THE PRESENCE AND PUBLIC PERCEPTION OF COYOTES (*CANIS LATRANS*) IN

SUBURBAN AND RURAL AREAS OF WESTERN GEORGIA

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THE PRESENCE AND PUBLIC PERCEPTION OF COYOTES (*CANIS LATRANS*) IN SUBURBAN AND RURAL AREAS OF WESTERN GEORGIA

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THESIS ABSTRACT

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Coyotes (*Canis latrans*) are animals that have adapted themselves to a variety of habitats throughout the country. Over the past fifty years, coyotes (*Canis latrans*) have expanded their range and established themselves as dominant carnivores throughout the southeastern U.S. in both rural/forested areas and urban/suburban areas. However, since coyotes are relatively new to the Southeast, little research has been conducted on them in habitats in this region. In addition to there being little research on the biology of the species there also has been no research done specifically on how the public in the southeastern states perceive coyotes in their community. If coyotes are becoming more prevalent in suburban areas, human/coyote conflicts may become an issue in the southeast. Understanding how the public feels about this species is important to developing management and education programs.

I sent a mail survey out to residents of the western Georgia area about their wildlife recreation participation, interactions with wildlife, wildlife preferences and

beliefs on management of wildlife in their community. I identified factors that may help predict management beliefs. I also identified sections of the public that should be targeted for education programs and certain areas that may need to be addressed in these programs. To investigate the site use and movement patterns of coyotes in western Georgia, I set up digital game cameras on various sites throughout three counties. I recorded and analyzed changes in occupancy at sites, detection, body condition and movement times of coyotes.

My data revealed that coyotes appeared to discriminate little between suburban and rural habitats and during stressful seasons may do better in suburban habitats. Coyotes persisted at all sites during at least one season during the year and overall populations appeared to be healthy. Coyote occupancy in my sites was approximately 30%. This seems to be below the cultural carrying capacity in these counties because in many areas the public was unaware they had coyotes near their homes. I found that the respondents' value of wildlife, and specifically coyotes, was the best predictor of preferences on management methods. Because coyotes were not a highly favored species in these communities, if management did need to occur, majority of respondents supported the use of lethal management methods done by agency personnel to remove animals. If lethal methods are to be used, education on which methods are effective would be needed before implementing.

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THESIS INTRODUCTION

Human populations continue to grow and as they do they are spreading out from urban centers. Everyone wants a home and a yard and, to accommodate this, human communities are spreading and forming suburban areas that consist of large lots, winding roads, and nearby forested or undeveloped areas. With this urban sprawl comes an increase in contact and potential conflict between humans and wildlife populations. Either humans move into areas that are occupied by specific wildlife species or, wildlife moves into areas where humans have set up residence because they have adapted to the food and cover resources associated with anthropogenic activities (Fedrianiet al. 2001). Regardless of the reason, this increased contact sets up the potential for conflicts between humans and wildlife species over space and resources. Though there are many species that have adapted to human residence and can potentially cause problems with the public, this project focuses on coyotes.

Alabama extension agents have received an increasing number of phone calls from suburban residents complaining about seeing coyotes in their neighborhoods and expressing concern for their pets and children (personal contact Jim Armstrong). Human problems with coyotes in this country are not new. Coyotes have been hunted, trapped and persecuted for at least the past 150 years (Bartel and Brunson 2003), usually due to loss of livestock in western states. However, they have managed to expand from their

original range in the western United States to include every state in the continental U. S. as well as most of North America (Bekoff 1978; Parker 1995). Though there have been many studies done on coyotes in the western states, many of them on effective removal (Bartel and Brunson 2003; Bromley and Gese 2001; Connolly and Burns 1990; Coolahan 1990; Dunbar and Giordano 2003; Geseet al. 1988; Henke and Bryant 1999; Masonet al. 1999; Masonet al. 2002; Phillips and White 2003; Phillipset al. 1990; Prusset al. 2002; Quinn 1997b; Sackset al. 1999a; Sackset al. 1999b; Sequinet al. 2003; Shivik and Gruver 2002; Wagner and Conover 1999; Windberg and Knowlton 1990b); relatively few studies have been done within the southeastern states (Armstrong and Walters 1995; Chamberlainet al. 2000; Crawfordet al. 1993; Hillet al. 1987; Holzmanet al. 1992; Philipp and Armstrong 1995; Sumneret al. 1984). More research needs to be done to investigate how coyotes have adapted and are persisting in southeastern habitats. Have coyotes moved into suburban areas in the Southeast? Are there health, social or behavioral differences between coyotes who live in urban areas and those who stay in rural areas?

Coyotes also raise some very interesting human dimension questions. In the western United States, bounties have been in place in some states for over a hundred years and coyotes are seen as some of the most persecuted animals in the area (Bartel and Brunson 2003). Most of this stems from loss of livestock on ranches. In the Southeast, livestock ranches are not as prevalent. It is very probable that the public in the southeastern states has different opinions and preferences for coyotes than those in western states. Since stable populations of coyotes are a recent phenomenon in the

Southeast, the public may not even realize there are coyote populations in their communities.

Coyotes have another dimension that distinguishes them from many other urban wildlife species; coyotes are a medium to large size carnivore. In fact, in much of the southeastern U.S. it is the largest carnivore that is still abundant. Being the top carnivore in an ecosystem may elicit both feelings of fear and respect from the public (Kellert 1985). Throughout history, carnivores such as wolves (*Canis lupus*), lions (*Panthera leo*), bears (*Ursus spp*.), and cougars (*Puma concolor*) have been feared, especially when they reside near human communities (Buys 1975; Caseyet al. 2005; Ericsson and Heberlein 2003; Gompper 2002a; Kellert 1985; Roskaftet al. 2003). People fear for the safety of their children, pets and livestock. Humans also compete for space and food resources with carnivores. In contrast to this, as the public has become more active in the protection of wildlife and non-government organizations have formed to protect animals; larger animals are often the target of protection. Predators are often perceived as charismatic and fascinating to much of the public (Rolston III 1987). Because of environmental education programs, more of the public understands more how these animals play an important role in regulating other populations in the ecosystem (Casey et. al. 2005). Do people of the southeast value coyotes in their communities or do they see them as a pest like many residents in western states do? How the public perceives these animals will dictate how they will be managed in the future. With wolves removed from much of the eastern U.S., coyotes are the dominate predator in these southeastern

ecosystems. Coyote populations have the potential to effect the distribution and abundance of other species in the southeastern states.

With these various questions waiting to be answered, we decided on a multi-method approach to try to understand different aspects of coyotes in the Southeast. Luckily, at the same time the Center for Forest Sustainability had been established here at Auburn University. This group is interdisciplinary, that is looking at the expansion of urban areas in the Southeast and how that may affect air quality, water quality, as well as, plant and wildlife health and distributions. This coyote project fit right into those goals of understanding wildlife changes in these areas. By working with this larger group, we used shared data, study sites, relationships with other graduate students on the project, and funding to support this research.

The first portion of this project focused on gaining a better understanding of the actual coyote population in these areas. We designed this to not only answer some of the biological question we had about coyotes but also for "ground truthing" the information we received from the public. Often public surveys address what the public thinks is going on with wildlife around them without actually knowing what is going on biologically with the wildlife species. Biological surveys of carnivore populations are usually very difficult, time consuming, and/or expensive. Our first option was to try trapping coyotes in these areas. We ruled that out however because it would be difficult to trap a large enough sample of coyotes. Other studies have trapped for years with sample sizes of approximately a dozen (Holzman et al. 1992; Quinn 1997; Sumner et al. 1984). In addition, it would be difficult to trap at many of the sites within the city limits

(e.g., city parks). A common method of surveying mammals is through scent and track stations. After researching coyote behavior and the use and success of track stations in past research, we decided against it. Coyote behavior such as rolling and scratching would erase track data. Captive studies have shown that they may be reluctant to step within a meter circle of substrate used to read tracks (Harris and Knowlton 2001) and differentiating between dog tracks and coyote tracks could be a problem. Data from track stations also can be erased by rain.

