, and many more biases I am sure.”

More than three decades ago, Kennedy was trying to understand how urbanization would affect changes in participation, shifting preferences in game species, and overall attitudes and values of urban hunters. His research led him to infer that urban hunters’ motivations and preferences were different from “traditional hunters” because the harvesting aspect of the hunt was not a high priority and that the long run effects of urbanization on game management were anyone’s guess (Kennedy 1977). Presently, some of these questions, such as what would happen to license sales, have been answered but the aforementioned description of urban hunters still needs further study. More recent literature focused on urban hunting has introduced the idea of expanding hunting access into urban areas to both provide more opportunities for urban populations and to attract more hunters (Schulz et al. 2003). Understanding the attitudes of hunters that participate in urban deer management programs may help to bolster recruitment and have long-term retention benefits which are needed for both deer management and agencies’ needs for increased license sales in our ever-increasing move toward greater urbanization.

Urban deer hunting research in Maryland showed that hunter satisfaction depended more on factors associated with companionship and nature than the amount of game harvested (More 1973). This idea of “multiple satisfactions” has been supported
as a way to increase the pleasure of the hunting experience and increase participation (Hendee 1974). Furthermore, it seems to have even more weight when dealing with urban hunters. For resident Colorado hunters focusing on big game, success was listed as the most satisfying and their success was enhanced if a trophy animal or great shot was taken (Schole et al. 1973). Likewise, poor harvest success has traditionally been shown to hinder future participation. In Montana, 60% of unsuccessful hunters responded that they would likely or definitely not hunt the same area the following season (Stankey et al. 1973). However, different hunter types show varying tolerances for non-harvest hunt attributes which may help explain their increased levels of satisfaction (Brown et al. 1977). Defining these variations in hunter characteristics and how they relate harvest and satisfaction has been attempted. Demographic variables such as age, income, education, and residence have not shown to affect this relationship (Porter et al. 1977). The relationship between harvest success and satisfaction is complex and subsequently may depend on the background, experience, motivations, commitment level, and the expectations of the hunter.

In a qualitative study of Western Kentucky deer hunters Mangun et al. 2007 found that continued hunter effort was largely based on the overall quality of the hunting experience which, subsequently, was influenced by opportunity, herd quality, the regulatory environment, and several other factors (Mangun et al. 2007). The “multiple satisfactions” analysis of hunting groups is multifaceted and, as shown above, is influenced not only by in-field behavior but also the management of the hunt at state and local levels.
Satisfaction, which leads to future participation, has been shown to be a complex concept. Likewise the formation of hunting motivations has shown to be multi-dimensional in nature. There are cultural aspects that may help in the understanding of the factors that lead to different motivations for hunting. These cultural factors can help determine the importance of hunting to one’s identity and include a perceived hunter’s background such as urban vs. rural, farming vs. non-farming, and southern vs. northern heritage. The importance of hunting to identity of has been shown to vary depending on race (Marks 1991). When hunters, in a North Carolina county, were asked whether hunting and guns were definitely part of their identity 74% of whites agreed while only 35% of blacks did. Marks also found that only 53% of blacks thought nature was an important part of hunting, compared to 98% of whites. So, while Missouri’s urban hunters are not a racially diverse group, the importance they place on hunting and their differing perceptions of self identification could help explain their motivations for hunting (Department of Interior 2006). Hunter motivations have been used as surrogates for grouping hunters into sub-categories or typologies. Understanding these variables and their effects on hunters and hunter typologies can lead to better understanding of how management policies and areas included in archery hunts may affect hunter behavior, landscape preferences, and harvest success (Stedman 2004).

*Hunter Typing using Motivations and Characteristics*

Typologies or grouping of hunters by attitudes, motivations, and behaviors may help explain a hunter’s habitat preferences, participation, success, satisfaction, and the likelihood of conflict. Plus, the knowledge of these different hunter types can help
resource managers enhance decision making based on both the natural resource and social implications as they relate to hunter satisfaction (Schroeder et al. 2006).

Though there are complex mechanisms that develop over time and influence individual hunters’ identities, motivations, and behaviors, establishing grouping types can be useful in understanding these interactions. Consequently, typing hunters has been attempted for decades through several means and most attempts to create hunter typology groups utilize motivations in some way. Kellert (1978) created a conceptual framework which described hunters in terms of their attitudes toward animals. The result categorized hunters into utilitarian/meat, nature, and dominionistic/sport typologies based on their answers during interviews and surveys. Another method, employed in South Dakota, asked hunters to indicate the primary reason they enjoyed muzzleloader hunting. Each survey participant could choose between eight motivations including: meat, nature, excitement, social, trophy, challenge, solitude, and expanded opportunity (Boulanger et al. 2006). Typologies and motivations have been shown to significantly influence participation and harvest in other studies (Decker and Connelly 1989 and Schroeder et al. 2006). However, in Boulanger’s study, motivations alone were not found to be a significant determinant of harvest success.

Decker and Connelly (1989) describe four major groups of motivations linking hunters to the sport: (1) Affiliative-oriented wildlife recreationists tend to choose the sport for companionship and social reasons; (2) Achievement-oriented individuals’ involvement aims to meet some level of performance as it relates to harvest or outdoor skills; (3) Appreciative-oriented recreationists chose hunting for the relaxation, peace, and stress reduction; and (4) The out-group-contact typology identifies those who
acknowledge a preference in meeting other individuals that they had had no prior connection with. While there are varying subsets of these four main types, they provide a course measurement to determine hunter typology classifications. Additionally, there has been some focus on managing game species for “multiple satisfactions” in state agencies. These typologies provide insight on how to provide for more preferred hunting experiences for multiple hunter types, which can then lead to better models for hunter participation (Schroeder et al. 2006). In contrast to the aforementioned South Dakota study, Decker and Connelly found significant differences between motivations and harvest success. They found that antlerless-deer-harvest systems tend to assume that hunters are motivated by achievement, but their New York State study found that only 11% of general deer hunters fall into the achievement-driven category. Thus, management that focuses on reducing deer herds must not assume that harvest is driven by those who are primarily motivated to participate from an achievement standpoint. Instead, Decker and Connelly found that appreciative orientations were more successful in harvesting deer than the other three categories. One of their conclusions was that those not highly focused on harvesting passed on more shots and thus gained more experience for when they decided to harvest. The understanding of how motivations/typologies influence participation, harvest, and satisfaction in an urban archery hunt is one of the goals of our research.

Rational for Urban Archery Deer Management Programs

White-tailed deer (Odocoileus virginianus) populations have become increasingly dense in North American urban areas due to the absence of hunting (Kilpatrick and Lima 1999; Porter et al. 2004; Henderson et. al 2000; Etter et al. 2002). These higher densities
of white-tailed deer have led to increasing conflicts between urban residents and deer concerning crop, ornamental, and garden depredation (Hansen and Beringer 1997) as well as elevated deer vehicle collisions. Approximately 1 billion dollars in auto damage was reported in 1995 as a result of deer-auto collisions with an average cost of $2000 per accident (Peterson et. al 2003). The city of Columbia, Missouri has mapped deer-auto collisions since the origination of their deer management program and utilizes these statistics to support further implementation of the program (City of Columbia 2007). These factors, combined with human health issues involving deer ticks as disease vectors, have established limits in the social carrying capacities of communities with high densities and prompted many municipalities to adopt controls on growth of the white-tailed deer population.

Ecological changes, resulting from deer overabundance, are also a concern in areas where population densities have exceeded historical levels (Russell et al. 2001). Estimates put the current mid-western population of deer at two to four times what they were pre-settlement (Cote 2004). Population growth has been attributed to several factors including a loss of large predators, regulated hunting, habitat fragmentation, and increases in forage. This is especially true in urban areas where human management is limited due to political and social constraints.

The use of urban archery hunts has been widely accepted for management in urban areas, especially in Missouri where 71% of the public space is open to the use of hunting in urban areas (US Department of Interior 2006; Hansen and Beringer 1997). In addition, because the costs associated with non-lethal and non-hunting alternatives are much greater than those involved with hunting several Missouri cities have adopted
archery hunting seasons to regulate deer densities. To this end, Columbia, Missouri passed a deer hunting ordinance on August 16, 2004 that allows limited hunting on certain selected city owned parcels (City of Columbia 2007).

Case Study: Columbia Deer Management Program

Columbia, Missouri is located in Boone County approximately 125 miles from both Kansas City and St. Louis, Missouri. Again, on August 16\textsuperscript{th}, 2004, Columbia opened selected, city-owned properties to hunters with the requirement that they attend a mandatory orientation meeting (City of Columbia 2007). In 2007, there were seven properties in the program: three city parks, the city landfill, and three sewer utility properties (Fig 2.1).

Again, to be eligible to participate in the deer management program hunters must attend an orientation meeting prior to the start of the season. After a short informational session each hunter is given a certificate (fig 2) that allows legal access, with archery equipment, on the selected areas (City of Columbia 2007). The urban archery hunt is held in accordance with the Missouri’s general archery season beginning on September 15\textsuperscript{th} and running through January 15\textsuperscript{th}, minus the period during the 10 day fall firearms season in the middle of November. However, antlerless and any-deer firearm permits may be filled with archery equipment on the program’s properties by certificate holders. Hunters must purchase, over the counter, either general archery season tags or antlerless tags which are unlimited (MDC 2008). The general archery tags allow the holder to harvest two deer of either sex, but only one antlered deer prior to the November firearms season (MDC 2008).
Figure 2.1
Columbia Deer Management Program Properties and Locations
Figure 2.2
Columbia Deer Management Program’s Hunting Permit
This case study allows insight into the types of hunters participating in an urban deer management program over that of “traditional” hunts because it occurs during the entirety of Missouri’s archery deer season and the proximity of Columbia to other publically available lands. In Boone County there are seven Missouri Department of Conservation areas open to archery hunting, over 65 ha in size (MDC 2009). In addition, the Cedar Creek Ranger District of the Mark Twain National Forest encompasses over 6000 ha which are all open to archery hunting. So, the Columbia Deer Management Program’s participants are not without other public options for hunting locations. In short, this means that understanding the hunters that are choosing to participate in the program and determining what factors are important for their retention is vital to the success of the program.

Study Objectives

Our objectives included: (1) describe the hunters who attended the orientation meeting in terms of gender, age, income, education, occupation status, hunting characteristics and experience, and perceived urban and farming backgrounds; (2) determine the participation, harvest and satisfaction rates of the group; and (3) determine the motivations of why the hunters attended the orientation and what they identified as important to satisfaction. We then used our data to determine if hunters’ motivations, demographics, backgrounds, and hunting experience influenced participation, harvest and success rates. We determined whether harvest success influenced satisfaction and the prediction of continued participation in the Columbia Deer Management Program (CDMP). Finally, we determined whether the demographic and hunter experience variables could predict participation and harvest within the CDMP.
Methods:

Surveys

We made initial contact with the hunters at each of the three mandatory orientation meetings. We read from a script (Appendix A) that introduced us, described our research focus, and included what the hunters could expect from both the initial (Appendix B) and post-hunt surveys (Appendix C). As an incentive we explained that there would be a drawing for those who completed the surveys. Those hunters who completed the surveys and were drawn received one of four $50 gift certificates to BassProShops. All study methods were submitted and approved by the University of Missouri’s Internal Review Board on Human Subjects (IRB) (#1120557).

Self-administered mail surveys were constructed and performed following procedures outlined by Dillman (2000). The initial survey was performed at the beginning of the archery season and a second following its conclusion. Both the initial and post-hunt surveys were pre-tested by four university of Missouri undergraduates for duration and ease of understanding. Pre-tests showed test duration times of between 14 to 17 minutes for the initial surveys and under 10 minutes for the post-hunt surveys. Initial surveys were mailed in October, 2008. The survey contained questions related to demographic variables, hunter background, hunter experience, perceptions, motivations, and hunting preferences. The post-hunt survey, conducted in January, 2009, provided insight into hunter participation, harvest, and satisfaction. The post-hunt survey’s mailing date coincided with the close of the archery season to reduce recall bias for the respondent. Additionally, the post-hunt survey was mailed, to those who had not returned their survey, two more times with approximately 10 days between mailings. A post card
(Appendix D) was sent to all those who attended the orientation between the second and third mailings of the post-hunt survey. Those individuals that did not participate in the October survey were mailed a post hunt survey that contained the questions they had missed. This survey was utilized to increase the overall sample size due to limited initial survey returns. The deadline for returns was March 1st, 2009. A thank you postcard (Appendix E) was sent to all respondents and the names of the winners of the gift certificates were revealed after I obtained permission for the release of each of their names.

Initial Survey and Statistical Analyses

We asked survey participants to answer demographic questions related to age, gender, residence, education, income, and occupation type. Individuals were asked to list their age, zip code, and the place they considered their hometown, but questions regarding gender, education, occupation, and income were categorical. We asked additional categorical questions regarding perceived urban or rural residence, farming background, and northern or southern heritage. Hunter background information questions, which were also categorical, asked the number of years deer hunted, number of years archery hunted, animals harvested, past experience within the Columbia Deer Management Program, and type of archery equipment used. We analyzed the data and expressed the answers as frequencies, percentages, means, standard deviations, and standard errors of answers given.

Hunting commitment questions asked respondents to rank how important hunting was to the individual’s identity, how much money they invested in equipment, and how
they were introduced to the sport. Each of these categorical questions was analyzed similar to those included in the demographic variable section.

An open-ended question was included asking the hunter to list the top reasons for participating in the program. The qualitative responses were measured by using a conventional context approach which relies on formulating coding groups once the data has been collected to avoid imposing preconceived categories (Hsieh 2005). In coordination with this approach Simstat’s Wordstat content analysis program was used to determine the Jaccard’s similarity measure and the co-occurrence of the words within each of the responses. The measure of co-occurrence was used to understand the connection between words in the responses. Jaccard’s similarity scores, which were used to break down words into major nodes, assisted in categorizing the major keywords and phrases that respondents used in their answers for both the most and least preferred scenes. Responses were then coded based on the “primary” keywords and phrases given. Primary keywords and phrases were determined to be those given first in the response, thus implying their importance to the respondent. Once able to establish how keywords were grouped, we read each entry individually and assigned a numeric code identifying the appropriate context of the answer given. We used descriptive statistics including percentages and frequencies to quantify the number of similarly coded responses compared with the number of overall answers.

The hunter typing portion of the questionnaire consisted of both the ranking of motivations for hunting and Likert scale questions to determine typologies, following procedures previously used in Boulanger’s classifications and Decker and Connelly’s motivations for deer hunting (Boulanger et al. 2006, Decker and Connelly 1989). First,
we used eight motivations for hunting that were taken directly from Boulanger’s study of South Dakota muzzleloader hunters and included: meat, nature, excitement, social, trophy, challenge, solitude, and expanded opportunity. Each individual was asked to rank from 1 through 8 (1 being the highest) the reasons they were participating in the Columbia Deer Management Program, why they archery hunt, and/or what motivates them to deer hunt with firearms. Responses were analyzed by identifying the number of numerical ranks for each motivation and their mean ranking. We then attempted to understand if the urban bowhunters were motivated to participate in the Columbia Deer Management program for different reasons than they traditionally bowhunted and firearms deer hunted. The rankings were analyzed by using the Wilcoxon rank sum test.