After ruling out these more traditional methods, we decided on using infrared motion-sensor cameras to record coyote presence at these sites. Cameras were used in conjunction with a bait and scent to photo-capture coyotes in these areas. Digital game cameras seemed the best option for cost and time investment while providing the most data about the animals captured. Eight sites were selected, four suburban and four rural, to run these camera stations. Cameras were rotated on a weekly basis from site to site throughout the study period. Initially this aspect of the study was set up to verify coyote presence and activity in these areas. However, during the fall semester of 2005, I took a wildlife population modeling course which introduced the concept of occupancy modeling. Occupancy models use presence/absence data to model the likelihood that a member of a chosen species will occupy a specific site. These models also use the data to give a rate of detection for the species. This rate is the probability that a species is detected at a site when it is present. Occupancy models do not model the survival of an individual or the size of a population. These models fit our original objective to better understand coyote use of suburban areas compared to rural areas in the Southeast.

The other aspect of our project was to survey residents living in southeastern communities. Both suburban and rural areas were being monitored for coyotes so I also wanted to survey both the suburban and rural communities in these areas. This allowed me to compare the public opinions to what I learned biologically about the coyote population. I chose to use a mail survey to get information from the public and developed a survey booklet consisting of twelve one-half pages. A mail survey was chosen because it seemed less intrusive to respondents compared to a phone survey and I could reach more respondents than on a computer survey. In my survey, I included questions pertaining to recreation interests, experience, wildlife preferences and how they felt about different management methods. Often surveys of the public ask about their knowledge of the species. I chose not to include any knowledge questions because past research showed little proof that knowledge was a good predictor of how people felt about a species but that their perception and experience with that species was more important (Ericsson and Heberlein 2003; Hunter and Rinner 2004; Lauber and Knuth 2004; Messmeret al. 1999). I attained address and phone information of residents near my camera sites from a sampling agency. Two rural areas and two suburban areas were sampled. Each rural area had an eight-mile radius and each suburban area had a four-mile radius. These sizes were selected based on average rural and suburban coyote home ranges found in other studies (Holzman et al. 1992; Person and Hirth 1991).

In my first chapter, I will discuss the results from my survey. Data on participation in recreational activities, wildlife preferences and demographic information was correlated with respondent beliefs on lethal and non-lethal management of deer and

coyotes. My second chapter will then report results from my camera monitoring stations. I will discuss how seasons and human development were correlated with coyote use of study sites, as well as, differences in coyote condition and activity patterns. The final section will then review how these two types of information can be combined to better understand coyotes in western Georgia and their relationship with the public. I will make recommendations on what this information means for local managers and what future research should focus on.

CHAPTER 1: PUBLIC PERCEPTIONS OF COYOTES (*CANIS LATRANS*) IN SUBURBAN AND RURAL AREAS OF WESTERN GEORGIA

ABSTRACT

Coyotes are a species that has been the source of many human dimension conflicts throughout the western states. Over the past hundred years it has made a new home in the southeastern U.S. However, relatively little is known on how the public in the Southeast feels about this species. My goals of this study were to understand management preference towards coyotes, compare these preferences to those towards another common wildlife species, and identify factors that many help predict these preferences in the public. Through a mail survey I inquired about recreation participation, wildlife interactions, wildlife preferences, and beliefs on wildlife management. I found that how respondents valued wildlife, especially coyotes, was the most important predictor in determining wildlife management preferences. In relation to other local wildlife, coyotes ranked low in preference. Many of our respondents did not even realize that coyotes lived in their communities. However, the majority felt that, if management was deemed necessary, they would support lethal control methods preformed by management agency personnel for removal of coyotes. Coyote presence is not currently concern in western Georgia area but managers should be prepared for education programs if management should need to be implemented.

INTRODUCTION

Humans have a history of conflict with coyotes in the western U.S. Most of the human conflict with coyotes is over predation of livestock or damage to agricultural crops (Bromley and Gese 2001; Knowlton et al. 1999; Sacks et al.1999a; Vercauteren et al. 2003; Wagner and Conover 1999). In a survey in Utah and Wyoming, respondents ranked the coyote in the top five species most responsible for depredation problems (Mclvor and Conover 1994). In Alabama, over $800 in average annual damage cost per fruit/vegetable producer was attributed to coyotes (Philipp and Armstrong 1995). Even though coyotes are relatively new to the Southeast, Alabama agricultural producers already have similarly negative views of coyotes (Philipp and Armstrong 1995). Government agencies and private land owners have spent millions of dollars over the last few decades trying to control coyote populations. Many western states have set bounty programs to encourage harvesting of coyotes (Bartel and Brunson 2003). A variety of removal methods have been attempted but even the most effective management has only been able to reduce populations for a few months at a time (Bartel and Brunson 2003; Coolahan 1990; Hubert Jr.et al. 1997; Pruss et al. 2002; Sacks et al. 1999a; Shivik et al. 2003; Wagner and Conover 1999).

Regardless of human efforts to control coyote populations, coyotes have expanded their range to encompass all of North America in both rural and urban/suburban habitats. The move of coyotes into cities has potential to cause negative interactions between humans and coyotes. Complaints and concerns to state extension

specialists about coyotes from the Birmingham and Montgomery, Alabama areas have increased in recent years (personal comm. Jim Armstrong).

Conover reported that 61% of households in major metropolitan areas reported problems with wildlife and 42% tried to solve their own damage problems spending a little over $30 per attempt. Fifty two percent of these attempts were unsuccessful (Conover 1997). Conover also estimated $5.5 billion and 1.6 billion hours where spent by urban residents annually on enhancing wildlife near their homes. His results suggest that suburban residents have strong interest and investment in wildlife populations and more resources should be focused on better understanding urban wildlife populations (Conover 1997).

Atwood et al. (2004) investigated the spatial ecology of coyotes in suburban areas and found that coyotes in these areas had smaller home ranges than coyotes in more rural areas. Smaller home ranges may lead to a higher density of coyotes which may lead to increases in disease spread, aggressive encounters between neighboring coyotes, and the possibility of negative interactions with humans (Atwood et al. 2004). However, in contrast, coyotes also may be effective in lowering levels of other nuisance urban wildlife (rats, raccoons, opossums, feral cats, etc.; Henke and Bryant 1999; Quinn 1997a).

Human populations, buildings and development, and the accidental capture of non-target species are added considerations in suburban wildlife management. Trapping and lethal methods of animal control have resulted in social controversy. The public differs greatly in their beliefs on animal control methods and animal rights. Andelt et al. (1999) found that the humane treatment of animals and the selectiveness of control

methods were the greatest concerns their respondents had in dealing with nuisance animals. Kellert reported that the general public disapproved of unselective killing of coyotes and 90% were against the use of poisons (Kellert 1985). The cost of the control method may be an important consideration when selecting control methods, as noted by Arthur (1981), who found that cost of control was one of the top considerations in coyote control. Conversely, Andelt et al. (1999) found that cost of method was one of the lowest ranked concerns.

Studies such as these highlight the variety of opinions that stakeholders may hold towards wildlife management actions. Knowledge of public beliefs on coyote control and preferred methods can help managers understand which management actions the community is more likely to support. By identifying the publics' preferences and beliefs, managers may also be able to develop education programs on a management that may be needed but would not generally be supported by the community.

Predicting Public Values

Over the past few decades researchers and wildlife managers have spent an extensive amount of time and resources trying to predict the attitudes and values of the public that they serve. This effort has increased as new public groups have become more involved in wildlife management policies. In some areas where managers may not have not made the effort to address all stakeholders, the public has reacted with ballot initiatives (Beck 1998). These actions take decision making away from wildlife managers and put it in the hands of the general public. Public approval of management decisions can also make management easier and more efficient. Community support and

assistance can make some management or monitoring plans possible since the number of wildlife managers/biologists is often limited. Even though wildlife populations are a wildlife managers' focus, managing and understanding the human population in the community is often just as important.

Many surveys have been done throughout the U.S. in order to better understand how the public feels about coyote management. A 1995 nationwide survey showed that economic loss warranted control of coyotes in the public's eyes (Reiter et al. 1999). In a survey on urban wildlife done in 1983, the majority of the respondents approved of killing coyotes only if there was injury to a pet or there was a threat of disease transmission (Wittman et al. 1998). In the late 1970s, surveys showed that most of the public disapproved of arbitrary shooting or trapping of coyotes and use of poisons (Arthur et al. 1979; Kellert 1979). Reiter et al.'s (1999) study also showed that the surveyed public believed non-lethal methods to be more humane than lethal control. In contrast, Arthur (1981) reported that the public surveyed felt that fast acting poisons and shooting were the most humane controls.

The public's perception of various management strategies can influence approval or disapproval of their use in communities. Reiter et al. (1999) found greater support for control of less attractive predator species. They also reported that the public felt that predator control was a right of agricultural producers who were experiencing damage (Reiter et al. 1999). Kellert's (1980) nationwide survey showed that coyotes received a relatively negative rank in the eyes of the general public when asked about preference of various species.

Each of the above surveys varied by area and types of groups surveyed. None however were done exclusively in the Southeast. The surveys show that different groups have their own sets of experiences and values towards coyotes that contribute to their evaluation of control methods. These support the idea that managers can not rely completely on past research to understand the publics' opinions but need to investigate their community specifically.

Even with differences between communities past research has identified some demographic factors that have been correlated with varying opinions of management and wildlife. In 1980, Kellert found that those with the least education had "a relative lack of interest, affection, and concern for animals." He states that individuals with a sporting or economic interest in wildlife may be exceptions to this general finding. Kellert also found that there were racial differences in attitudes - non-whites held less concern or affection for wildlife than whites (Kellert 1980). In Arthur's survey (1981), a majority of women (67%) disliked predators. Kellert and Berry (1987) also concluded that gender was one of the most important demographic influences on wildlife beliefs. They reported females having "stronger emotional attachments for individual animals". However, women also scored higher on the negativistic scale and "expressed substantially more fear and indifference" towards wildlife species. Males' beliefs appeared to be more based on " fairness, logic, hierarchy, assertiveness, and individual rights" than emotion (Kellert and Berry 1987). Messmer et al. (1999) reported that younger adults were less supportive of traditional wildlife management methods. A 1994 survey showed that non-farmers preferred non-lethal over lethal control as compared to farmers who were most

concerned with the most effective control methods. It is suggested that this difference of opinion is due to the daily damage issues farmers must face and a difference in received information (Mclvor and Conover 1994)

Activities and recreation have also been found to strongly affect beliefs about wildlife, predators and coyotes. Kellert reported that anti-hunters and zoo enthusiasts expressed strong affection for wolves and coyotes. He also found that those who felt positively about predators generally had more appreciation for wildlife and the outdoors. Those who felt negatively about predators generally had a high disinterest and fear of animals (Kellert 1985). Kellert and Berry (1987) recorded more male participation in consumptive recreation such as hunting, fishing, and trapping. In a recreational study done by Teisl and O'Brian (2003), they concluded that activities such as wildlife watching and nature photography were related to higher levels of environmental concern and behavior. Overall, they determined that respondents with participation in outdoor recreation activities of any kind had higher concern for environmental issues and made where more likely to join or support environmental organizations (Teisl and O'Brien 2003).

Because of the importance of public values in management decisions, my study aimed to evaluate how the public in rural and suburban areas perceived coyotes in their communities. The survey consisted of three sections to report experiences and recreation with wildlife, values of wildlife and their use, and beliefs on various control methods to be used in the community. Questions were asked about both coyotes and white-tailed deer (*Odocoileus virginianus*) so as to compare differences in beliefs towards these two

species. White-tailed deer were selected because they are also a suburban/rural species that poses damage and human conflict concerns.

Goals and Hypotheses

I used survey results to examine the relationship between these three factors in an attempt to better predict management beliefs in the general public of western GA. I had four major hypotheses that I investigated with the data from my surveys. First was that respondent's participation in wildlife/outdoor recreation and interactions with wildlife would effect respondent's attitudes towards wildlife. I predicted that respondents with higher participation in non-consumptive recreation such as wildlife photography and bird watching would be less likely to support hunting of wildlife. I predicted that increased interactions with wildlife would increase respondents' value of wildlife. In addition I believed that increased reports of damage interactions with a species would increase preference for lethal control.

My second hypothesis stated that demographic factors would play a role in respondents' values of wildlife and preferences for management. I predicted that lethal control would most likely be supported by males, respondents within the lowest and highest income levels, respondents with less than a college education and those that live in rural areas.

My third hypothesis was that attitudes toward wildlife would be the most important predictors for preferences towards coyote control methods. I predicted that a lower value of wildlife would correlate with support for lethal control of coyotes while a higher value of wildlife would correlate with increased support for non-lethal control.

My fourth hypothesis was that beliefs on management methods for deer and coyotes would be different due to different damage levels and different attitudes towards each species. I predicted that respondents would have a higher preference for deer than coyotes in their communities but that deer would cause more damage. I predicted that lethal control will be more supported for coyotes while non-lethal control will be the most supported method of removal for deer. In addition I predicted that respondents who believed coyotes lived near their homes would be more likely to support lethal control of coyotes where respondents who believed deer lived near their home would support non-lethal removal methods of deer.

The final goal of my project was to determine which management methods would be most accepted for managing both coyotes and deer in western Georgia communities and when respondents believed they should be used.

STUDY AREA

My study area was located in western Georgia in Muscogee, Harris and Meriwether counties. Four different populations, two suburban and two rural, were sampled from selected areas within these counties. Demographic information from the 2002 census data was summarized by county in Table 1 (Survey Sampling International, LLC). Radiuses of the study areas were selected to correlate with the average home range of coyotes in the areas (Holzman et al. 1992; Person and Hirth 1991). Two areas of a four-mile radius were selected from within Muscogee County. The first was centered at the Columbus Airport located in the north-central section of Columbus (32.5128˚N,

84.9275˚W). The second was in the Green Island area located on the northeastern side of Columbus (32.5549˚N, 85.0227˚W). The third area, located in the western-central area Harris County (32.77245˚N, 85.0795˚W), had an eight-mile radius. The final sample area also had an eight-mile radius and was taken around the town of Gay, Georgia, which lies in the northeastern section of Meriwether County (33.1095˚N, 84.59306˚W).