In addition, three Likert scale questions were included to understand the impact of the expanded opportunities the hunt offered to participants in the program.

The second method of hunter typing also was based on existing methods and used Likert scale questions. Decker and Connelly (1989) used factor analysis to identify questions that pertained to their appreciative, achievement, affiliative, and outgroup contact hunter types. We used their study’s findings and methods to formulate our questionnaire. We included six questions to measure appreciative responses, six to measure achievement, two for affiliative, and five for outgroup contact groups. Each of these questions include a four point scale where 1 equaled strongly disagree, 2 slightly disagree, 3 slightly agree, 4 strongly agree, and 5 indicating no opinion. The questions were then normalized for no opinion by giving those responses a median score. These likert scale questions were analyzed individually by determining the mean scores and frequencies for each question. Questions representing each of the four motivational
categories, or hunter types, were then averaged to achieve hunter typology scores for each category. These averages were represented in terms of mean scores for appreciative, achievement, affiliative, and outgroup contact typologies. To separate the respondents into groups to analyze how typologies influence participation, harvest and success a binary coding system was employed where each respondent was coded as having a high or low average score for each category.

We used analysis of variance (ANOVA) to determine if there was a statistically significant difference ($\alpha<.05$) between and among the categorical demographic and background variables and the rankings that hunters entered for their motivations or their mean scores for appreciative, achievement, affiliative, and outgroup contact typologies. Education employed binary coding that was either College level or higher or below college level. Occupation status was either student or retired and employed. The income variable was transformed into binary form with $40,000 as the separating figure. This income was chosen because the median household income for Columbia, Missouri was $40,326 in 2008 (City-data 2009). Experienced hunters, over 10 years, were compared to those more recently entering the sport. Rural and farming background variables were compared without further categorizing due to their binary form. Tukey’s post hoc test was used to examine main effects in those tests that were not binary in nature ($\alpha<.05$).

Post Hunt Survey Analyses

Harvest data was broken into the numbers of antlerless and antlered deer taken in both the Columbia Deer Management Program and the overall 2008-2009 Missouri deer seasons. A question regarding the number of deer hit and not retrieved was also
included. Harvest and wounded game data were analyzed using descriptive statistics including totals, means per hunter, and standard errors. This data was also examined in light of how many individuals participated in the hunt.

Hunters were asked whether they would be participating in next year’s program and to list the reason(s) why or why not. Hunters were also asked if they considered their experience on the city’s properties during the season as successful. This question was used as a surrogate for satisfaction and was not implied as harvest success. Hunters were also asked how they determine and/or define hunting success. Additionally, the survey contained a question asking if they experienced or witnessed any conflicts on city owned properties. If they had, an open ended question queried about the situation. The quantitative questions were described by listing frequencies and percentages, while the qualitative segments utilized the conventional context analysis described earlier.

Respondents were asked how many trips they made to each of the seven properties and the data were expressed in terms of trips per hunter.

We used Kruskal-Wallis ANOVA to determine whether the motivations and typologies were significantly different between those who did and did not participate, harvest, and/or perceive their hunts as successful which was used as our surrogate for satisfaction.

Predicting Participation and Harvest

Participation and harvest are the response variables we chose to model due to the fact that they tend to be the most discussed and most important in the management of hunting programs and game species. Major goals of resource managers are to increase
participation rates, as well as to determine influences on success. Our response variables were qualitative in nature and had two outcomes following a Bernoulli distribution. Therefore, binary logistic regression was used as our method for modeling. We used a logit link to determine the maximum likelihood estimates of our coefficients. Participation was modeled in a similar manner. Likewise, we did not model for the level of participation but only if the hunter took at least one trip.

We considered three separate models of both participation and harvest success. The models were a priori models set up based on prior research and theory. The participation models were developed to explain what the factors that influence hunting trips may be. By understanding what types of hunters are actually participating in the program managers can better predict who their true constituents are. Additionally, we wanted to explore what the factors were that best predicted who would harvest. This is important because reducing the deer herd is the goal of this program and by understanding what types of hunters and what behaviors of those hunters best predict harvest managers can focus their efforts on promoting to acquire more successful hunters. The first model included the hunter background and typology explanatory variables for participation and “days afield” for harvest. The other models were based on research and also the findings from our conventional context analysis produced from our initial survey (Hsui 2009). We examined the qualitative data for context and keywords to develop model selection stemming from our understanding of the most plausible influences on harvest and participation based on the responses given. Both model 2 and model 3 for participation and the models for harvest success were nested models.
The first a priori model for participation included age, importance of hunting to identity, and hunting experience. Age was categorized into less than 30, 30 to 59, and 60 and older. We tested whether younger hunters were more likely to participate than those in the older categories. The importance of hunting to identity was chosen because, in theory, those who deem hunting more important should participate at greater levels. This variable was measured by the Likert scale answer to, “Hunting is part of my identity.” Those who answered “strongly agree” were coded into one group while all others were placed into a second category. Hunting experience was determined to be high if an individual had archery hunted at least 10 years and low if less than 10 years.

Participation Model 1

Participation = Age + importance of hunting to identity + hunting experience

The second model used residence as the independent variable and the third included hunting experience, past experience in the Columbia Deer Management Program, and archery hunting experience. Residence was determined by zip codes and broken into two groups. Those who lived in Columbia were one group and those outside the city were considered non-residents. This was chosen because “close to home” was the top motivation given in open ended responses during our initial survey. The third model contained the local residence variable and both hunting experience (> or ≤ 10 years) and past experience in the Columbia Deer Management Program -- which deemed any hunter who had hunted in the program before the 2008 season as experienced. Hunters with past participation in the program have shown that they are committed because they have been enrolled for at least two years. Moreover, hunting experience shows their commitment to the sport. By adding the past experience and hunting experience variables we tried to
determine whether adding more information about our hunters’ backgrounds would better predict participation, or if the proximity of the hunters’ residence is the best predictor of participation.

**Participation Model 2**

Participation=Local Residence

**Participation Model 3**

Participation=Local Residence + Past CDMP Experience + Hunting Experience

The harvest dependent variable modeled hunters who participated by taking at least 1 trip during the CDMP season. The “days afield” variable categorized those who took 5 or more trips and those who hunted less than 5 times. This was chosen to include a more stringent “days afield” component to eliminate those who may have only partially committed to hunt the program. This was our only variable for the reduced model. Additionally, our second model contained those with past experience because they should have prior knowledge of the hunting areas giving them an advantage in harvesting. This hypothesis stems from a study by Thomas et al. (1977). The authors found that home-range hunters, or those who hunt the same site in consecutive years, harvested more deer overall (34%) and more deer per hour of hunting (16%). The third harvest model, our full model, also included deer hunting experience, measured the same as in our participation model, and the typology, from Decker and Connelly (1989), that was appreciative oriented. As stated previously, the higher number of “days in the field” should indicate a greater chance for harvest. The appreciative typology was chosen because Decker and
Connelly’s New York study found this group harvested at higher rates. We wanted to explore whether adding information about the hunting experience and typologies of our hunters could enhance the predictability of our models or if only looking at returning hunters and “days afield is the best approach.

Harvest Model 1
Harvest= 5 or more trips

Harvest Model 2
Harvest= 5 or more trips + Past CDMP Experience

Harvest Model 3
Harvest= 5 or more trips + Past CDMP Experience + Hunting Experience + Appreciative Type

Chi Square tests were performed to test the goodness of fit of the models. If the logistic response function is appropriate then chi-square alpha levels should be low (α=.05). DFFITS was used to test the influence of each of the cases on the overall fitted value of the regression model and is a good measure for identifying outliers that have high influences. DFBETAS was used to assess the impact of observations on the coefficients and Cook’s Distance used to determine the effects of each case on the overall regression model.
Results

Survey response rates

The mandatory orientation meeting for the Columbia Deer Management Program had 197 attendees with 188 deliverable addresses. We received surveys from 116 different hunters during the overall study. While we collected demographic data and hunter background information on 116 hunters, the participation, harvest success, and satisfaction questions contained in the post-hunt survey received only 103 returns (54.7%). Also, due to the voluntary nature of the survey several questions had fewer responses.

Demographic and Background Variables

The hunters that attended the orientation were predominantly male and zip codes given determined that most lived in Columbia, Missouri (78.4%). Students made up 15.5% of survey respondents, 78.4% of the hunters were working full-time, and 5.2% considered themselves retired. Additionally, those participating in this hunt were younger and more highly educated than the “typical” Missouri hunter with 46.1% having earned a bachelor’s degree, or higher, and 49.6% of the hunters were less than 30 years old (Table 2.1). Most hunters perceived their residences (69.8%) and backgrounds (63.1%) as urban and 36.8% considered themselves as having a farming background. The hunters tended to live on less than 0.4 ha (78.4%) with only 7.7% residing on at least 4.05 ha of land. When the hunters were asked whether they perceived themselves as northern or southern a majority (56%) answered no affiliation. Only 12.9% replied that they considered themselves northern, while 31% answered southern.
Table 2.1
Columbia’s Urban Hunters Compared to Missouri’s General Hunters
(Percentage of Survey Respondents)

<table>
<thead>
<tr>
<th>Hunter Data</th>
<th>CDMP</th>
<th>Missouri</th>
<th>Z-score</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>98.3</td>
<td>85</td>
<td>3.905</td>
<td>0.000</td>
</tr>
<tr>
<td>Female</td>
<td>1.7</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-34</td>
<td>59.5</td>
<td>22</td>
<td>8.038</td>
<td>0.000</td>
</tr>
<tr>
<td>35-54</td>
<td>31.9</td>
<td>53</td>
<td>4.103</td>
<td>0.000</td>
</tr>
<tr>
<td>55 and older</td>
<td>7.8</td>
<td>18</td>
<td>2.697</td>
<td>0.007</td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; $40,000</td>
<td>45.3</td>
<td>25</td>
<td>4.360</td>
<td>0.000</td>
</tr>
<tr>
<td>≥ $40,000</td>
<td>64.7</td>
<td>75</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; High School</td>
<td>6.1</td>
<td>16</td>
<td>2.760</td>
<td>0.006</td>
</tr>
<tr>
<td>High School</td>
<td>32.2</td>
<td>32</td>
<td>0.042</td>
<td>0.966</td>
</tr>
<tr>
<td>Associates/Technical</td>
<td>15.7</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>College Degree</td>
<td>46.1</td>
<td>19</td>
<td>6.167</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Residence</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>69.8*</td>
<td>38**</td>
<td>6.229</td>
<td>0.000</td>
</tr>
<tr>
<td>Rural</td>
<td>30.2*</td>
<td>62**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N=116 CDMP
Missouri statistics (US Census 2006) N=560
(* denotes perceived residence, ** based on population density)

Introduction to the Sport, Equipment Types, and Experience

Answers given for the question regarding who introduced the survey participant to hunting were dominated by family (57.9%) and friends (18.4%) with those who were self-taught making up 24.7% of the sample. We determined hunters to be experienced if they had more than 10 years of prior deer hunting experience, although we also measured the number of years of all hunting, archery hunting, and past participation in the Columbia Deer Management Program (CDMP) (Table 2.2). We found that the hunters, in general, participating in the CDMP were highly experienced in terms of years with only 29.8% of the respondents answering that they had less than 10 years of experience
deer hunting while 40% of the sample had over 10 years of archery hunting experience. Only 18.1% had not participated in the CDMP in past seasons.

We also found that the hunters, as a group, were experienced in terms of number of past animals harvested by all methods and, specifically, with archery equipment (Table 2.2). A large majority of the hunters (87.7%) used compound bows with 6.1% using recurves, or longbows, while 5.3% utilized disability permits for crossbows. We found that 61% of hunters had invested over $700 in their archery hunting equipment. Hunters who had harvested more than 10 deer accounted for 69.4% of the group, while hunters harvesting more than 10 deer with archery equipment composed 23.6% of our sample.

We also included the number of antlerless deer harvested in our survey to determine if the hunters participating in the management program focused solely on antlered deer or fit with the characteristics needed by managers. We found that 46.6% of the hunters had harvested more than 10 antlerless deer prior to the start of the 2009 archery season. However, when we asked about the number of deer harvested in the CDMP during the four prior seasons 65.8% of respondents had never taken a deer with only 6 hunters having harvested over 5 deer (N=73).
### Table 2.2
Hunting Experience of Orientation Participants
(Percentage of Survey respondents)

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>&lt;5</th>
<th>5-10</th>
<th>11-15</th>
<th>16-20</th>
<th>&gt;20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Years Hunting</td>
<td>0.0</td>
<td>5.5</td>
<td>9.6</td>
<td>16.4</td>
<td>26.0</td>
<td>42.5</td>
</tr>
<tr>
<td>Total Years Deer Hunting</td>
<td>0.0</td>
<td>11.3</td>
<td>18.3</td>
<td>20.0</td>
<td>20.9</td>
<td>29.6</td>
</tr>
<tr>
<td>Total Years Archery Hunting</td>
<td>0.9</td>
<td>36.0</td>
<td>22.8</td>
<td>17.5</td>
<td>8.8</td>
<td>14.0</td>
</tr>
<tr>
<td>Total Deer Harvested</td>
<td>5.6</td>
<td>12.5</td>
<td>12.5</td>
<td>22.2</td>
<td>9.7</td>
<td>37.5</td>
</tr>
<tr>
<td>Total Archery Deer Harvested</td>
<td>12.5</td>
<td>40.3</td>
<td>13.9</td>
<td>9.7</td>
<td>11.1</td>
<td>12.5</td>
</tr>
<tr>
<td>Total Antlerless Deer Harvested</td>
<td>8.2</td>
<td>23.3</td>
<td>21.9</td>
<td>13.7</td>
<td>5.5</td>
<td>27.4</td>
</tr>
</tbody>
</table>

N=116

### Hunter Motivations and Typologies

By utilizing keywords determined from the conventional context analysis method we sought to ascertain the motivations hunters gave for attending the orientation meeting (Figure 2.3). The top reasons given for attending were that the hunting areas were either close to their residence/work or that the hunt offered them more hunting opportunities (Expanded Opportunity).

When using the motivations utilized by Boulanger et al. (1999) we also found that the expanded opportunity that the hunt offered was the top reason for participating while trophy motivations were ranked the lowest (Table 2.3). When analyzing the percentages of the ranks for each motivation we were able to determine that nature was also ranked higher by most hunters, while social reasons showed lower rankings and the challenge, solitude, and excitement motivations received more of the middle rankings (Figure 2.3).
Figure 2.3
Motivations for Attending CDMP Orientation Meeting

Percentages of Hunters' Top Three Reasons for Participation

- Close to Home/Work-Easy Access: 30.36%
- Recreation & Enjoyment: 19.64%
- Reduce Deer damage: 14.29%
- Expanded Opportunity: 10.12%
- Large Deer Population: 8.93%
- Low Hunting Pressure: 7.74%
- Meat: 6.42%
- Nature: 5.07%
- Social: 4.76%
- Tradition: 3.57%
- Trophy: 2.38%
- Urban deer easier to hunt: 1.05%

N=63
The mean rankings using the motivations from Boulanger’s 2008 study were also used to describe the motivations of the hunters and how their motivations compared to why they archery hunt, in general, and also why they firearms deer hunt (Table 2.3). By using the Wilcoxon Rank Sum Test we found that hunters ranked social and solitude motivations for the CDMP statistically the same for why they archery hunt in general. We also found no statistical difference between the way hunters ranked the meat motivation for hunting in the CDMP and why they hunted deer with firearms. All the other motivations for participating in the CDMP were statistically different than why these hunters choose to archery hunt, generally, and firearms deer hunt.
Table 2.3
Motivations for Hunting in the CDMP, General Archery Season, and Firearms Hunting & Statistical Differences Between CDMP Motivations and Other Types of Deer Hunting (Ranks Displayed as Means ± Standard Errors) (1=highest rank, 8=lowest rank)

<table>
<thead>
<tr>
<th></th>
<th>CDMP</th>
<th>General Archery(P)</th>
<th>Firearms (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meat</td>
<td>3.74±.222</td>
<td>4.06±.279 (0.039)</td>
<td>3.54±.242 (0.067)</td>
</tr>
<tr>
<td>Nature</td>
<td>2.94±.154</td>
<td>3.76±.226 (0.012)</td>
<td>3.58±.169 (0.001)</td>
</tr>
<tr>
<td>Excitement</td>
<td>4.05±.157</td>
<td>3.49±.208 (0.001)</td>
<td>3.43±.157 (0.001)</td>
</tr>
<tr>
<td>Social</td>
<td>5.90±.194</td>
<td>6.07±.224 (0.848)</td>
<td>4.29±.226 (0.000)</td>
</tr>
<tr>
<td>Trophy</td>
<td>6.06±.205</td>
<td>5.49±.265 (0.046)</td>
<td>4.44±.259 (0.000)</td>
</tr>
<tr>
<td>Challenge</td>
<td>4.83±.164</td>
<td>3.31±.255 (0.000)</td>
<td>5.92±.185 (0.000)</td>
</tr>
<tr>
<td>Solitude</td>
<td>5.61±.176</td>
<td>5.35±.240 (0.558)</td>
<td>5.94±.188 (0.031)</td>
</tr>
<tr>
<td>Expanded Opportunity</td>
<td>2.79±.204</td>
<td>4.40±.287 (0.000)</td>
<td>4.80±.238 (0.000)</td>
</tr>
</tbody>
</table>

N=111 for CDMP and Firearms Hunting
N=70 for General Archery Hunting
P values determined by Wilcoxon Rank Sum Test

The second method we used for typing the hunters was taken from Decker and Connelly’s 1989 study that utilized appreciative, achievement, affiliative, and outgroup contact types of hunters (Table 2.4). Respondents could answer that they strongly disagreed (1), disagreed (2), agreed (3), or strongly agreed (4) with the Likert scale question. The mean scores associated with appreciative questions were the highest (3.33), followed by Affiliative (2.61), Achievement (2.33), and outgroup contact (1.98) (Figure 3.4). When binary codes were employed to show either agreement or disagreement with the questions related to the typologies 96.4% of the hunters mean scores were in agreement with the appreciative questions, followed by affiliative (44.3%), achievement (27%), and outgroup contact (14.5%).
Table 2.4
Example Typology Questions with Mean Scores (1=strongly disagree, 4=strongly agree)

<table>
<thead>
<tr>
<th>Typology</th>
<th>Mean Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appreciative</td>
<td></td>
</tr>
<tr>
<td>I hunt to relax and get away from everyday problems</td>
<td>3.29</td>
</tr>
<tr>
<td>I archery hunt to get outdoors and enjoy nature</td>
<td>3.69</td>
</tr>
<tr>
<td>Developing and using outdoor skills is a major reason why I hunt</td>
<td>3.27</td>
</tr>
<tr>
<td>Achievement</td>
<td></td>
</tr>
<tr>
<td>Harvesting deer determines whether a hunt is successful</td>
<td>2.18</td>
</tr>
<tr>
<td>I use the CDMP to put meat in the freezer</td>
<td>3.14</td>
</tr>
<tr>
<td>Getting a shot at a deer is a major reason why I hunt</td>
<td>2.47</td>
</tr>
<tr>
<td>Affiliative</td>
<td></td>
</tr>
<tr>
<td>Being with hunting companions is why I participate in the CDMP</td>
<td>2.18</td>
</tr>
<tr>
<td>Companionship of family and friends is important during a hunt</td>
<td>2.97</td>
</tr>
<tr>
<td>Outgroup Contact</td>
<td></td>
</tr>
<tr>
<td>I choose to hunt areas where I will see other hunters</td>
<td>1.50</td>
</tr>
<tr>
<td>Seeing other hunters in the field ruins my hunt</td>
<td>2.59</td>
</tr>
</tbody>
</table>

Figure 2.5
Mean Score Distributions for Questions Regarding Typology Orientations (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree)
Hunter Demographics and Backgrounds as Predictors of Motivations and Typologies

Much like previous studies we found that hunter motivations and typologies are formed through a complex process and not easily determined from simple demographics and backgrounds. However, using ANOVA, we found that significant differences did emerge from those participating in the CDMP. The hunters’ residence, as determined by zip codes, did influence the motivations they chose for participating in this program. The local residents living in Columbia were more likely to rank nature higher \( (P = .017) \) and social motivations lower \( (P = .000) \). Likewise, locals gave lower scores to affiliative questions \( (P = .000) \). Retired individuals ranked social motivations higher \( (P = .038) \) and hunters between ages 30 to 59 ranked the expanded opportunity the hunt offered higher \( (P = .031) \). Hunter’s incomes also showed significant differences on the rankings of meat and expanded opportunity. Those who had average household incomes of greater than $40,000 ranked meat \( (P = .012) \) and the expanded opportunity motivation \( (P = .001) \) lower than those making less. Additionally, those who perceived their backgrounds as urban ranked nature higher \( (P = .038) \) and social \( (P = .030) \) and trophy \( (P = .031) \) motivations lower. Hunters that considered their backgrounds as urban also scored lower on the affiliative hunter typology questions. We also found that hunters living on less than 0.04 ha ranked motivations for meat \( (P = .004) \) and social \( (P = .031) \) lower than those with more land.

Participation, Harvest Success, and Satisfaction

There were 63 \( (N = 103) \) hunters that recorded that they hunted at least one time during the course of the 2009 season in the CDMP. Out of this group 15 hunters \( (23.8\%) \) harvested a total of 28 deer; four of the deer were antlered bucks. By breaking down the number of
days spent in the field we were able to determine that 35.6% (N=36) of the group hunted at least five days and those hunters had a harvest rate of 38.8%. The number of hunters that responded that they were likely to participate in the program the following year was 89 (N=100). Of the 11 hunters who did not plan on future participation 10 cited that they were either moving or had acquired private lands to hunt. The remaining hunter found a place on a Missouri Department of Conservation area which he planned to hunt. When we further examined the perceived success of the hunters 90% considered their hunts successful, while, as stated above, only 23.8% of those who hunted harvested deer.

By using a one-way ANOVA we determined that neither satisfaction (F= 0.276, df= 5/63, p=0.924) or future participation (F=0.279, df = 5/94,p=0.925) were significantly influenced by harvest. To gain insight into what factors these hunters used to determine success we used an open ended question and conventional context analysis. We found that 20.5% of survey participants (N=102) listed harvesting a deer was how they determined a successful hunt. Seeing deer (47.4%) was the top response followed by enjoying nature (17.9%) and general relaxation or getting away (14.1%).

**Hunter Motivations and Typologies’ Influence on Participation, Harvest and Satisfaction**

We used Kruskal-Wallis ANOVA and found the different rankings for hunter motivations and typology scores’ produced little statistical significance on the varying rates of participation, harvest, and satisfaction. However, similar to Decker and Connelly (1989) we found that, using Kruskal-Wallis ANOVA, those hunters that scored higher on appreciative questions harvested at higher rates (X²=4.89,p=.029). We also found that
hunters who ranked the trophy motivation higher harvested at lower rates ($X^2=4.43$, $p=.025$).

**Predicting Participation and Harvest**

When we used binary logistic regression to predict participation our model containing age, importance of hunting to identity, and deer hunting experience variables was not significant, though the deer hunting experience variable was significant within the model (Table 2.5). Hunters with over 10 years of experience were shown to have increased odds of taking at least one hunting trip during the course of the season. Our second and third models were both significant at the alpha < 0.01 level. Our reduced model showed that local residents, or those living in Columbia, were over 4 times more likely to participate than those with zip codes outside the city. Residence alone explained 10% of the variance between those participating and those not taking at least one hunting trip during the course of the 2008 season. When examining, using a pseudo $R^2$, our full model we found that 19.1% of the variance was explained. This model, containing residence, CDMP Experience, and deer hunting experience contained only one variable, hunting experience, which did not have a significant impact on participation. Our full model (Model 3) showed that the logged odds of participating for local residents increased by more than 3 times compared to that of non-locals, and it also showed that hunters who had prior experience in the CDMP were over 4.5 times more likely to participate (Table 2.5). We used the chi-square goodness of fit for model selection and found that model 3 both showed significance at a higher alpha level and explained more of the variance in participation. We used DFFITS, DFBETAS, and Cook’s Distance to
determine outliers and one hunter had a DFBETA of over 1, however even though the values were high enough to indicate this hunter as an outlier it did not significantly change our models to require removal. This hunter was 26 years old, had less than 10 years of hunting experience, answered that hunting was important to his identity, and did not have prior experience with the CDMP and participated. After closer examination, this hunter participated at a high level (13 trips), listed meat as his primary motivation, and harvested an antlerless deer during the course of the program.

Table 2.5
Predictors of Participation (≥ 1 Hunting Trip)

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exp(B) (P)</td>
<td>Exp(B) (P)</td>
<td>Exp(B) (P)</td>
</tr>
<tr>
<td>Constant</td>
<td>2.872</td>
<td>0.389</td>
<td>0.193</td>
</tr>
<tr>
<td>Age (&lt; 30)</td>
<td>0.566 (0.163)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hunting Importance to Identity</td>
<td>1.115 (0.793)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deer Hunting Experience</td>
<td>0.426 (0.041)</td>
<td>0.616(0.297)</td>
<td></td>
</tr>
<tr>
<td>Local Resident</td>
<td></td>
<td>4.11 (0.004)</td>
<td>3.067(0.036)</td>
</tr>
<tr>
<td>CDMP Experience</td>
<td></td>
<td></td>
<td>4.767(0.006)</td>
</tr>
<tr>
<td>Nagelkerke R²</td>
<td>0.054</td>
<td>0.100</td>
<td>0.191</td>
</tr>
<tr>
<td>N=103</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chi Square Goodness of Fit (P)</td>
<td>4.534 (0.209)</td>
<td>9.037 (0.003)</td>
<td>17.724(0.001)</td>
</tr>
</tbody>
</table>

Each of our harvest models contained the “five trips” variable that was used as a surrogate for a high number of “days afield” and we found it had the most impact on harvest. In our reduced model containing only the “days afield” variable we were able to explain 25.2% of the overall variance associated with harvest success (Table 2.6). By using the logged odds that model 1 produced we found that those taking at least 5 trips
were more than 15 times more likely to harvest at least 1 deer. By adding the variable used to show prior participation in the CDMP (P=0.862) we found that we only explained 0.1% more of the variance, however the fit of the model was also significant at the 0.01 level. Our full model containing the additional deer hunting experience variable and those whose mean scores for appreciative typologies were high was showed significance at a high level and our pseudo R² determined that this model explained 36.8% of the overall variance between those who harvested a deer during the program and those who did not. The full model showed, when controlling for hunter background variables, those who took 5 or more trips were over 23 times more likely to harvest. Those with greater than 10 years of deer hunting experience were 4.725 times more likely to harvest, while those who scored higher on appreciative questions were 2.2% more likely to harvest (Table 2.6). Past experience in the program was found to have no significant affect on harvest success. We used DFFITS, DFBETAS, and Cooks Distance and found that the same individual that was deemed to be an outlier in the participation models was also an outlier in our harvest models. Though the values indicated this outlier they were not substantial enough to require removal.
Table 2.6
Predictors of Harvest Success

<table>
<thead>
<tr>
<th></th>
<th>Model 1 Exp(B) (P)</th>
<th>Model 2 Exp(B) (P)</th>
<th>Model 3 Exp(B) (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.040</td>
<td>0.049</td>
<td>1.073</td>
</tr>
<tr>
<td>5 Trips</td>
<td>15.217 (0.011)</td>
<td>15.467 (0.011)</td>
<td>23.434 (0.010)</td>
</tr>
<tr>
<td>CDMP Experience</td>
<td>0.796 (0.862)</td>
<td>0.293 (0.379)</td>
<td></td>
</tr>
<tr>
<td>Deer Hunting Experience</td>
<td></td>
<td></td>
<td>4.725 (0.107)</td>
</tr>
<tr>
<td>Appreciative Typology</td>
<td></td>
<td></td>
<td>0.022 (0.048)</td>
</tr>
<tr>
<td>Nagelkerke R²</td>
<td>0.252</td>
<td>0.253</td>
<td>0.368</td>
</tr>
<tr>
<td>N=63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chi Square Goodness of Fit (P)</td>
<td>11.599 (0.001)</td>
<td>11.629 (0.003)</td>
<td>17.75 (0.001)</td>
</tr>
</tbody>
</table>
**Discussion**

We found that hunters who obtained permits for the Columbia Deer Management program tended to be white males, who were younger and more highly educated, but had lower incomes than Missouri’s typical hunters. While our survey did not contain a specific question regarding race we did not encounter, or perceive to encounter, a minority participant at any of the three orientation meetings. While Missouri has minority hunters, not encountering any minorities at the meetings seems to coincide with other surveys of Missouri hunters which, due to small sample sizes, have been unable to accurately quantify this small group (US Census 2006). While some of the age differences could be attributed to being in a college town only 15% of the hunters were students and almost half were under the age of 30. We think the trend of younger hunters may be attributed to the recent shift toward urban deer management and that older hunters may have already determined hunting areas and are not seeking out these new programs to expand their opportunities. If urban hunting programs are able to attract younger hunters and more hunters who are self-taught it may be a way to retain and recruit more deer hunters. Though a large majority of those participating were from Columbia, Missouri this may be an effect of the orientation meetings being held in the city during a short period at the end of the summer. Thomas et al. (1977) found that the most important groups of hunters are often ill served by holding public meetings near hunting sites because it limited the input from out of town constituents. Columbia may increase the number of committed hunters in their program if the orientation meetings were held in several locations during different weeks of the year.
Traditionally nature values associated with hunting have been viewed more in the context of wilderness areas. Our results from the open-ended questions suggested that nature was not the primary motivation of the hunters. But, nature was often used as a modifier in the reasons why individuals were hunting even though it was only used as the primary, or first listed reason, by less than 2% of the hunters. Many times the primary reason for participating was the proximity of hunting locations to a hunter’s work or residence and then they would state that it allowed them more of a chance to enjoy nature. Likewise, when hunters would list they were participating to relax they would qualify their statement by stating that they relax by getting out in nature. This may help explain the discrepancy of the results we obtained when measuring respondents’ motivations by using more traditional rankings or Likert scale questions. For the more traditional methods our results showed that hunters participating in this urban deer management programs were motivated by nature values. This was especially true when the hunters participating perceived their backgrounds as urban. Good (1997) stated that wilderness, and by surrogate nature, can be many things to one person and the hunters participating on these small city owned parcel identified with being in nature as one of their top motivations for participating. However, as stated earlier the most reported primary motivation was that the program offered hunters expanded opportunity. During the orientation meetings several hunters approached me and stated that they liked having the option to get away for a couple of hours near their residence or after they left work. This was quantified during our study where 30.36% of the top answers for participating were that the areas were either close to the hunter’s home or workplace. This would
suggest that those obtaining permits are trying to find a convenient place to hunt with minimal travel times that also allows them to experience nature.