METHODS

Sample Population

The mail survey was designed as a stratified random sample. I attempted to contact the same number of respondents (n= 475) in each of the four selected areas. This number was selected because I assumed that we had a diverse population. To be conservative, approximately 380 respondents would be needed from each county to assume a sampling error of no more than $\pm$ 5% at the 95% confidence level (Salant and Dillman 1994). Approximately 20% was added to this base number for expected undeliverable samples. Phone and address information was collected from Survey Sampling International, Inc. for each of the four areas. The most rural area in Meriwether County was the only area that did not have enough residents to fill the request so I only sent surveys to 415 residents.

Survey Instrument

The survey instrument was developed in the fall of 2004. It contained three major sections concerning wildlife experience, preferences and management opinions. The wildlife experience section included a four-point scale of eleven recreation activities and

questions about interactions, damage, and prevention methods concerning deer and coyotes. The preference section contained 25 questions with a four-point Likert scale focusing on value of wildlife populations, opinions of hunting and beliefs towards government responsibility for wildlife damage problems. I chose not to give a neutral option in the preference section to force respondents to make a decision. The preference section also included two questions on preferred wildlife species near residence. The final section on wildlife management concentrated on ranking methods of control for both deer and coyotes. The survey ended with a demographics section asking age, gender, race, education, occupation, income, and organization membership. A first draft of questions was sent out for comments to peers. After their responses were incorporated a second draft was sent to 25 residents from each area as a pre-test. Suggestions, comments, and questions that arose from the pre-test were addressed to improve understandability of the survey.

The final survey was mailed to 450 respondents in each area (n=390 in Area 4) in June 2005. The initial mailing included a cover letter, the survey booklet, a stamped addressed return envelope, and a bumper sticker from the Auburn School of Forestry and Wildlife Sciences as an advance thank you for their participation. After two weeks a reminder postcard was sent to those whose responses were not received yet. The postcard told them I had not received their survey and thanked them if they had already sent it in. A complete follow-up survey was sent after another two weeks to the remaining non-respondents (Dillman 1978). In September 2005, a phone survey was conducted on the final non-respondents of each area to assess non-respondent bias.

Analysis

I preformed common factor analysis with a varimax rotation on both the recreation and preference section data (Bright and Porter 2001). Factors with eigenvalues of greater than 1 were considered. For recreation and preference questions, I standardized responses by subtracting the mean and then dividing the result by the standard deviation. Each recreation or preference question was given a score that correlated with the level that the question contributed to that factor. Recreation and preference scores were calculated for each respondent by multiplying the standardized response by the question score for each factor. These values for each response were added to give a total score for each of the recreation and preference factors. Preference scores were averaged to avoid bias from similar questions. Analysis of variance (PROC ANOVA; SAS Institute Inc. 2002-2003) was used to determine differences in responses between various demographic groups.

Overall interaction scores were computed by using the sum of responses from eleven questions. The questions I used inquired about seeing animals, seeing animal tracks, damage problems, etc. A response of "1" meant there was an interaction and a "2" meant there was no interaction. The lower the scores, the more interaction the respondent had with both species. The scores ranged from 12 to 22 (Figure 2).

Linear regression (PROC REG; SAS Institute Inc. 2002-2003) was used to determine demographic effects on recreation and preference factor scores, and to assess the effect of recreation factor scores on preference factor scores. Wald's chi-square and partial r^2 values were used to assess significance and contribution of each factor to

models. Finally, logistic regression (PROC LOGISTIC; SAS Institute Inc. 2002-2003) was used to assess the predictive value of demographic data and factor scores on lethal versus non-lethal management preferences. Wald's chi-square and model r^2 values were used to determine which factors best predicted management beliefs for deer and coyotes.

RESULTS

Survey Response

Of the 1740 final surveys that were sent, 129 of them were undeliverable and 727 surveys were returned (44.6% response rate). There were some differences in response rates by area with the highest response of 48.3% in the rural counties (Table 1). I received a similar number of responses from all four areas and feel that areas were equally represented (Table 1). I conducted a non-response bias survey on ten percent of the non-respondents in each surveyed area. The survey included fourteen questions on basic wildlife experience, outdoor interests, and demographics. There were a few significant differences between the two groups. Respondents of the mail survey reported more deer near their home than those who where surveyed by phone. Mail respondents also participated more in outdoor and nature recreation than those in our phone survey. A greater return of surveys by people who were more interested in wildlife was not surprising. Respondents to the phone survey were more likely to be female than male (70% and 30%, respectively), while our mail survey had males as 70% of the respondents. The last significant difference that we found in most of the areas is that the mail respondents were more likely to have had damage to crops or ornamental plants than

those from the phone survey. It is understandable that those who have had problems with these species would be more responsive to questions about their management. Though my mail survey respondents are a subsection of the overall population, this is the subsection that is most likely to be effected by and involved in future wildlife management decisions.

Recreation Scores

Common factor analysis, revealed three underlying recreation factors with an eigenvalue of greater than one that connected the eleven recreation activities discussed in my survey; consumptive recreation factor, wildlife viewing factor, and a general outdoor recreation factor (Table 2). The consumptive recreation factor included participation in hunting, trapping, fishing, television programs, reading magazines and ATV use. The wildlife viewing factor included nature photography and bird watching. The general outdoor recreation factor included camping and hiking. Each respondent's participation level in each of the activities was computed with that activity's score for each of the factors. Factor score was used to reflect respondents' participation level for each category.

Preference Scores

Common factor analysis of the section on wildlife preferences confirmed that our two first sets of questions related to two factors respectively. Questions 1 – 11 showed relation to what I called wildlife enjoyment/value and questions 12 - 16 were correlated to a factor that I called hunting support. Respondents' scores for each factor varied from -1.3 to 3.6.

Recreation

My first hypothesis focused on how participation in recreation activities and interactions with wildlife may affect attitudes towards wildlife. My survey inquired about eleven different recreation activities. Trapping had the lowest reported participation rate with 93% of the respondents never partaking (Table 3). Hunting also had low participation from respondents with a majority of my respondents did not report participation. However 17 % of respondents reported hunting more than 5 times a year. This indicates a larger presence of hunters in western Georgia and within the survey respondents compared to 7% of the population who hunt nationwide (Dudaet al. 1998).

One of the most popular activities reported by survey respondents was watching television programs that focused on outdoor themes, with 87% having watched a program in the last year and almost 40% indicated that they watch them frequently (defined in survey as greater than five times a year; Table 3). Television was followed by bird watching around the home as the next most popular activity with 44.5% of respondents reporting participation frequently. Duda et al. (1998) reported wildlife watching as an activity enjoyed by all genders, ages, and backgrounds. Respondents of my study were above the South Atlantic area average of 31% reported in 1996 (Duda and others 1998). Rural residents reported higher participation in each activity as compared to suburban residents (Table 3).

In attempt to address my first hypothesis I investigated the relationships between recreation interests and the two preference factors, wildlife enjoyment/value and hunting support. All three recreation factors significantly contributed ($p<0.0001$) in modeling

wildlife enjoyment/value resulting in an adjusted r^2 value of 0.2411. Wildlife viewing showed the greatest correlation with a partial r^2 value of .1256. General outdoor recreation had the lowest correlation ($r^2 = 0.039$). This was expected because neither of these activities directly involved wildlife. With regards to hunting support, only consumptive recreation made a significant contribution ($p<0.0001$) resulting in a model with an r^2 value of 0.1278. This relationship is not surprising because hunting is included as one of the consumptive recreation activities.

Wildlife Interactions

The second part of my first hypothesis addressed the effect respondents' interactions with wildlife may have on the values and management preferences of species. Recent studies have looked at how area of residence affects wildlife management beliefs (Heberlein and Ericsson 2005; Teelet al. 2002). These studies assumed that rural residents would have increased interactions and experience with wildlife. This is an assumption that may not be valid when the presence of animals such as coyotes is equal to or greater than those of rural areas (see following chapter; Atwood et al. 2004; Grinder and Krausman 2001b). To test this assumption for my study population, I compared overall interaction scores between rural and suburban residents. The mean scores between rural and suburban areas were different, (rural mean = 16.57, SD = 1.99; urban mean = 20.15, SD = 1.89) with the residence type explaining almost 50% of the difference (r^2 =0.458). Overall interaction scores were also correlated with management preferences for both species. Increase interactions with wildlife was correlated with an increase in wildlife enjoyment/value ($p<0.0001$, f = 52.3). However,

an increased interaction score was also correlated in a reduced support of hunting ($p<0.0001$, $f = 44.86$). Increased overall interaction with wildlife increased the preference for lethal management in both deer ($p<0.0001$) and coyotes ($p<0.0001$).

The second way I addressed the wildlife interaction portion of my first hypothesis was by investigating whether lethal or non-lethal management preference was dependent on whether the respondent believed the species lived near their home. With deer, the preference of lethal or non-lethal management was significantly effected ($p = 0.0317$) by whether or not the respondent believed they had deer living within a mile of their home. Respondents who believed they had deer near their home, and even those who were unsure, were more likely to approve of lethal management than those who did not believe they had deer living near them. Like deer, the preference of lethal or non-lethal management of coyotes was affected ($p =<.0001$) by whether respondents believed coyotes lived near their home. Those who believed coyotes lived near their homes where more likely to support lethal management of the population. Believed proximity to coyote population also affected people's reasons for when coyotes should be managed (Figure 3).

Demographics

My second hypothesis focused on using demographic factors to predict wildlife attitudes/preferences and opinions on wildlife management methods. I used linear regression to determine correlations between demographic variables and the two preference factors (Table 4). For the wildlife enjoyment/value the demographic variables of RACE, AGE, GENDER, ED (education) and RES (residence area) were all found to

show significant correlation. RACE had the strongest influence with an r^2 value of 0.07. AGE, GENDER, ED, and RES contributed with r^2 values of 0.05, 0.015, 0.007 and 0.02 respectively. The hunting support factor had five variables that contributed significantly: GENDER, AGE, RACE, OCC (occupation), and RES (residence). GENDER, RACE, RES were the largest contributors with r^2 values of 0.021, 0.024, and 0.023 respectively.

I then examined how demographic data related to specific management preferences. I used logistic regression to find correlations between demographic factors and whether the respondent supported lethal or non-lethal management. With deer, gender and area of residence correlated significantly to management decisions with respective p-values of <.0001 and 0.0012. Males and rural respondents were more likely to approve of lethal management than women and urban respondents. In the coyote model, gender was the only demographic variable that contributed significantly. Like with deer, males were more likely to support lethal methods to control coyote populations.

Preferences

My third hypothesis focused on how respondents' attitudes towards wildlife and hunting related to their beliefs on management of the two species. I used logistic regression to investigate the relationship between these two beliefs and the preference for lethal or non-lethal management for both deer and coyotes (Table 5). For deer management, my data show correlation with the hunting support factor ($p<0.0001$) but no significant correlation with the wildlife enjoyment/value factor ($p=0.47$). Predictability of respondents' management preference was increased by approximately nine percent

with these two factors. For coyote management preferences both wildlife enjoyment/value factor and hunting support factor contributed significantly with p-values of 0.003 and <0.0001, respectively.

Managing Deer and Coyotes

The final section of our survey included questions that inquired about the respondents' beliefs and reasons for managing these two species in their community. I used this section to address the final hypothesis and final goal of my project. For deer, many respondents (48%) felt that an increase in deer/car collisions was a valid reason for reducing the population. Thirty-four percent believed that we should always reduce the deer population and 31% felt that damage to commercial crops was also valid reason for population reduction. With coyotes 43% of the respondents felt you should always reduce the population. The other most approved reasons were possible disease transmission to pets (41%) and damage to livestock (35%).

The remaining questions inquired about respondents preferences on management methods. Overall, lethal methods of control were supported by the majority of the respondents with 55% support for deer and 61% support for coyotes. This majority may be due to the higher number of male respondents as well as the fact that this survey is looking at a southern U.S. population (Kellert 1985; Kellert and Berry 1987).

Public gun hunts were the most supported lethal control method for deer and live trap and removal was the most popular non-lethal method for deer control. For coyotes, shooting by the agency was the preferred lethal method and the use of fertility control

was the most supported non-lethal control. Survey respondents ranked their preference for various management methods for each species on a five point scale (Figures 3 and 4).

DISCUSSION

Recreation

Respondents reported watching wildlife television as a recreation activity with high participation. Other surveys have also reported wildlife television shows as a popular wildlife-related activity across southeastern states (Duda and Young 1995; Rossi 1998). Respondents also chose television as the most common and preferred way of receiving information about wildlife. These results suggest that television could be an important resource for wildlife managers to inform the public on new wildlife issues. Other areas have used media as an outlet for education on suburban wildlife issues and found it very helpful (Raiket al. 2005).

My results also revealed that rural residents reported higher participation in each activity as compared to suburban residents (Table 3). This is consistent with findings by Duda et al. (1998) who reported that participation in consumptive recreation activities was more likely to occur if an individual lived in rural areas. Residential effects on hunting participation were also reported by Heberlein and Thomson (1996). My study investigated effects of current residency, but other studies have connected current recreation activities to childhood residency (Adams et al. 1997; Duda et al. 1998; Heberlein and Ericsson 2005). Heberlein and Ericsson (2005) suggest that residence in rural areas can influence beliefs and activity participation for up to two generations.

Since my survey did not inquire about previous residence, I am unsure how that may have affected respondents in this area.

My models show that participation in recreation with direct interaction with wildlife can help predict how respondents valued wildlife. Participation in both consumptive and wildlife viewing activities correlated with respondents' enjoyment/value of wildlife as well as support of hunting. Participation in consumptive recreation activities was correlated with increased scores for wildlife enjoyment/value and hunting support. Respondents who participated in wildlife viewing activities were more likely to have increased scores for wildlife enjoyment/value.

Wildlife Interactions

According to my results, rural respondents had a significantly more interactions with wildlife than those residents in suburban areas. These differences in interactions with wildlife appear to be correlated with preferences for wildlife and beliefs on management methods. It is not surprising that an increase in wildlife interactions is correlated with increased value of wildlife. However, it is surprising that respondents with higher interaction scores where less likely to support hunting but more likely to support lethal management of both deer and coyotes. This shows us that respondents see hunting as more than just the killing of the animal. Respondents may see hunting as unnecessary as compared to a management being done for a purpose or to reach an objective. If managers want to encourage public support of hunting this difference should probably be considered.

Whittman et al. (1998) investigated public opinion of lethal control the use of for beavers, mountain lions, and coyotes in Colorado. They found that just the presence of the animals in the area was not enough to merit lethal control. Only when animals posed threats to pets or humans did their public feel lethal control should be used. My results show that proximity of wildlife to a respondent's home was correlated with their preference of lethal or non-lethal management and when management should be used. Respondents were more likely to approve of lethal control for both coyotes and deer if they believed the species lived within a mile of their home. Proximity to their home may be a measure of potential threat the public feels. With coyotes, concern for pets increased when respondent felt that coyotes could be close (Figure 1).