As previously mentioned, when using traditional techniques our study indicated that hunters participating in the CDMP did so based on motivations and typologies similar to those observed in previous studies (Boulanger et al. 2006, Decker and Connelly 1989, and Potter et al. 1977). Nature motivations received the highest overall scores followed by expanded opportunity and meat. Motivations for trophy animals were the lowest followed by social, solitude, and challenge motivations. Similarly, Hendee (1974) found that differences existed between backcountry hunters’ and general season party hunters’ motivations, preferences, and characteristics. We found that our hunting group had different motivations for participating in the CDMP than they did for other deer hunts. While motivations for hunting are mainly viewed as hunter-based, we found that they are more situational in nature. This finding may be the reason why, as in earlier studies, that most demographic and background variables do not appear to be major factors in determining the complex formations of motivations for hunting. Only those highly motivated by meat in our hunt also included meat as a top motivation for firearms hunting. Motivations for archery hunting in general and archery hunting in the CDMP were also significantly different. Only the rankings for trophy, solitude, and social reasons were similar between the archery categories. Because rankings for trophy motivations were more dichotomous one could predict that hunters hold strong views on this motivation, thus not allowing for as much variation for different types of archery hunting. This may be a symptom of the nature of archery hunting. In other words, archery hunting is a less social type of hunting where hunters spend more time alone on a stand.
We believe this accounts for why the social and solitude motivations were similar for both general archery hunting and hunting in the CDMP. Some of our findings linking demographics and hunter backgrounds were statistically significant; but, these results should only be viewed for why hunters were motivated to participate in this particular urban hunt.

As previously stated, we found that those who perceive themselves as urban were more motivated by nature. Likewise, those living in Columbia were more likely to list nature as a strong motivator and they also were more strongly linked to appreciative typologies. Locals were also less likely to hunt for social reasons. This is most likely because those living outside of Columbia have hunting companions that they meet to hunt the program with. Because our results showed that those making less than $40,000 a year ranked the expanded opportunity the hunt afforded them higher than those with greater household incomes the hunt may provide areas to those with fewer connections to private lands. Urban management programs may also expand the opportunity that those in lower income brackets have to harvest animals for meat, which was also ranked higher as a motivation for participating by those with lower household incomes. This data may help answer questions regarding ways to better implement programs more equitably across income groups.

While the traditional rankings and scoring of motivations for hunting provided useful information about the hunters in our group, the qualitative responses were often times more insightful. We found that 14.29% of the top reasons the hunters gave for participating were to reduce deer damage in the community. This was a common theme that hunters talked about during the orientation meeting and several hunters stated that
the hunters in the group were a benefit to the community. A few hunters stated that it was their way of performing a community service. Another top motivation for hunting the program was that the city offered a large deer population that saw limited hunting pressure (10.2%). Several of the hunters indicated that they saw deer in the community on a regular basis and they were intrigued by the possibility of hunting them.

Our survey showed that 61.1% of the respondents made at least one hunting trip during the program and that 23.8% of those participants harvest at least one deer. Those that spent at least 5 days in the field harvested at 35.6%. Our results showed that 89% of hunters viewed their hunts as successful, and while the harvest rates are higher than Missouri’s general archery success rates most hunters did not base their satisfaction on harvest. This finding was similar to previous literature (Brown et al. 1977, Hendee 1974, Potter et al. 1977, Stankey et al. 1977). The factor of satisfactions revolving around harvest but not tied to harvest is well documented. More (1984) hypothesized that the pleasure of hunting did not stem from the reward of killing an animal but rather the elements involved in the process. Qualitative responses of CDMP hunters found that satisfactions were more likely to be determined by seeing deer (47.4%) and enjoying nature and relaxing (32.0%).

Similar to Decker and Connelly (1989) we found that appreciative hunters harvested at a significantly higher rate. This may be related to other findings which suggest that younger and less experienced hunters are more likely to rate achievement higher than that of appreciation. Decker and Connelly also found that appreciative hunters were more likely to pass on shooting deer which is an attribute one might expect to find in more experience hunters. We also found that hunters who ranked trophy as a
primary motivation harvested at lower rates. This was expected because those who are determined to harvest a trophy will have fewer opportunities during the season than a hunter seeking an antlerless deer.

When we used our demographic, hunter background, and typology data to predict participation we found that local residents and those who had prior experience in the program were more likely to take at least one hunting trip during the season. We identified that by adding hunting experience to the model we were able to predict 19.1% of the variance in participation rates. Research quantifying variables that influence hunter participation could lead to better estimates of the number of hunters needed to meet management objectives concerning the harvest of antlerless deer. We found that the “days afield” concept was very important to harvest. When implementing our full model for harvest that contained deer hunting experience, days afield, and those with high scores for appreciative typology questions we found that those who took 5 or more trips harvested more than 23 times the rate of those hunting 1 to 4 times. Understanding the affect of this variable showcases the importance of understanding what motivates hunters to participate.

While the prediction of participation rates of hunters was only a part of our research, more needs to be developed to determine the causal factors that increase the number of hunting trips taken during managed urban hunts. We believe that the best way to approach this question is through qualitative analysis using either focus groups or interviews. Our survey, and those that proceeded, can only determine the major factors that might address increasing both the effectiveness of urban deer programs and the quality of the hunting experience. More in-depth research needs to be employed to
understand the complex relationship and formation of the motivating factors that lead to participation in hunting programs. Questions concerning the influences of demographics, socio-economics, and influences on perceived backgrounds and hunting identities on participation need to be addressed if management of urban deer populations is to succeed in an age of decreasing hunters.
Management Implications

While the goal of urban deer management programs is to reduce deer populations we should not underscore the importance of determining what motivates hunters to participate. Although nature ranked high on the list of reasons for participating when we explored this relationship further we found that most included nature as a qualifier to primary reason for participated in this particular program. Expanding opportunities to hunt closer to home and work, as well as social and recreational values that motivate the hunters to participate should not be underscored by managers. By simply measuring and promoting a program’s success in terms of harvest numbers managers may very well be missing the reasons most hunters have for participating. The potential for harvest is the underlying reason for hunting, but to promote these urban hunts managers may be better served to emphasize the multiple satisfactions that the programs provide to hunters.

Moreover, our models showed that participation is higher for those who reside in the same town as the management program and participation is also strongly linked to retention of current hunters. This information could be beneficial in the marketing of the programs. Our data suggests that managers could benefit their programs if they work to meet the concerns of current hunters and focus promotions through local media to increase the number of hunters making it into the field. Harvest was strongly linked to the “day’s afield” concept. And, although hunters with varying levels of experience were included in our models, the number of hunting trips was the most important variable in determining harvest success. Identifying aspects of the program and properties included to maximize the number of hunting trips made should be attempted to increase the number of deer harvested.
Literature Cited


CHAPTER 3

HUNTING SCENE PREFERENCES OF ARCHERY DEER HUNTERS IN AN URBAN DEER MANAGEMENT PROGRAM

Abstract

Urban deer management studies have traditionally focused on either community dynamics and building support for management proposals or effects hunting has on the behaviors and populations of deer. This case study utilized an ongoing urban deer management program and defined its urban hunters’ landscape scene preferences, effects of landscape preference on harvest, and whether hunter backgrounds and motivations influence landscape scene preferences. We also used conventional context analysis to find the reasons hunters preferred or disliked particular habitat scenes. Our methods included a self-administered mail survey that was completed following the 2008 urban archery season for the City of Columbia, Missouri’s Deer Management Program. Surveys were mailed to each of the 197 individuals who attended the mandatory orientation meeting. Respondents were asked to rank 15 black and white photos that represented the major habitat classifications on the properties included in the management program. Additionally, 8 hunter motivations were ranked and questions regarding hunting experience and perceived backgrounds were included. Our results were determined from the 103 (54.8%) surveys returned out of the 188 deliverable addresses. The top ranked motivations for participating were the expanded opportunity allowed by the hunt (42.3%), nature (23.4%) and meat (18.9%). Preferred landscape scenes were closed forests having a minimal understory and least preferred scenes were those that depicted either mowed fields, deciduous thickets, or closed canopy forests having a dense understory. Conventional context analysis indicated three major groups of reasons behind scene selection. These were coded as hunter utility, quality of deer habitat, and general familiarity or aesthetic values of a scene. For both the most preferred (45%, N=100) and least preferred (64.3%, N=98) hunter utility was the reason given for particular preferences followed by quality of deer habitat. Overall, hunter backgrounds and experience were not found to have a significant influence on landscape preference. Additionally, landscape preference did not significantly affect harvest results. Understanding these urban archers’ landscape preferences could enhance managers’ abilities to predict hunter densities and areas that game may receive more pressure. It also provides insight into the decisions that hunters make in determining which locations to hunt. Considering that landscape preferences were based on hunter utility (e.g. ability to use tree stands, having clearer shooting lanes) than on perceived deer habitat, managers may need to adapt programs to locate hunters in areas with the highest deer densities to meet their harvest goals.
Introduction

The quest to understand landscape preference has been a focus of forestry and urban planning for decades. Viewing landscape scenes to interpret the three-dimensional world has been the most relied upon method and is coined as surface analysis. Surface analysis can be used to make inferences about nature and it can provide an empirical method for assessing perceived landscape quality (Kaplan 1988). However, it can also be used to generalize the quality of the scenes without placing a quantitative measure on them. Surface analysis uses a method of analyzing scenes based on complexity, coherence, mystery, and legibility of photographs. Complexity is the diversity and richness of the scene. Coherence involves the factors such as structure and readily identifiable components that make the picture easier to comprehend. The mystery component provides for the promise of further discovery, whereas legibility associates the ease with which an individual could navigate if on the ground. Generally, when complexity is higher the scene receives higher scores, but if that complexity reaches a level that reduces coherence and legibility, the scene’s attractiveness will suffer. However, in natural scenes this has proven to not always hold true. For example, Kaplan et al. (1972) found that in natural scenes the less complex they were the higher they seemed to rank. Lower complexity would tend to favor those scenes with mature forests with fewer stems because nature scenes depicting open fields often receive low ratings due to their lower scores in mystery and extreme lack of complexity (Kaplan 1988). More recent studies focused on forest scenes (not relying on the previously mentioned method) have also shown that generally early successional habitats are not preferred (Gobster
2001). It seems that highly ordered scenes with diversity of imagery, but also containing a limit on sight-- which adds mystery -- have more consistent appeal.

Although these general rules of complexity, coherence, mystery, and legibility have led to determinations of which scenes are preferred in nature, as human influence becomes more dominant, the preference scores tend to decrease. Thus, more “natural” scenes are seen as more pleasing than “built” human scenes regardless of complexity, coherence, mystery and legibility (Kaplan et al. 1972). If hunters are determining their preferences based on aesthetics this insight could lead to hunters choosing scenes and hunting sites that are less associated with man-made structures or natural habitat manipulations.

Furthermore, it has been found that demographic and background variables can lead to differing landscape preferences and this information is critical for managers to make better decisions (Lyons 1983). Cross-cultural studies involving college students from different countries have also compared landscape preferences and found that there are significant differences between nationalities (Kaplan and Herbert 1986, McAndrew et al. 1988). In this study, cultural and background variables were chosen precisely because previous literature suggests that different backgrounds and perceptions of self can alter landscape preference (Lyons 1983, Zube et al. 1974). In the past, little to no emphasis has been placed on determining how hunter characteristics, motivations, and methods might influence the areas which hunters choose. This is important because traditionally hunter densities and pressure on game in specific areas have been shown to influence overall hunter satisfaction (Kennedy 1977). Additionally, hunter densities have been used in managed urban hunts to determine the number of hunters allowed at particular sites.
Therefore, understanding landscape preferences in urban hunts where no specific hunting locations are mandated, like the Columbia Deer Management Program, could better predict lands that may see higher hunter densities and more pressured game. This information is crucial, not only for the short term management of white-tailed deer in urban areas but also for the long-term sustainability of the hunting interest in urban deer management programs.

How and why individuals utilize landscapes for recreation can influence what types of habitats are perceived as having greater aesthetic value (Calvin et al. 1972, Gobster 1999, Noe 1981). Because hunts have traditionally taken place in rural landscapes, understanding the perceptions of urban green space landscapes and their utilization by hunters could provide insight for urban deer management. Questions regarding urban landscape scene preference and outdoor recreation have been explored in past studies; however, the intent of these studies has focused more on cultural backgrounds, such as race, than on particular field behaviors and modes of urban deer hunting. Triana (1994), at the August A. Busch Memorial Wildlife Area in Missouri, found that groups with differing use patterns tended to rate landscapes in relation and/or contrast to others. For example, Kaltenborn and Anderson's (2009) study of Norwegian ptarmigan hunters (albeit neither urban nor relating to deer) found that local habitats available to hunters, hunter motivations, and use of dogs (field behavior) influenced their preference for hunting scenes.

The areas of focus mentioned above relate to preferences for landscape scenes and they show that those who utilize areas for different reasons and are from differing groups with varying backgrounds may have divergent preferences for natural scenes. But what
preferences do urban hunters have and how do they determine their hunting scene preference? Understanding whether different motivations and characteristics of hunters influences hunting preferences for specific locations is key to facilitating better utilization of these small, urban parcels included in urban deer management programs. Hunters may choose different locations than are generally associated as having greater aesthetic appeal because of varying ideas about the functionality of certain landscape scenes for their hunting methods or their higher perceived quality as it relates to deer habitat. By understanding these preferences, as noted above, it may help separate areas that are not in high demand by the general public or used to estimate true hunter densities.

Research Objectives

Research examining urban archery deer hunters’ landscape preferences could help managers in the determination of lands to include in urban deer management programs and better predict harvest outcomes, hunter densities per location, and potential conflicts that could arise in multiple-use areas. This has been noted in previous studies concerning managers’ abilities to better implement policies facilitating additional antlerless deer harvest when more precise predictions can be made concerning hunter characteristics such as motivations and field behavior, including choice of hunting locations (Stedman 2004). In this study we determined the preferences of hunting scenes and the underlying reasons for those preferences given by urban archery hunters. We also determined the properties most visited by hunters and whether those properties had higher percentages of preferred landscape scenes. Additionally, we explored the relationship between hunter motivations, backgrounds, and hunting experience with landscape scene preference.
Hunters’ choices of landscape scenes were also compared to harvest success to try to understand if particular habitat preferences are associated with increased harvest. Lastly, we identified the scouting methods that those in this hunting population used to choose their hunting location which was then utilized to identify whether landscape scene preference could better predict “on the ground” hunting location choice.
Methods

Study Area and Hunting Guidelines

Columbia, Missouri is located in Boone County approximately 125 miles from both Kansas City and St. Louis, Missouri. It lies between the Northern Till Plains and Ozark Border Natural Division of Missouri (Thom and Wilson 1980). The topography of the area is generally characterized by rolling hills with abundant ridge tops and ravines that feed into bottomland streams. The area climate is continental and humid (Critchfield 1966).

The city of Columbia, since August 16th, 2004, has provided selected city-owned properties that are open for hunting if individuals attend a mandatory orientation meeting (City of Columbia 2007). In 2007, the Columbia Deer Management Program (CDMP) included seven properties: three city parks, the city landfill, and three sewer utility properties (Fig 1). These properties are diverse in terms of usage, management, and vegetation types. Smith Park (20.4 ha), Grindstone Nature Area (60.7 ha), and Twin Lakes Recreation Area (4.1 ha) are multi-purpose properties where non-hunters frequent. The three city utility properties are located off Strawn Road (39.7 ha), Coats Lane (47.8 ha), and Bainbridge Lane (13.0 ha) and the landfill site is located north of Wyatt lane (38.4 ha) (City of Columbia 2009). The vegetation types on these areas, which will be described in detail in further sections, range from annually mowed fields to mature forests.

As stated earlier, to be eligible to participate in the deer management program hunters must attend an orientation meeting prior to the start of the season. After a short informational session each hunter is given a certificate that allows legal access, with
archery equipment, on the selected areas (City of Columbia 2007). The urban archery hunt is held in accordance with the Missouri’s general archery season beginning on September 15\textsuperscript{th} and running through January 15\textsuperscript{th}, minus the period during the 10 day fall firearms season in the middle of November. However, antlerless and any-deer firearm permits may be filled with archery equipment on the program’s properties by certificate holders. Hunters must purchase, over the counter, either general archery season tags or antlerless tags which are unlimited (MDC 2008). General archery tags allow the holder to harvest two deer of either sex, but only one antlered deer prior to the November firearms season (MDC 2008).

Survey Procedures

A self-administered survey (Appendix C), conducted in January, 2009, was mailed to all individuals who attended the Columbia Deer Management Program’s mandatory orientation meeting. All study methods were submitted and approved by the University of Missouri’s Internal Review Board on Human Subjects (IRB) (#1120557). Both survey construction and mailing processes used the procedures outlined by Dillman (2000). This post-hunt survey was pre-tested by University of Missouri undergraduates for duration and ease of understanding. Pilot tests showed duration times of less than 10 minutes for the survey. The survey’s January mailing time coincided with the closing of the 2008 archery season to reduce recall bias. Additionally, for those who didn’t return the initial mailings a reminder post card was sent between the second and third mailings of the survey. A follow-up thank you postcard was sent to all respondents.
Site Analysis

We conducted site analyses on each of the seven public hunting properties using a modified version of the plant formation classification system developed by the New York City, New York Department of Parks and Recreation (Rogers and Roundtree 1985). Classifications included plant formations, topography, dominant plants, hydrological features, and management characteristics. The Rogers and Roundtree (1985) entitation method was modified to both better capture what deer hunting recreationists seek out in the landscape and what can be perceived from two-dimensional photographs (Appendix E). Tree size was broken down into small (< 30.5 cm) and large (> 30.5 cm) diameter at breast height (dbh) to identify trees that were suitable for hanging and climbing treestands. The size of 30.5 cm, or 12 inches, was used because it is approximately the size that we found most hunters feel comfortable in climbing and it is near the size needed to break up a hunter’s form. Additionally, dominant plant species were recorded to illustrate which areas contained mast species because hunters are known to choose hunting locations based on available food sources. We defined topography as being either level or sloped to see if preferences changed regarding elevation relief. Topography was also included to try to understand if line of sight was important to hunting location preference and if hunters used topography to identify travel corridors. Additionally, the areas contained a variety of small streams and ditches which were classified as riparian areas. The riparian classification was included, instead of hydrological features, to understand if water resources were preferred for either deer requirement reasons or used to identify potential travel corridors for deer. Management characteristics for this study included how often herbaceous vegetation was mowed or
cleared. This was measured by identifying the stage of the grasses and whether they were mowed/hayed annually or if the land was “overgrown”, including woody plant establishment. The management feature was broken down into three categories: (1) Areas mowed at least once annually (mowed > 1 year); (2) Areas that had shown recent mowing, clearing, or burning, but not on an annual basis (mowed 1 to 5 years); and (3) areas that had shown no recent mowing or clearing but had not yet developed substantial woody growth (thickets/scrub) and were labeled as herbaceous (mowed < 5 years).

While the entirety of the properties were mapped vegetation units were only included in the study if they represented at least a 0.4 ha contiguous patch. Each of the study sites was divided and described by the percent of each vegetative type. These vegetation types included on each of the sites were totaled for all properties included in the deer management program to determine the overall vegetation classifications.

Photos were taken of each major vegetation type (5% of total properties) derived from the on-site analyses. Each photo was taken between 10 am and 3 pm to achieve similar light levels. Additionally, maximum cloud cover was limited to 50% for the photos. Photos were taken during October and November of 2008 to mimic the varying conditions during the full hunting season.

**Landscape Scene Perception-Response Variable**

Fifteen black and white photos were selected and included in the survey as best representative of the varying habitat types occurring among the study areas (Appendix D). Respondents were asked to rank their preference for each photo by answering 15 five-point, Likert scale questions represented by strongly dislike (1), somewhat dislike
(2), somewhat like (3), like (4), and strongly like (5). Photo rankings were determined using mean scores and standard deviations for each scene rating. This method was similar to historical scene preference studies (Calvin et al. 1972, Kaplan and Herbert 1987, Lyons 1988) and also used in the modified study identifying different preferences by user groups in the previously mentioned August A. Busch Memorial Conservation Area (Triana 1994). The mean Likert scale answers were considered the response variables for this study.

Similar to Triana (1994) survey respondents were also asked to list their top three preferred scenes for where they would like to hunt and to explain why they chose them. The qualitative responses were measured by using a conventional context approach which relies on formulating coding groups once the data has been collected to avoid imposing preconceived categories (Hsieh 2005). In coordination with this approach, Simstat's Wordstat program’s content analysis was used to determine the Jaccard’s similarity measure and the co-occurrence of the words within each of the responses. The measure of co-occurrence was used to understand the connection of words in the responses; and, Jaccard’s similarity index, which was used to break down words into major nodes, assisted in categorizing the major keywords and phrases that respondents used in their answers for both the most and least preferred scenes. Responses were then coded based on the “primary” keywords and phrases given. Primary keywords and phrases were determined to be those given first in the response, thus implying their importance to the respondent. Once we were able to establish how keywords were grouped, we then read each entry individually and assigned a numeric code identifying the appropriate context of the answer given. We used descriptive statistics, including
percentages and frequencies, to quantify the number of similarly coded responses compared with the number of overall answers.

**Hunter Background, Experience, Motivations, and Scouting Methods**

We asked questions pertaining to each hunter’s background. Two categorical questions regarding perceived urban, rural or farming backgrounds were included. Additionally, the number of years of deer hunting experience was asked, as well as who taught the hunter his skills. We described the answers of the categorical data in terms of percentages of the group, and the rankings as frequencies and means of each method.

The hunter typing portion of this study consisted of 8 motivations for deer hunting (Boulanger et al. 2006). Motivations for hunting in this portion of our research were taken directly from Boulanger’s study on South Dakota muzzleloader hunters because that study also focused on an expansion of already existing deer seasons for the state. The motivations included: meat, nature, excitement, social, trophy, challenge, solitude, and expanded opportunity. Each individual was asked to rank 1 through 8 (1 being the most important) the reasons they were participating in the Columbia Deer Management Program. The question was then analyzed by both the top choices selected by each hunter and the mean rankings for each motivation.

Harvest data was broken into numbers of antlerless and antlered deer taken in both the Columbia Deer Management Program and the overall 2008-2009 Missouri deer seasons but for the purposes of this analysis answers were categorized into two groups. These two groups identified those that either harvested or did not harvest a deer in the Columbia Deer Management Program (CDMP). The number of hunting trips associated
with each property was included in the survey. Respondents were asked how many trips they made to each of the seven properties and the data was expressed in terms of trips per hunter at each location. This data was used in conjunction with the vegetation classification analysis to determine whether individuals were choosing hunting locations based on their overall vegetative types.

The preferred method of scouting hunting locations was also included to understand how individuals select the locations that they hunt. Respondents were asked to rank the following methods 1 to 7 (with 1 considered most important) that they use to find hunting locations: satellite imagery, topographical mapping, photos, on-site scouting, word of mouth, general ease, and randomness.

**Hunter Characteristics and Behaviors as Predictors of Landscape Choice**

The mean preference (Likert) scores for hunting scenes (response variables) were tested against hunters’ top motivations listed for urban archery hunting, such as meat or nature, using Kruskal-Wallis ANOVA. This procedure was followed for those with greater hunting experience (>10 years), rural vs. urban backgrounds, and farming vs. non-farming backgrounds, as well as those who harvested against those who did not harvest during the program. These variables were chosen to see if different preferences for habitat scenes exist in those with more hunting experience, different motivations, and harvest success. Landscape preference scores were compared between those who were self-taught and those who acquired their hunting knowledge from others to determine if the way these recreationists were introduced to the sport influenced what scenes they preferred to hunt.
Methods Summary

Response Variable

Mean Preference Scores (5 Point-Likert Scale)

Predictor Variables

Hunting Experience (> , < 10 Years)

Rural vs. Non-Rural Background

Farming vs. Non-Farming Background

Introduction to Deer Hunting

Motivations for Urban Archery Hunting

Harvest Success

Additional Analysis

Vegetation and Landscape Classifications

Most and Least Preferred Hunting Scenes (Top and Bottom 3)

Qualitative Reasons for Landscape Choice

Methods of Scouting
Results

Survey Response

The mandatory orientation meeting for the Columbia Deer Management Program had 197 attendees with 188 deliverable addresses. We received surveys from 116 different hunters during the overall study. While we collected demographic data and hunter background information on the 116 hunters, the landscape perception questions included on the post-hunt survey received 103 responses (54.7%). Also, due to the voluntary nature of the survey, several questions had fewer responses.

Hunter Backgrounds, Characteristics, Scouting Methods, and Motivations

A majority of survey respondents in the Columbia Deer Management Program perceived themselves as urban (63.1%) and 63.2% came from non-farming backgrounds. This sample hunting group had a majority that were taught how to hunt by family members (57.9%) and friends (18.4%). The group was composed of mostly experienced hunters (76.3%), deemed to be more than 10 years of experience for the purposes of this study. The preferred method of scouting was the on-site method (72.0%) followed by word of mouth (9.0%) (Table 3.1).

Table 3.1. Mean Ranks ± Standard Error of Scouting Methods

<table>
<thead>
<tr>
<th>Method</th>
<th>N</th>
<th>Mean Score</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-Site</td>
<td>111</td>
<td>1.60</td>
<td>.110</td>
</tr>
<tr>
<td>Word of Mouth</td>
<td>106</td>
<td>3.71</td>
<td>.186</td>
</tr>
<tr>
<td>Aerial Photos</td>
<td>103</td>
<td>4.05</td>
<td>.160</td>
</tr>
<tr>
<td>Randomness</td>
<td>103</td>
<td>4.29</td>
<td>.186</td>
</tr>
<tr>
<td>Topographical Maps</td>
<td>102</td>
<td>4.44</td>
<td>.166</td>
</tr>
<tr>
<td>Satellite Imagery</td>
<td>102</td>
<td>4.85</td>
<td>.185</td>
</tr>
<tr>
<td>Ease of Access</td>
<td>104</td>
<td>4.87</td>
<td>.176</td>
</tr>
</tbody>
</table>
Hunters ranked their motivations for attending the orientation for Columbia’s Deer Management Program and listed the expanded opportunity the hunt afforded to them as the most important (42.3%). Meat (18.9%) and nature (23.4%) were also ranked as the top reasons by many. The remaining five motivations (excitement, social, solitude, trophy, and challenge) made up 15.4% of primary motivations for participating. The motivations for attending the orientation to gain permission to hunt were also calculated in terms of mean scores and standard errors (Table 3.2).

<table>
<thead>
<tr>
<th>Motivation</th>
<th>N</th>
<th>Mean Scores</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meat</td>
<td>111</td>
<td>3.74</td>
<td>.222</td>
</tr>
<tr>
<td>Nature</td>
<td>111</td>
<td>2.94</td>
<td>.154</td>
</tr>
<tr>
<td>Excitement</td>
<td>110</td>
<td>4.05</td>
<td>.157</td>
</tr>
<tr>
<td>Social</td>
<td>109</td>
<td>5.90</td>
<td>.194</td>
</tr>
<tr>
<td>Trophy</td>
<td>110</td>
<td>6.06</td>
<td>.205</td>
</tr>
<tr>
<td>Challenge</td>
<td>109</td>
<td>4.83</td>
<td>.164</td>
</tr>
<tr>
<td>Solitude</td>
<td>109</td>
<td>5.61</td>
<td>.176</td>
</tr>
<tr>
<td>Expanded Opportunity</td>
<td>111</td>
<td>2.79</td>
<td>.204</td>
</tr>
</tbody>
</table>

**Hunter Participation, Harvest Success, and Hunting Location Choice**

Survey respondents that participated in at least one day of hunting made up 61.1% of the group (N=103). Fifteen of the hunters (23.8%) who participated harvested a total of 28 deer, with four antlered bucks taken by the respondents of the survey.