Demographics

Both preference factors found ethnicity as an important predictor of attitudes toward wildlife. Kellert (1980) found that black Americans scored low scores on the naturalistic scale and high on the utilitarian and negativistic. Duda et al. (1998) reports that white Americans are more likely to approve of hunters and to participate in hunting than minority Americans. The cultural reasons for these differences go beyond the scope of this study, but are related to the differing norms and cultural perceptions of hunting and outdoor recreation held my minorities in the U.S. (to be cited). Both Duda et al. and Kellert also cite age and gender as defining characteristics in understanding hunting and general wildlife preferences (Duda et al. 1998; Kellert 1980).

Other demographic factors were shown to relate to specific management preferences. Males and rural respondents were more likely to approve of lethal

management in general than women and urban respondents. Area of residence however was not found to be significant for coyote management preferences. Teel et al. (2002) reported women and urban residents were more likely to oppose hunting and predator management than men and rural residents. Though I have discussed some studies that have shown preference differences by area for residence, studies done in Sweden reported no differences in urban/rural attitudes towards wolves (Ericsson and Heberlein 2003; Heberlein and Ericsson 2005) suggesting that increased rural experience does not necessarily result in increased negative attitudes toward a species. They suggested that experiences with rural areas were more important as a predictor than area of residence (Heberlein and Ericsson 2005). Gender also turned up as a very important predictor in management beliefs. More than one study has looked at how gender may affect wildlife opinions (Casey et al. 2005; Kellert 1980; Kellert 1985; Kellert and Berry 1987; Teel et al. 2002). In general, women have been grouped as scoring high on the moralistic scale, having stronger emotions towards individual animals, opposing cruelty and exploitation of animals but also tending to score higher on the negativistic scale (Kellert 1980; Kellert and Berry 1987). Women tend to express more fear and indifference towards animals than males (Kellert and Berry 1987). This could explain why our data shows females against lethal control for deer but supporting lethal control for coyotes (Figure 5). Coyotes may trigger that fear because of their possible danger to pets or children (Kellert 1985; Kellert and Berry 1987).

Preference Factors

Preference factors were shown to increase predictability of management preferences. Respondents were more likely to support non-lethal control of deer and coyotes if they had a higher enjoyment/value in wildlife and they did not support hunting. It is not surprising that those who support hunting also support lethal control, especially since one of the most accepted lethal control methods was public hunting (Figures 3 and 4).

By comparing models of preference factors predicted by demographic or recreation interests, our data suggests that recreation interests are better indicators of an individual's preference towards wildlife and hunting. Though the recreation interest model had the higher r^2 value, there is still a large amount of variance that is not explained by this model. This suggests that there are factors other than recreation interests that effect wildlife and hunting preferences.

Managing Deer and Coyotes

Overall I found that respondents supported lethal control of both deer and coyotes. This majority support for lethal control may be due to the higher number of male respondents as well as the fact that this survey is looking at a southern U.S. population (Kellert 1985; Kellert and Berry 1987). The most supported reasons for management threats to human safety, pet safety, or livelihood (crops or livestock). Loker (1996) found no significant connection between heath and safety concerns and acceptance of lethal management. In my population 30-40% felt that management should

always be done on deer and coyotes. However, support of management in the remaining population related to safety concerns.

My results did report some differences in management preferences for deer and coyotes; greater support for lethal coyotes than deer, especially in female. This difference is possibly liked to a fear or dislike of coyotes. Respondents were asked to rank animals by which they preferred living near their home. While deer was the most popular species with an average rank of 3.9 out of 5, coyotes ranked much lower at 2.1. This negative opinion of coyotes has been found in studies done in multiple areas of the U.S. (Kellert 1985; Mclvor and Conover 1994; Wittman and others 1998).

CONCLUSIONS

Coyotes versus Deer

Overall, both suburban and rural communities in western Georgia had more interactions with and knowledge of deer than coyotes. Damage and effort to prevent future damage was higher with deer than coyotes. However, support for lethal control of coyotes was still higher than deer. My results showed that damage issues are not the most important indicator of the beliefs towards management of a species, but that the public's perception of that animal plays a role in which management efforts the public supports. Other studies have shown that, in similar situations with other species such as mountain lions or beavers, the public is more likely to support lethal control of coyotes (Wittman and others 1998). Our respondents ranked deer as their most preferred animal of the list with coyotes much closer to the bottom of the list. This preference of seeing

deer near their home appears to offset the damage, or potential damage, they may experience.

Males in our study generally supported lethal control of both species however the majority of females support lethal control for only coyotes and not deer (Figure 5). Other studies have previously discussed how this shift in belief is common for females. They imply that females attach emotionally to individual animals and often support protection of animal rights. In contrast, females were also shown to have an increased fear, especially of predator species, and disinterest in wildlife species as compared to males (Kellert 1985; Kellert and Berry 1987).

Suburban versus Rural

One of the major focuses of this project was to compare suburban and rural populations. According to my research, suburban residents participated in less recreation activities and overall had fewer interactions with wildlife species than rural respondents. However, regardless of this difference I did not see that area of residence was a strong predictor of wildlife preferences or beliefs on management methods. My research shows that understanding how the public values wildlife is more important than their actual interactions. Wildlife preferences seem to be rooted deeper in the value system. Current place of residence is not likely to capture that. With more complicated models, like those used by Bright and Porter (2001), we see that these beliefs may come from factors we have not considered yet.

MANAGEMENT IMPLICATIONS

The majority of respondents from our study area approved of lethal management of both species; this may be a result of being located in the South (Kellert 1985). This majority support for lethal control is not found in some other areas of the country (Teel and others 2002) but this sentiment may be increasing in areas that are receiving attention for wildlife conflicts (Whittakeret al. 2001). Overall shooting was the most approved method of management while chemicals and gassing/fumigating dens was least approved by respondents. Deer management by public hunts was most supported while for coyotes, agency management was preferred by respondents. The support of deer hunting is expected due to its strong cultural importance in the Southeast (Rossi 1998), however dealing with coyotes is a fairly new situation for this area.

This research does, however, show that both females and the public that does not support consumptive recreation should be a consideration for managers in this area. If lethal control of either species, especially deer in suburban areas, is deemed necessary then education programs need to focus on these groups and address some of their concerns to gain their support. In many other communities, communication with the public has been an important component in either understanding, diffusing or preventing a conflict between the community and the managers (Casey and others 2005; Kilpatrick and LaBonte 2003; Kirkpatrick and Turner Jr. 1997; Lauber and Knuth 2004; Messmer and others 1999; Miller and McGee 2001). Using education programs and media outlets to reach specific stakeholders in western Georgia can help managers in this area to prevent future problems in implementing management of these species.

TABLES AND FIGURES:

Table 1: Responses from mail surveys from study areas in western Georgia counties in 2005; Area 1 and 2 (Muscogee County) Area 3 (Harris County) Area 4 (Meriwether County).

Area	# Sent	Wrong Addresses	Unable to Complete	Refused	Round 1	Round 2	% Returned
1	450	44	11	3	100	49	0.37
2	450	35	11	9	122	51	0.44
3	450	23	3	1	170	59	0.54
4	390	9	3	0	110	53	0.43
Total	1740	111	28	13	502	212	0.45

Table 2: Level of correlation of each recreation activity with the top factors as determined through common factor analysis with a varimax rotation. The highest correlation for each activity is highlighted.