Hunting trips at each property were divided by the number of hunters that performed the post-hunt survey (Table 3.7). Hunters responded to the open-ended question regarding how they chose their hunting locations with primarily one answer.
The properties’ proximity to the hunters workplace or residence made up 74.4% (N=103) of the responses for the reason that particular site was chosen. Other reasons stated were how the areas were perceived in terms of quality of hunting (10.3%), general quality of habitat (10.3%), and the relative hunting pressure of the sites (5.1%).

Table 3.3. Hunting Trips per Property

<table>
<thead>
<tr>
<th>Property</th>
<th># of Trips/Hunter</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bainbridge Lane (Sewer Utility)</td>
<td>0.11</td>
<td>0.051</td>
</tr>
<tr>
<td>Coats Lane (Sewer Utility)</td>
<td>0.06</td>
<td>0.310</td>
</tr>
<tr>
<td>Grindstone Nature Area</td>
<td>0.99</td>
<td>0.314</td>
</tr>
<tr>
<td>Smith Park</td>
<td>0.29</td>
<td>0.123</td>
</tr>
<tr>
<td>Strawn Road (Sewer Utility)</td>
<td>1.64</td>
<td>0.538</td>
</tr>
<tr>
<td>Twin Lakes Rec. Area</td>
<td>0.65</td>
<td>0.221</td>
</tr>
<tr>
<td>Wyatt Lane (Landfill)</td>
<td>1.62</td>
<td>0.487</td>
</tr>
</tbody>
</table>

N=103

Site Analysis

Formation, topography, dominant woody plants, woody vegetation size, and species were used along with management characteristics to classify each area, as well as to determine the photos taken. However, the major classifications of vegetation types are the most apparent in the photographs are expressed in terms of percentages for each property (Figure 3.1) and in terms of overall percentages of all properties included (Table 3.3). As stated previously, the formation for aquatic plants is defined in terms of riparian habitat. There was only 1 pond greater than 0.4 ha included on the sites and it measured less than 1.2 ha in size.

The seven hunting properties included 212.2 ha of defined vegetation. The properties’ major formations divided into closed canopy (101.8 ha), herbaceous (78.2 ha), riparian (28.9 ha), thicket/scrub (21.9 ha), and woodland (10.3 ha) (Table 3.3).
Figure 3.1 Plant Formations of Hunting Properties

Table 3.4. Vegetation Classifications of Properties Included in CDMP and Origination of Photos Used for Landscape Preference

<table>
<thead>
<tr>
<th>Formation</th>
<th>% of All Habitats</th>
<th>Scene #’s</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Closed Forest Total</strong></td>
<td>48.0%</td>
<td></td>
</tr>
<tr>
<td>Closed Forest-open understory, small dbh</td>
<td>8.5%</td>
<td>1</td>
</tr>
<tr>
<td>Closed Forest-open understory, large dbh</td>
<td>26.1%</td>
<td>8, 11, 10</td>
</tr>
<tr>
<td>Closed Forest-dense understory, small dbh</td>
<td>4.2%</td>
<td></td>
</tr>
<tr>
<td>Closed Forest-dense understory, large dbh</td>
<td>8.5%</td>
<td>12</td>
</tr>
<tr>
<td><strong>Woodland Total</strong></td>
<td>4.9%</td>
<td></td>
</tr>
<tr>
<td>Woodland large dbh</td>
<td>4.9%</td>
<td>7, 14</td>
</tr>
<tr>
<td>Woodland small dia.</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td><strong>Herbaceous Total</strong></td>
<td>36.8%</td>
<td></td>
</tr>
<tr>
<td>Herbaceous mowed &lt; 1 year</td>
<td>13.0%</td>
<td>15</td>
</tr>
<tr>
<td>Herbaceous mowed 1-5 years</td>
<td>18.4%</td>
<td>2</td>
</tr>
<tr>
<td>Herbaceous mowed &gt; 5 years</td>
<td>5.4%</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Thicket</strong></td>
<td>10.3%</td>
<td></td>
</tr>
<tr>
<td>Evergreen Thicket</td>
<td>6.4%</td>
<td>13</td>
</tr>
<tr>
<td>Deciduous Thicket</td>
<td>5.8%</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total Riparian/Aquatic</strong></td>
<td>13.6%</td>
<td>5, 6, 9</td>
</tr>
</tbody>
</table>
Landscape Preference

When hunters were asked to choose their favorite scene to hunt, the 3 most preferred scenes were those depicting closed canopy forests that had large diameter trees (> 30.5 cm dbh) and limited understory. These forests garnered 54.4% of the top three choices listed out of the fifteen photos in the survey. Closed Forest units having level topography and dominated by oak trees received 23.7% of the entries, whereas units with level topography dominated by maples received 16%. The third most listed scene was the closed canopy forest with limited understory dominated by oaks that had sloping topography (14.7%). No other scene received more than 8% of the top three rankings. In the question asking hunters to list their least preferred habitats, the scene depicting a deciduous thicket received the most entries (17.9%). The scene from the unit that was mowed/hayed on an annual basis received 16.2% of the entries. The third least preferred habitat scene (12%) contained the herbaceous community that was “overgrown” or not mowed with woody plants present.

Rankings for hunting preference were similar to those listed above. The rankings were performed using a 5-point Likert scale (1 meaning strongly dislike and 5 strongly like). The only change between the rankings and listings of most and least preferred sites was found in the least preferred sites where the closed canopy forest that had a dense understory scored lower than the herbaceous community mowed on an annual basis.
Table 3.5. Means ± Standard Errors for Hunting Preference for Each Scene

<table>
<thead>
<tr>
<th>Scene Description</th>
<th>N</th>
<th>Mean</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed Forest-Oak (Large dbh) Level Topography, Open Understory [8]</td>
<td>99</td>
<td>4.36</td>
<td>.082</td>
</tr>
<tr>
<td>Closed Forest-Maple (Large dbh) Level Topography, Open Understory [11]</td>
<td>100</td>
<td>4.23</td>
<td>.078</td>
</tr>
<tr>
<td>Closed Forest-Oak (Large dbh) Slope Topography, Open Understory [10]</td>
<td>100</td>
<td>4.11</td>
<td>.087</td>
</tr>
<tr>
<td>Woodland-Deciduous (Large dbh) Level Topography [7]</td>
<td>100</td>
<td>3.95</td>
<td>.087</td>
</tr>
<tr>
<td>Riparian-Deciduous (Small dbh) Slope Topography [5]</td>
<td>100</td>
<td>3.64</td>
<td>.094</td>
</tr>
<tr>
<td>Closed Forest-Oak (Small dbh) Level Topography, Limited Understory [1]</td>
<td>100</td>
<td>3.55</td>
<td>.102</td>
</tr>
<tr>
<td>Riparian-Deciduous (Large dbh) Level Topography [6]</td>
<td>100</td>
<td>3.44</td>
<td>.109</td>
</tr>
<tr>
<td>Woodland-Deciduous (Small dbh) Level Topography [14]</td>
<td>99</td>
<td>3.42</td>
<td>.089</td>
</tr>
<tr>
<td>Riparian-Deciduous (Large dbh) Eroded bank [9]</td>
<td>101</td>
<td>3.35</td>
<td>.117</td>
</tr>
<tr>
<td>Thicket-E. Redcedar (Small dbh) Level Topography [13]</td>
<td>100</td>
<td>3.26</td>
<td>.100</td>
</tr>
<tr>
<td>Herb.-evergreen (Small dbh), Level Topography, Mowed &lt; 5 years [3]</td>
<td>100</td>
<td>2.95</td>
<td>.101</td>
</tr>
<tr>
<td>Herb.-Deciduous (Large dbh) Mowed &gt; 1 year [15]</td>
<td>100</td>
<td>2.78</td>
<td>.131</td>
</tr>
<tr>
<td>Closed Forest-Oak (Large dbh) Level Topography, Dense Understory [12]</td>
<td>100</td>
<td>2.65</td>
<td>.113</td>
</tr>
<tr>
<td>Herb.-Deciduous (Small dbh), Level Topography, Mowed 1-5 years [2]</td>
<td>100</td>
<td>2.63</td>
<td>.098</td>
</tr>
<tr>
<td>Thicket-Oak (Small dbh) Level Topography [4]</td>
<td>100</td>
<td>2.38</td>
<td>.115</td>
</tr>
</tbody>
</table>
**Keyword Analysis**

The respondents’ words for describing the reasons preferred scenes provide a rough estimate of how they evaluate areas which they might chose to hunt (Table 3.5). However, by utilizing the Jaccard’s index and looking at word co-occurrences we were able to determine the linkages of the most used words and how closely related they were in each individual response for the coding of keywords into categories used to quantify the data and understand their usage outside of plain in-text reading of each of the responses (Figure 3.2 and Figure 3.3).

Table 3.6. Most Frequent Words Used to Describe Scene Selections

<table>
<thead>
<tr>
<th>Top Scene Descriptions</th>
<th>Word</th>
<th>% Records</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed Forest-Oak (Large dbh)</td>
<td>Good</td>
<td>44.0</td>
</tr>
<tr>
<td>Level Topography, Open Understory [8]</td>
<td>Trees</td>
<td>41.0</td>
</tr>
<tr>
<td></td>
<td>Cover</td>
<td>35.0</td>
</tr>
<tr>
<td>Closed Forest-Maple (Large dbh)</td>
<td>Treestand</td>
<td>33.0</td>
</tr>
<tr>
<td>Level Topography, Open Understory [10]</td>
<td>Open</td>
<td>31.0</td>
</tr>
<tr>
<td></td>
<td>Food</td>
<td>25.0</td>
</tr>
<tr>
<td>Closed Forest-Oak (Large Diameter)</td>
<td>Mature</td>
<td>22.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bottom Scene Descriptions</th>
<th>Word</th>
<th>% Records</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thicket-Oak(Small dbh)</td>
<td>Open</td>
<td>26.3</td>
</tr>
<tr>
<td></td>
<td>Cover</td>
<td>14.7</td>
</tr>
<tr>
<td>Herb.-Deciduous(Large dbh)</td>
<td>Shot</td>
<td>14.1</td>
</tr>
<tr>
<td></td>
<td>Treestand</td>
<td>11.6</td>
</tr>
<tr>
<td>Closed Forest-Oak(Large dbh)</td>
<td>Trees</td>
<td>10.5</td>
</tr>
<tr>
<td>Level Topography, Dense Understory [12]</td>
<td>Archery</td>
<td>9.7</td>
</tr>
</tbody>
</table>
Figure 3.2. Most Preferred Scenes Keyword Usage and Relationship Within and Between Records

Figure 3.3. Least Preferred Scene Keyword Usage and Relationship Within and Between Records
The conventional context analysis approach describing the reasons why hunters chose particular scenes as their most and least favorite found that keywords for preferences broke down into three major categories. The first group evaluated the scenes in terms of hunter utility. Hunter utility was determined to be combinations of keywords describing either use of hunting equipment or the ease/difficulty one might have in hunting each of the defined scenes. Those responses coded into the hunter utility category made up 45% of the reasoning behind the top scene choices (N=100) and 64.3% of the reasons for the least preferred scenes (N=98). The second coding group utilized keywords that described an area’s perceived deer habitat quality. These reasons encompassed 34% of the preferred scenes and 12.2% of the least preferred scenes. The last coded category was defined by those words that described the overall aesthetics of a scene, the keywords regarding a scene’s natural components, or a hunter’s familiarity with a particular habitat. Individual responses coded into this category made up 21% of the reasons for top scene choices and 23.5% of the least preferred scene reasons.

In-text context can be used to further illustrate the reasons behind why particular scenes are chosen (Table 3.6). These examples also show the overall context behind the coding criteria.
Table 3.7 Example Hunter Responses Concerning Scene Preference

**Most Preferred Scenes**

Hunter Utility-“Looks like some good trees for treestand and not too much shrubbery to shoot through”

Deer Habitat-“Good mix of mature hardwoods and smaller trees for browse and cover. Looks like good deer habitat”

Aesthetic/Familiarity-“I grew up hunting this type of habitat”

**Least Preferred Scenes**

Hunter Utility-“Too thick for archery. If brush and thick undergrowth is within twenty yards I usually will not hunt it. Or if I can not get a clear shot within twenty yards I won’t hunt it.

Deer Habitat-“Grass is a bad food source and deer.”

Aesthetic/Familiarity-“I don’t like to hunt open fields”

**Motivations, Backgrounds, and Experience as Predictors of Scene Preference**

There were no significant differences found among the different motivation rankings and the mean score rankings for the scene preference when tested using Kruskal-Wallis ANOVA. Likewise, there also were no significant differences found between those who perceived themselves as urban or rural and the mean rankings of the scenes. Hunting experience and how individuals were introduced to the sport produced significant results on only one scene, while farming vs. non-farming backgrounds produced significant results on 2 scenes. The Kruskal-Wallis one-way ANOVA indicated significant differences (F=6.242, df=1,97, p=.014, Ω²=.051) between those with hunting experience greater than 10 years (M=2.83, SD=1.10), compared to those with less experience (M=2.21, SD=1.11), when ranking the closed canopy forest with dense understory. The group of hunters that were self-taught ranked the herbaceous scene with annual mowing lower (M= 2.27, SD=1.282) than those who were taught by
family or friends (M=3.01, SD=1.26) (F=10.60, df=1,96, p=.012, Ω²=.057). Significant
differences were found when comparing the deciduous thicket rankings between those
with (M=2.76, SD=1.28) and without (M=2.15, SD=1.01) a farming background
(F=6.242, df=1,97, p=.014, Ω²=.051). There also were significant differences in how
this group ranked the closed canopy forest dominated by maples (F=8.58, df=1,98,
p=.030, Ω²=.038). Those with farming backgrounds (M=3.87, SD=1.12) ranked this
scene lower than those with no farming backgrounds (M=4.26, SD=0.651).

Landscape Preference as a Predictor of Harvest Success

Overall landscape preference was not a good predictor of harvest success. There
was only one scene that hunters who harvested ranked statistically different from those
who did not harvest. The scene depicting a woodland habitat differed significantly, using
Kruskal-Wallis ANOVA, between those who harvested and those who did not (F=6.084,
df=1,63, p=.017, Ω²=.050). Those who harvested ranked the scene significantly lower
(M=3.43, SD=0.89) than those who did not harvest (M=4.09, SD=0.74).
Discussion

This case study provided an excellent opportunity to compare urban hunters’ preferences for landscapes available to them for hunting due to the variety of vegetation types and properties included in the management program. Also, the information concerning motivations, hunting experience, and backgrounds of the hunters, and their choices of hunting areas help define a new population of urban hunters. While the information we gathered only relates to the 2008 archery season it may have longer term implications for the Columbia Deer Management Program because of hunter’s long term connections and tendencies to hunting the same areas year after year (Thomas et al. 1977).

In many ways the results of the landscape preferences of hunters seem to mimic what might be expected from the patterns seen in previous literature concerning general preferences for natural scenes (Kaplan et al. 1972, Kaplan 1988, Gobster 2001). Mature forests with a minimal understory were the most preferred scenes which could be predicted when using Kaplan’s complexity, coherence, mystery, and legibility components of rating landscape images. These forests offered order and allowed the hunters to distinguish the on the ground coherence of the scene and made it easier to decipher the three-dimensional space from the photograph, and/or offered greater legibility. The lowest rated and listed scenes either did not offer complexity and had little mystery, such as the mowed field, or had limited legibility and coherence like the thicket/scrub scene. However, while these choices may be engrained in these participants though genetic or learned overall aesthetic preferences when viewing the hunters’ answers for choosing scenes we were offered greater insight into what was behind their
hunting preferences. Results indicated that these urban hunters typically considered the use of their archery equipment or its limitations as the top reasons for rating landscape scenes for which they would like (45%) or “dislike” (64.5%) to hunt. While this might be a finding limited to this sample (which had higher household incomes than the community’s median) - it may also stem from the greater national trend of the increased usage of hunting gadgetry and commercialization the sport has seen over the last few decades. Today’s hunters are no doubt influenced by the hunting megastores, TV shows, and hunting magazines showing the latest equipment, so they may be more driven to seek out hunting locations that allow them to use their equipment rather than solely focusing on the perceived quality of deer habitat.

Additionally, by inquiring about the methods used for scouting we were better able to equate whether landscape scene preferences could be used to help predict the on-the-ground stand locations hunters may choose. Because the hunters in this study used on-site scouting (72%) and word of mouth (9%) to choose their locations rather than using aerial photographs, topographical maps, and satellite imagery, the perceived quality of the hunting scene may better reflect their overall choices for actual hunting locations. In areas where hunters may use mapping techniques to predict deer corridors and habitat this type of perception study may be more limited in its implications for assessing where hunters may choose to locate. However, even with the large use of on-site scouting of these hunters a limitation of our study was we were unable to measure actual stand locations or hunter movements at the property level. We also recognize that the choice of stand locations is multidimensional in its nature. This was evident by the reasons hunters gave for why they chose to hunt specific properties during the season. The results
showed that the top reason (74.4%) that hunters gave was that the area they hunted was either near their residence or workplace. This may explain why Strawn Road (1.64 hunting trips/hunter) and the landfill property (1.62 hunting trips/hunter) received the most visitation while having minimal habitat resembling the most preferred scenes. But, the least preferred scene depicting the annually mowed field which made up almost the entirety of the Coats Lane property (0.06 hunting trips/hunter) did coincide with the scene’s low preference by respondents. This information suggests that landscape preference studies might better predict hunter trips to properties that are homogeneous in their vegetative structure and species present.

Our results showed little, to no, statistically significant variation between and among the motivations for urban archery hunting, the way individuals were introduced to the sport, hunting experience, farming backgrounds, urban backgrounds, and harvest success during the program. Those with farming backgrounds did rank the closed canopy forest dominated by maples lower than those without farming backgrounds. This may be due to this group’s ability to identify the species of trees present. In areas with more “nature educated” hunters the preferences of hunters may be more precise concerning forest community make up. Likewise, those with hunting experience ranked the closed canopy forest with a dense understory higher and common answers given for preferring the scene related to the quality of deer habitat. The reasons that the self-introduced hunters gave in ranking the mowed herbaceous community higher revolved around the extended sight and ability to see deer. But, overall there were not statistical differences in how hunters from different motivations, backgrounds and experience preferred hunting scenes.
We found in the course of analyzing our data that the information garnered from
the qualitative, or open-ended, questions were more insightful into how hunters make
decisions about why they participate, where they hunt, and how they make choices about
hunting scene preferences. An example of this was how line of sight was very important
to many of the hunters. While these keywords were coded as hunter utility it brings an
added component of their ability to see deer as important to where they prefer to hunt.
The most given reasons for not preferring scenes was also listed as hunter utility. Many
times the reasons given were that no shooting lanes were available through the dense
underbrush. Many of Columbia’s properties, like many cities, are remnant crop fields or
pastures which are in early successional stages. While these areas contain suitable deer
habitat and open spaces to manage them, hunters are averse to hunting them due to
limitations of archery equipment. Also, by solely focusing on hunter trips per area we
could not have determined the reasons behind particular site selections. Additionally,
some hunters only visited areas that others had told them were productive, or they hunted
with friends that chose particular areas. Thus, areas that are popular this season will most
likely be the same areas visited at higher rates in future seasons.
Management Implications

While information regarding the different backgrounds, motivations, and experience of hunters may be important to participation, satisfaction, and harvest success it did not prove to be indicative of hunting scene preference in our study. Information in this study will help Columbia’s Deer Management Program in its efforts to understand hunter preferences, methods for hunting site selection, and to provide more insight into hunter densities which can affect participation, satisfaction, and harvest success. Because the motivations, backgrounds, and experience did not statistically influence hunting scene preference the management of hunting sites does not need to be segmented for separate hunter groups. Identifying the closed canopy forests that contain a minimal understory may provide the city with an idea of true hunter densities and where deer are seeing the most hunting pressure.

This study also shows that the scenes hunters prefer are very similar to those indicated by past studies, as well as to those in the general population. This information could prove useful in the management of deer in public parks. As urban green spaces age and develop into mature forests they should become more attractive to both hunters and general recreationists though for differing reasons.

However, management of high deer densities in areas that do not contain mature trees for treestands, or have limited sight and shooting lanes may prove difficult for the program based on information that suggests that most hunters prefer hunting scenes based on “hunter utility” rather than deer habitat. Providing hunters with population estimates of deer for each site may spur interest in hunting areas that do not have vegetation that is preferred by hunters.
Literature Cited


CHAPTER 4
DISCUSSION

Our results showed that the Columbia Deer management program contained hunters that were younger and more highly educated than those in Missouri’s general hunting population. If urban hunting programs are able to attract younger hunters they may help stem the tide of decreasing participants in consumptive based outdoor recreation. The hunters in the Columbia Deer Management Program were also experience hunters, of which, almost half had harvested more than 10 antlerless deer. Like several earlier studies we found that the formations of hunting motivations and typologies are complex and not easily predicted by demographics, backgrounds, and experience.

I believe one of the most important findings in this research project was that hunters were motivated to participate in the urban program for different reasons than why they archery hunt elsewhere and also why they generally firearms deer hunt. We found that participants were largely motivated by the fact that the areas offered them locations to hunt close to home or work. We also found that nature based motivations for hunting should not be viewed only in the context of traditional rural or wilderness hunting. Participants were strongly associated with appreciative oriented typologies and nature was the second most chosen reason for participating in the program. Although, our findings also showed that nature based motivations were mostly used to qualify their primary motivations. This means that though a person may state that they are primarily hunting for meat, social, or for the expanded opportunity that a hunt offers getting out and experiencing nature is often the underlying activity that leads to their participation in
a hunt. Additionally, we found that those who perceive themselves as urban and living in Columbia were more motivated by nature and they also were more strongly linked to appreciative typologies. Because the nature motivation tends to be stronger in urban residents the hunting program can also be viewed as offering a nature based recreation component that is missing in many urban areas. I believe that this aspect of the program is often underappreciated by managers that view hunting in a more traditional context and by those with traditional hunting backgrounds.

While the major goal of urban deer management programs is to limit the growth or decrease urban deer populations success of programs relies on the ability to retain hunters. Most participants in the 2008 season showed a strong commitment to the program with 81.9% listing they had participated in the past and a large majority (89%) of the hunters predicted that they would participate in the following season. For this reason I believe that the management guidelines used by the Columbia Deer Management Program should be used as a template for other communities deciding on strategies to combat high deer densities. With most hunters satisfied with the program and those who predicted they would not participate in following seasons listing that they were moving out of the area I view this as further reasons to champion this type of hunting format. This satisfaction can be seen in these example responses to why hunters would continue to participate:

“I love the city program and will take more time next year. I had knee surgery this year”

“Places to hunt are easy to access”

“Good program, my hunting group always kills a few deer, and I enjoy hunting urban areas”

“Extra opportunity to hunt when you don’t have much time and it would be interesting to shoot an urban deer. I also want to show support for the program so it continues”
“It is a fantastic way to gain access to more public land. Great management”

“It is a good opportunity to help manage the urban deer population”

“To continue to hunt does in town and it helps when I ask private landowners to hunt their property”

“It is convenient and easy. Some of my neighbors want to thin the herd so they will not eat all of their flowers”

We also found that harvest was not a predictor of satisfaction. The hunters qualitative responses indicated that satisfactions were more likely to be determined by seeing deer (47.4%) and enjoying nature and relaxing (32.0%). This finding further illustrates that the “multiple satisfactions” approach to managing optimal hunting experiences is also relevant to urban deer management programs.

Our results showed that the most important variable in predicting who would harvest was the number of hunting trips taken. The “days afield” concept, traditionally used to measure program success, was very important to harvest. In fact, when controlling for hunting experience and past experience in the program those hunters that took at least 5 hunting trips were over 23 times more likely to harvest. We also found that when we predicted harvest by including hunting trips, past experience in the program, hunting experience, and those who were appreciative oriented we were able to account for 38.6% of the variance. Though we did not include the determinants of predicting the number of animals wounded during the program we did ask respondents to list the number of deer they were unable to retrieve. We found that 20 deer were not located by hunters after they had wounded them. While this number appears to be large considering that only 28 deer were harvested it does not exceed numbers indicated from previous archery studies.
Because the program’s managers also measure success on public support for the program and because the hunts take place on public areas with many non-hunter users I included a question regarding any conflicts hunter may have experienced. The participants responded that they did not encounter any conflicts with non-hunters during their time on city own properties. Only one individual stated he had a conflict and it was due to other hunters hurrying to beat him to a hunting location. It should be noted that this conflict did not cause the hunter to indicate that he would not return to hunt the program during the next season. I believe this is an effect of both the fact that the program is well established in the community and that the managers stress that the hunters “take the high road” when they encounter other users. In each orientation meeting the managers let the participants know that one negative situation might put the future of the program at risk. This not only imprints the importance to the hunters but I believe it helps serve a form of peer-regulation in the group.

I found that hunters preferred landscape scenes that are much the same as those determined in past studies on general landscape preference. Closed forests with large diameter trees containing a minimal understory were the most preferred scenes. The least preferred scenes either depicted thickets or mowed herbaceous communities. This finding has an added benefit because managers do not need to promote dichotomous landscapes for hunters and general recreationists. However, our results showed that hunters value these landscapes for reasons other than their general aesthetics. Hunters indicated that the ability to use hunting equipment or the landscapes’ features limiting the use of equipment were the top reasons for preference of hunting scenes. I believe this finding is not unique to this sample but is indicative of the changes in today’s hunting
public which is more influenced by corporate and media sources touting the newest
equipment. Results of our survey showed little significant variation between and among
hunter characteristics and motivations and preference of hunting scenes.

Urban hunting programs are in their infancy in terms of understanding the
requirements needed to sustain the interest of hunters. As programs succeed in lowering
deer densities more effort needs to be made to determine effects of hunter retention and
recruitment. This project gives a course measurement of the motivations, typologies, and
landscape preference that should be examined more thoroughly. I believe the best way to
accomplish this is through employing more qualitative techniques, such as interviews and
focus groups to ascertain the fundamental beliefs and values hunters develop that
determine their ongoing satisfaction in hunting urban deer management programs.
Hello,
My name is Nathan Weber and I am a master’s student in the Fisheries and Wildlife Department at the University of Missouri. I was raised in Southeast Missouri and have been an avid hunter all my life and have been archery hunting (off and on) since I was 15 though it is the hunting season I take the least seriously. Since I moved back to Columbia in 2007 to start work on my master’s degree I have been curious about why individuals choose to participate in the Columbia Deer Hunting Program. After looking into similar research on other hunting seasons and programs I realized that research in this area is very limited. This has led me here to speak with you today.

My research really has two main areas of focus. The first area pertains to the factors that determine the types of hunters and the second focuses on landscape preferences of hunter types. Questions regarding each hunter’s demographics, perceptions, and motivations will be asked to better understand what factors lead to participation and success during the 2008-2009 archery season. This is the pre-hunt survey and will be followed by a post-hunt questionnaire at the closure of the season on January 15th, 2009. Each survey will take you about 15-20 minutes to answer the questions.

I would greatly appreciate if you answer all questions contained in the surveys. Names and addresses are collected solely for mailing use and to initially link the pre-hunt and post-hunt surveys. At the completion of the post-harvest study all surveys will be given number identifications and personal information linking participants’ data will be erased. **Completion of this survey has no effect on a hunter’s ability to participate in the City of Columbia’s Urban Archery Program during this season or subsequent years.**

Because this survey is so vital to my research and I understand your time is precious to you I will be including four $50 gift certificates to show my appreciation. Those hunters who participate in both the pre-hunt and post-hunt surveys will be eligible for one of four $50 gift certificates to Bass Pro Shops. A random drawing will be held after the collection of post-hunt surveys to determine the recipients. Thank you for participating in this voluntary survey.
APPENDIX B

Urban Archery Survey Consent Form
Columbia, Missouri Urban Archery Program
Nathan Weber-University of Missouri, Fisheries and Wildlife Department

The purpose of this survey is to obtain information on participants in Columbia, Missouri’s urban archery hunt. Questions regarding each hunter’s demographics, perceptions, and motivations will be asked to better understand what factors lead to participation and success during the 2008-2009 season. This is the pre-hunt survey and will be followed by a post-hunt questionnaire at the closure of the season on January 15th, 2009. Preliminary results and post-hunt survey links will be available online starting in December. (http://web.missouri.edu/~nilonc/Nathan.htm)

Participation in this survey is voluntary. Should you chose to participate, you may refuse to answer any question or stop at any time. By participating in this survey you are granting your consent.