	FACTORS		
Recreation Activity	**Consumptive**	**Wildlife Viewing**	**General Outdoor**
Hunting	**0.751**	-0.002	0.166
Fishing	**0.696**	0.128	0.129
Trapping	**0.335**	-0.004	0.124
Television	**0.545**	0.473	-0.009
Magazines	**0.677**	0.399	0.071
Bird watching at home	0.055	**0.703**	0.015
Bird watching away	0.031	**0.71**	0.18
Photography	0.099	**0.449**	0.299
Hiking	0.162	0.356	**0.485**
Camping	0.427	0.115	**0.533**
ATV use	**0.536**	0.033	0.356

Table 3: Percent participation in recreation activities by residence area.

	Participation (1=Never, 2=Rarely, 3=Occasionally, 4= Frequently)							
	Urban n=321				Rural n=391			
Activity	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Hunting	79.40	8.72	4.98	6.85	51.41	13.30	9.72	25.58
Fishing	48.13	21.88	17.19	12.81	25.83	19.69	18.93	35.55
Trapping	96.55	2.51	0.31	0.63	90.23	5.66	2.57	1.54
Outdoor TV Programs	16.51	23.99	27.41	32.09	10.23	17.14	27.88	44.76
Outdoor Magazines	40.00	21.88	23.13	15.00	21.74	23.79	26.60	27.88
Bird Watching At Home	24.38	11.88	22.81	40.94	14.62	11.28	26.67	47.44
Bird Watching Away	48.28	19.12	18.81	13.79	37.44	24.36	20.00	18.21
Nature Photography	59.81	19.63	15.89	4.67	47.57	24.04	19.18	9.21
Hiking	54.52	20.56	15.58	9.35	42.97	25.06	20.97	11.00
Camping	65.42	19.31	7.79	7.48	46.55	25.83	16.62	11.00
Off-Road Vehicle Use	75.39	11.53	7.48	5.61	55.24	13.55	15.86	15.35

Table 4: Linear regression models assessing demographic effects on preference factor scores. (Note: lower preference scores show higher enjoyment of wildlife and more agreement with hunting.) Values for overall models are highlight at the top for each factor.

Factor	Variable	Beta	P-value	R^2
			<0.0001	**0.18**
	GENDER	0.26839	0.0017	0.02
	AGE	0.01364	<0.0001	0.05
Wildlife Enjoyment/Value	RACE	0.72614	<0.0001	0.08
	ED	-0.08047	0.0296	0.01
	OCC	-0.00633	0.3637	<0.01
	INCOME	-0.02401	0.2531	0.002
	RES	0.27512	0.0004	0.02
			<0.0001	**0.1043**
	GENDER	0.29889	0.0007	0.0228
	AGE	0.00864	0.0018	0.01537
Hunting Support	RACE	0.41394	0.0005	0.0264
	ED	0.05905	0.1227	0.01301
	OCC	-0.01571	0.0298	0.00602
	INCOME	-0.00536	0.8052	0.00002
	RES	0.27662	0.0006	0.02064

Table 5: Logistic Regression of wildlife preference factors on wildlife management preferences for deer and coyotes. Estimates show the likelihood of support for non-lethal control methods.

	Factor	Estimate	SE	Wald Chi-Square	P
Deer Management	Wildlife Enjoyment/Value	1.03	1.44	0.52	0.473
	Hunting Support	-9.35	2.12	19.37	<0.0001
Coyote Management	Wildlife Enjoyment/Value	4.45	1.52	8.60	0.003
	Hunting Support	-11.00	2.14	26.56	<0.001

Figure 1: Reasons why respondents believe coyotes should be managed by whether they believe coyotes live within one mile of their home. (* $p \leq .05$)

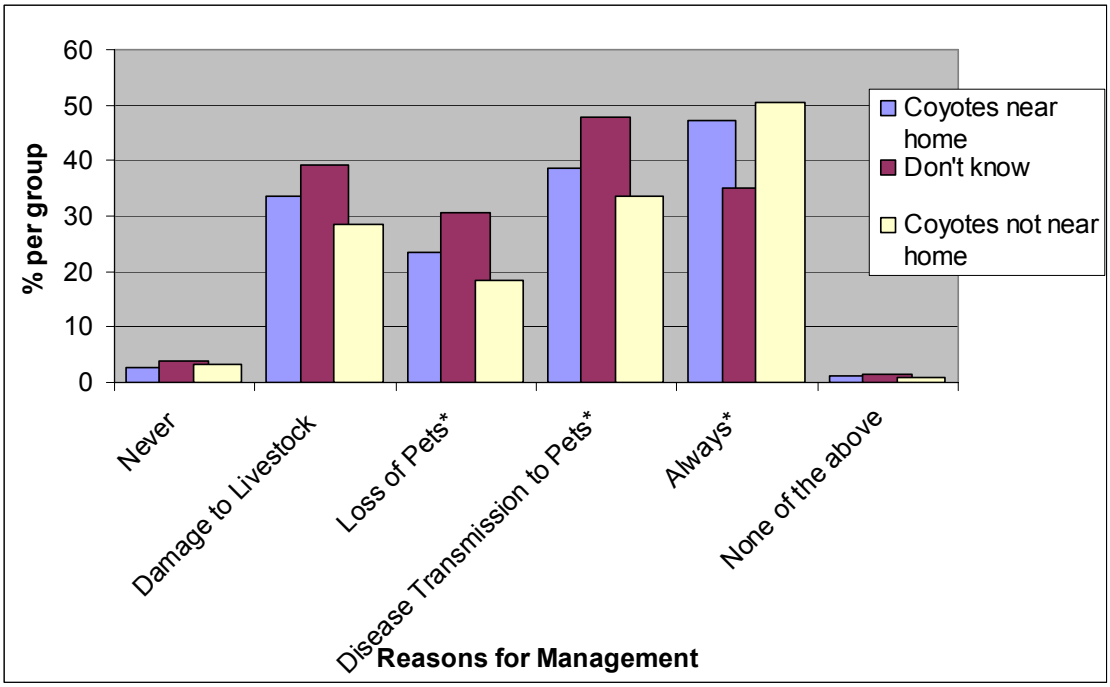


Figure 2: Overall interaction scores of residents by area of residence.