Please circle the appropriate answer or provide a short answer where indicated, and if you make a mistake simply cross it out and circle your final selection. Please answer all questions contained in the survey. Names and addresses are collected solely for mailing use and to initially link the pre-hunt and post-hunt surveys. At the completion of the post-harvest study all surveys will be given number identifications and personal information linking participants’ data will be erased. **Completion of this survey will not affect a hunter’s ability to participate in the City of Columbia’s Urban Archery Program during this season or subsequent years.**

Those hunters who participate in both the pre-hunt and post-hunt surveys will be eligible for one of four $50 gift certificates to Bass Pro Shops. A random drawing will be held after the collection of post-hunt surveys to determine the recipients. Thank you for participating in this voluntary survey. **Please include your email address if you would prefer your post-hunt survey to be sent digitally.**

Name: ____________________________________________

Street Address ____________________________________________

City, State Zip ____________________________________________

Email: ____________________________________________
### Hunter Demographic Information:

*Please Circle the appropriate answer or provide a short answer in the blank fields.*

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your current age</td>
<td>Male, Female</td>
</tr>
<tr>
<td>Your current Zip Code</td>
<td></td>
</tr>
<tr>
<td>What city and state do you consider as your hometown?</td>
<td></td>
</tr>
<tr>
<td>Your highest level of Education Completed</td>
<td>Grade School, High School, Associates/Technical, Bachelor, Graduate +</td>
</tr>
<tr>
<td>Occupation Status?</td>
<td>Student, Currently employed, Retired, Unemployed</td>
</tr>
<tr>
<td>Do you consider your occupation?</td>
<td>Technical, Professional</td>
</tr>
<tr>
<td>What is your occupation?</td>
<td></td>
</tr>
<tr>
<td>What is your annual household income?</td>
<td>Less than 20,000, 20,000 to 39,999, 40,000 to 59,999, 60,000 to 79,999, 80,000 +</td>
</tr>
<tr>
<td>What do you consider your current residence?</td>
<td>Rural, Urban</td>
</tr>
<tr>
<td>What do you consider yourself as (background)?</td>
<td>Rural, Urban</td>
</tr>
<tr>
<td>Do you currently live or were you raised on a farm?</td>
<td>Yes, No</td>
</tr>
<tr>
<td>What term best describes you?</td>
<td>Southern, Northern, neither</td>
</tr>
<tr>
<td>Acreage at current residence</td>
<td>less than 1, 1 to 5, 6 to 10, 11 to 20, 21+</td>
</tr>
</tbody>
</table>
Harvest Information:
Please Circle the appropriate answer.

<table>
<thead>
<tr>
<th>Total years hunted (All Species)</th>
<th>0</th>
<th>1 to 5</th>
<th>6 to 10</th>
<th>11 to 15</th>
<th>16 to 20</th>
<th>20+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total years hunted (Deer)</td>
<td>0</td>
<td>1 to 5</td>
<td>6 to 10</td>
<td>11 to 15</td>
<td>16 to 20</td>
<td>20+</td>
</tr>
<tr>
<td>Total years hunted (Archery Deer)</td>
<td>0</td>
<td>1 to 5</td>
<td>6 to 10</td>
<td>11 to 15</td>
<td>16 to 20</td>
<td>20+</td>
</tr>
<tr>
<td>Total years hunted (Columbia, Mo Urban Archery)</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Total Deer Harvested (All Methods)</td>
<td>0</td>
<td>1 to 5</td>
<td>6 to 10</td>
<td>11 to 15</td>
<td>16 to 20</td>
<td>20+</td>
</tr>
<tr>
<td>Total Deer Harvested (Archery)</td>
<td>0</td>
<td>1 to 5</td>
<td>6 to 10</td>
<td>11 to 15</td>
<td>16 to 20</td>
<td>20+</td>
</tr>
<tr>
<td>Total Does Harvested (All Methods)</td>
<td>0</td>
<td>1 to 5</td>
<td>6 to 10</td>
<td>11 to 15</td>
<td>16 to 20</td>
<td>20+</td>
</tr>
<tr>
<td>Total Deer Harvested (Last Archery Season)</td>
<td>0</td>
<td>1 to 5</td>
<td>6 to 10</td>
<td>11 to 15</td>
<td>16 to 20</td>
<td>20+</td>
</tr>
<tr>
<td>Total Deer Harvested (Columbia, Mo Urban Archery-all years)</td>
<td>0</td>
<td>1 to 5</td>
<td>6 to 10</td>
<td>11 to 15</td>
<td>16 to 20</td>
<td>20+</td>
</tr>
</tbody>
</table>

Type of Archery Equipment
- Recurve
- Compound
- Crossbow

Hunter Characteristics and Motivations:

Please list or describe the top three reasons why you participate in the Columbia Urban Archery Deer Program.

1. __________________________________________________________
   __________________________________________________________
   __________________________________________________________

2. __________________________________________________________
   __________________________________________________________
   __________________________________________________________

3. __________________________________________________________
   __________________________________________________________
   __________________________________________________________

Please rank each question with 1 being the most important and subsequent numbers showing less importance. Only use each number one time.

The reason that best explains why you participate in Columbia’s Archery Deer Hunting Program is…
(Rank 1-8) (1 being the most important)
The reason that best explains why you archery deer hunt in general…

(Rank 1-8)

- I only archery hunt in the Columbia City Program
- Meat (harvest game for personal consumption)
- Nature
- Excitement
- Social aspects (companionship)
- Trophy
- Challenge
- Solitude
- Expanded opportunity (offers you more time to participate in hunting)

The reason that best explains why you participate in the modern firearms deer season…

(Rank 1-8)

- I do not use firearms to harvest deer
- Meat (harvest game for personal consumption)
- Nature
- Excitement
- Social aspects (companionship)
- Trophy
- Challenge
- Solitude
- Expanded opportunity (offers you more time to participate in hunting)

The type of hunter that I think has the most prestige or honor is…

(Rank 1-8) (1 having greatest prestige)

- Meat (harvest game for personal consumption)
- Nature
- Excitement
- Social aspects (companionship)
- Trophy
- Challenge
- Solitude
- Expanded opportunity (offers you more time to participate in hunting)

Rank the following game animals in the order you most enjoy hunting…

(Rank 1-8) (1 is greatest enjoyment)

- Deer
- Turkey
- Quail and/or Pheasant
- Squirrel
- Rabbit
- Dove
- Waterfowl
- Furbearers
Rank the following game animals in the amount of skill it takes to hunt them successfully… (Rank 1-8)

- Deer
- Turkey
- Quail and/or Pheasant
- Squirrel
- Rabbit
- Dove
- Waterfowl
- Furbearers

The most important to my identity as a person is… (Rank 1-5)

- Family
- Hunting
- Religion
- Career
- Education

How I learned to hunt can be best described as… (Mark only one answer)

- I taught myself
- Friends
- Parent
- Extended Family

The amount of money I have spent on my archery hunting equipment is… (Mark only one answer)

- $0-99
- $100-199
- $200-299
- $300-399
- $400-499
- $500-599
- $600-699
- over $700

Rank the methods that you most rely upon to choose your archery deer hunting location… (Rank 1-7)

- Topographical maps
- Arial Photos
- Satellite imagery
- On-site scouting
- People tell you about deer locations
- How easy it is to get to
- I Just walk until I get to an area that looks good

The amount of days I expect to archery hunt this year is… (Mark only one answer)

- 0-9
- 10-19
- 20-29
- 30+

The amount of days I expect to hunt on the City of Columbia properties is… (Mark only one answer)

- 0-9
- 10-19
- 20-29
- 30+
Please circle the appropriate answer.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Slightly Disagree</th>
<th>Slightly Agree</th>
<th>Strongly Agree</th>
<th>No Opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvesting Deer determines whether a hunt is successful...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Seeing Deer is important to a successful hunt...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Seeing other hunters in the field ruins my hunt...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I expect to see other hunters when participating in the Columbia Archery Deer Hunting Program...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I choose to hunt areas where I believe I will see other hunters...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Hunting is part of my identity...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am participating in the Columbia Archery Deer Hunting Program because my hunting opportunities are limited...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am participating in the Columbia Archery Deer Hunting Program because it is close to my residence...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Urban deer are easier to harvest/hunt than those in rural areas...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I avoid hunting areas where I believe I will see non-hunters...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Being with hunting companions is the reason I participate in the Columbia Archery Deer Hunting Program...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I hunt lands included in the Columbia Archery Deer Hunting Program that have many non-hunter visitors...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Companionship of family and friends is important during a hunt...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I have a great knowledge of the tree species and the natural communities where I choose to hunt...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am participating in the Columbia Archery Deer Hunting Program to harvest a trophy buck...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>If I harvest a deer during the Columbia Archery Hunting Program I will give it away to friends or donate the meat...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I archery hunt to relax and get away from everyday problems...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I archery hunt to get outdoors and enjoy nature...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I could consider my participation in the Columbia Archery Deer Hunting Program a success if I do not harvest a trophy...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I could consider my participation in the Columbia Archery Deer Hunting Program a success if I do not harvest a doe...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I will harvest every legal deer that I can when on the City of Columbia’s properties...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I use the Columbia Archery Deer Hunting Program to put meat in the freezer...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The Columbia Archery Deer Hunting Program is the only place I will archery hunt this year...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Showing my family and friends a trophy deer I shot is why I archery hunt...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Getting a shot at a deer is a major reason why I archery hunt...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Seeing Deer is very important during an archery hunt...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Developing and using outdoor skills is a major reason why I archery hunt...</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
APPENDIX C

Urban Archery Survey Consent Form
Columbia, Missouri Urban Archery Program
Nathan Weber-University of Missouri, Fisheries and Wildlife Department

If you have already submitted this survey I appreciate your participation. If you feel you have received this copy in error please contact me at the number or email listed below.

The purpose of this survey is to obtain post-hunt information on participants in Columbia, Missouri's urban archery hunt. Your participation in this survey is appreciated regardless of whether you hunted this season. Questions regarding each hunter's habitat preferences and behaviors will be asked to better understand what factors led to participation and success during the 2008-2009 season. Preliminary results and post-hunt survey links will be available online starting in late February.
(http://web.missouri.edu/~nilonc/Nathan.htm)

Participation in this survey is voluntary. Should you chose to participate, you may choose to answer all questions or stop at any time. By participating in this survey you are granting your consent.

Please circle the appropriate answer or provide a short answer where indicated, and if you make a mistake simply cross it out and circle your final selection. Names and addresses are collected solely for mailing use and to initially link the pre-hunt and post-hunt surveys. At the completion of this study all surveys will be given a number identification and personal information linking participants' data will be erased. Completion of this survey will not affect a hunter's ability to participate in the City of Columbia's Urban Archery Program in subsequent years.

Those hunters who participate in the survey will be eligible for one of four $50 gift certificates to Bass Pro Shops. A random drawing will be held on April 1st, 2009 to determine the recipients. Thank you for participating in this voluntary survey. If you have any questions feel free to email me at naw7a5@mizzou.edu or call 573-673-0068.

Name:________________________________________________________

Street Address_________________________________________________

City, State Zip________________________________________________
Harvest Information:
Please write number in box provided.

<table>
<thead>
<tr>
<th>Antlerless Deer Harvested 2008-09 (Columbia's Urban Archery)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Antlered Deer Harvested (Columbia's Urban Archery)</td>
<td></td>
</tr>
<tr>
<td>Total Antlerless Harvested 2008-09 (All Methods)</td>
<td></td>
</tr>
<tr>
<td>Total Antlered Deer Harvested 2008-09 (All Methods)</td>
<td></td>
</tr>
<tr>
<td>Did you shoot any deer that were not retrieved? (How Many?)</td>
<td></td>
</tr>
</tbody>
</table>

Estimated number of hunting trips to: (if you did not hunt please list why on the line below)

- Strawn Rd_____  Coats Ln_____  Bainbridge_____
- Twin Lakes_____  Landfill_____  Grindstone
- Park_____
- Smith Property_____

Why did you hunt the properties you marked?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Do you consider your hunts on the City’s properties successful? (Circle)  YES  NO

How do you determine hunting success?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Did you experience or witness any conflicts between hunters and other area users? YES NO
What happened?
________________________________________________________________
________________________________________________________________
________________________________________________________________

Do you plan on participating in Columbia’s program next season? (Circle) YES NO
Why?
________________________________________________________________
________________________________________________________________
________________________________________________________________

Any suggestions on how the program could improve your hunting experience?
________________________________________________________________

Please examine the photos provided and rank each habitat by how much you would like to hunt them. On the corresponding line please circle the ranking that best fits your hunting preferences. You will also be asked to rank your top three hunting habitat scenes and the three you most disliked.

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<th>Somewhat Dislike</th>
<th>Somewhat Like</th>
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</table>
The ID number of the top three habitats I would most prefer to hunt are:
1. ____
2. ____
3. ____

Why would you prefer to hunt these scenes?
1. __________________________________________________________
   __________________________________________________________
   __________________________________________________________

2. __________________________________________________________
   __________________________________________________________
   __________________________________________________________

3. __________________________________________________________
   __________________________________________________________
   __________________________________________________________

The three habitats I would least like to hunt are:
1. ____
2. ____
3. ____

Why you chose your least favorite hunting scene:
1. __________________________________________________________
   __________________________________________________________
   __________________________________________________________
APPENDIX D

PICTURE 1
Closed Forest-Oak (Small Diameter) Level Topography, Dense Understory

PICTURE 2
Herbaceous-Deciduous (Small Diameter) Level Topography, Mowed 1-5 years
PICTURE 3
Herbaceous-evergreen (Small Diameter) Mowed < 5 years

PICTURE 4
Thicket-Oak (Small Diameter) Level Topography
PICTURE 5
Riparian-Deciduous (Small Diameter) Slope

PICTURE 6
Riparian-Deciduous (Large Diameter) Level Topography
PICTURE 7
Woodland-Deciduous (Large Diameter) Level Topography

PICTURE 8
Closed Forest-Oak (Large Diameter) Level Topography, Open Understory
PICTURE 9
Riparian-Deciduous (Large Diameter) Eroded Slope

PICTURE 10
Closed Forest-Oak (Large Diameter) Slope, Open Understory
PICTURE 11
Closed Forest-Maple (Large Diameter) Level Topography, Open Understory

PICTURE 12
Closed Forest-Oak (Large Diameter) Level Topography, Dense Understory
PICTURE 13
Thicket-Evergreen, eastern redcedar (Small Diameter) Level Topography

PICTURE 14
Woodland-Deciduous (Small Diameter) Level Topography
PICTURE 15
Herbaceous-Deciduous (Large Diameter) Level Topography, Mowed Annually
APPENDIX E

ENTITATION DATA SHEET

PROPERTY NAME_____________________

UNIT______________________________

FORMATION
1. CLOSED FOREST
2. WOODLAND
3. SCRUB/THICKET
4. HERBACEOUS
5. AQUATIC (RIPARIAN)

DOMINANT WOODY PLANTS
1. EVERGREEN
2. DECIDUOUS

TREE SIZE
1. TREES OVER 12 INCHES IN DIAMETER AT BREAST HEIGHT
2. TREES UNVER 12 INCHES IN DIAMETER AT BREAST HEIGHT

DOMINANT TREE SPECIES
1. _______________________
2. _______________________
3. _______________________

TOPOGRAPHY
1. LEVEL
2. SLOPE

MOWING
1. W/IN LAST YEAR
2. W/IN 2-5 YEARS
3. GREATER THAN 5 YEARS