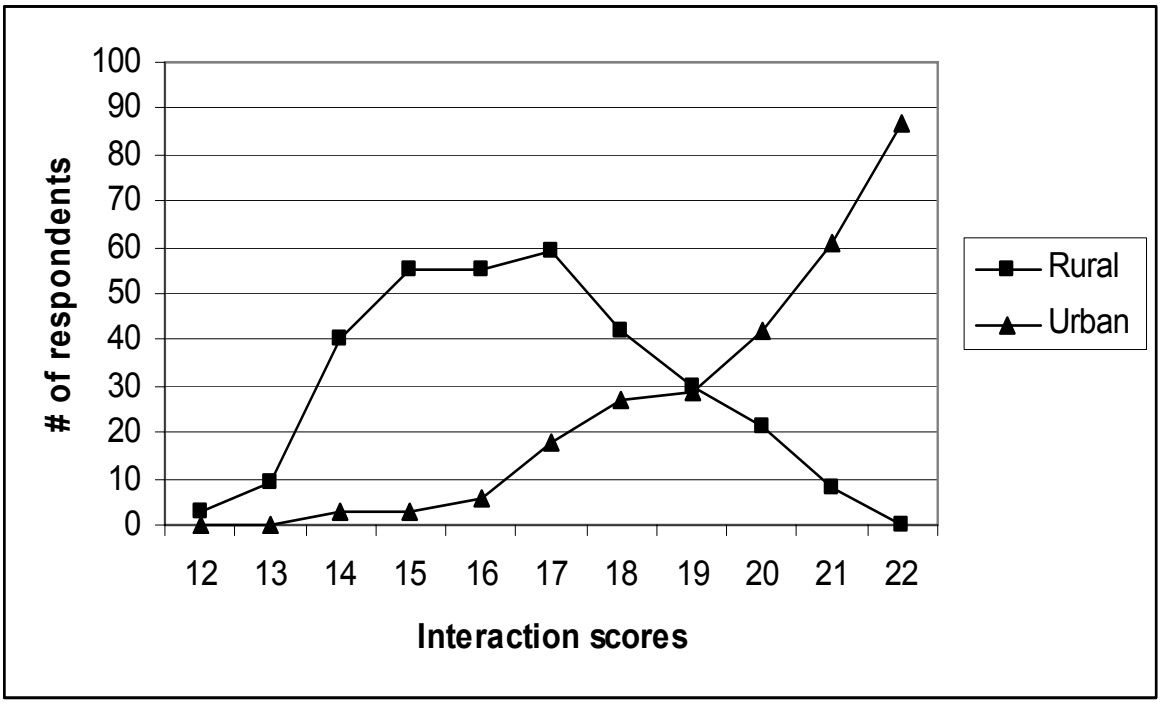


Figure 3: Mean scores of deer management methods on a scale from 1 to 5.

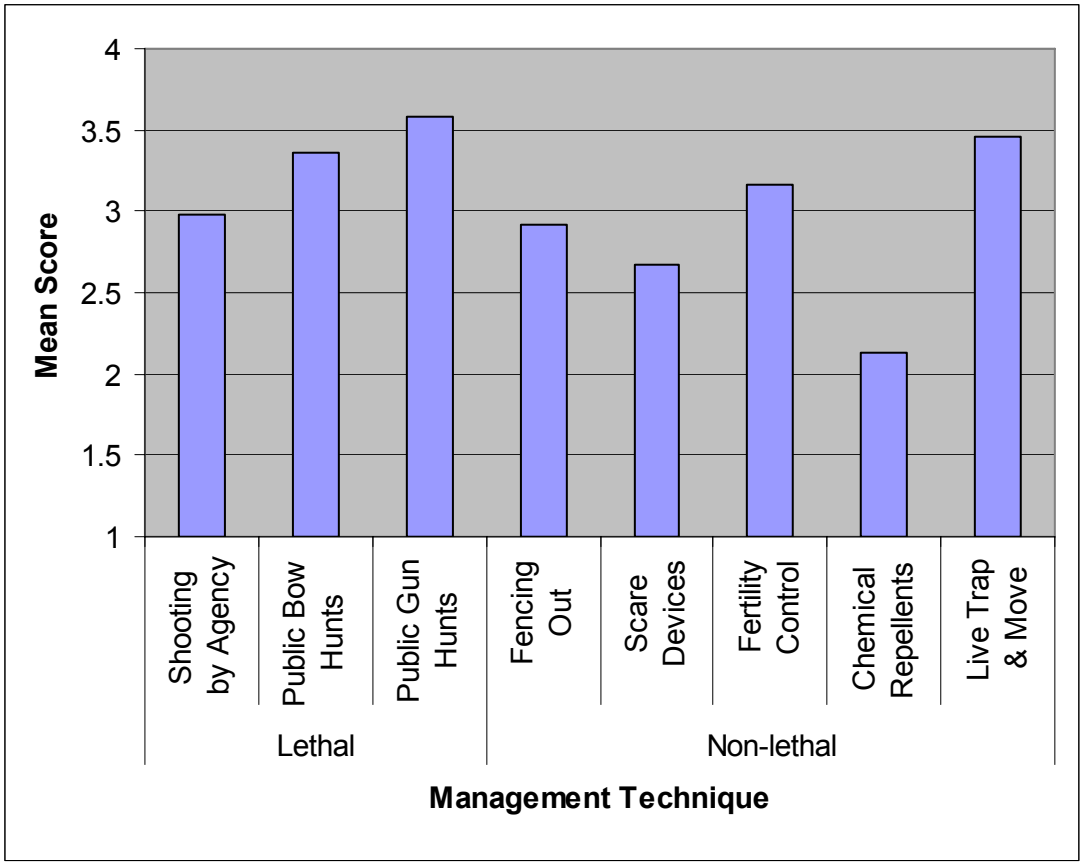


Figure 4: Mean scores of coyote management methods on a scale from 1 to 5.

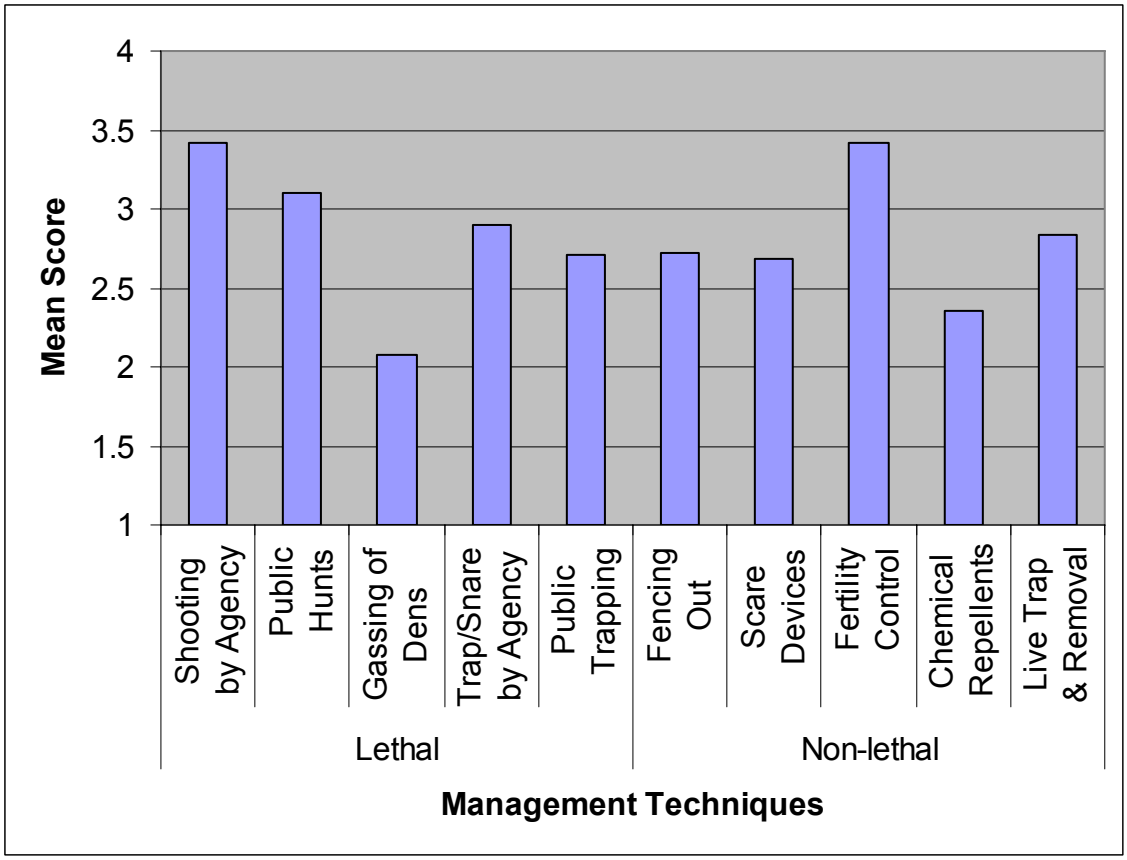
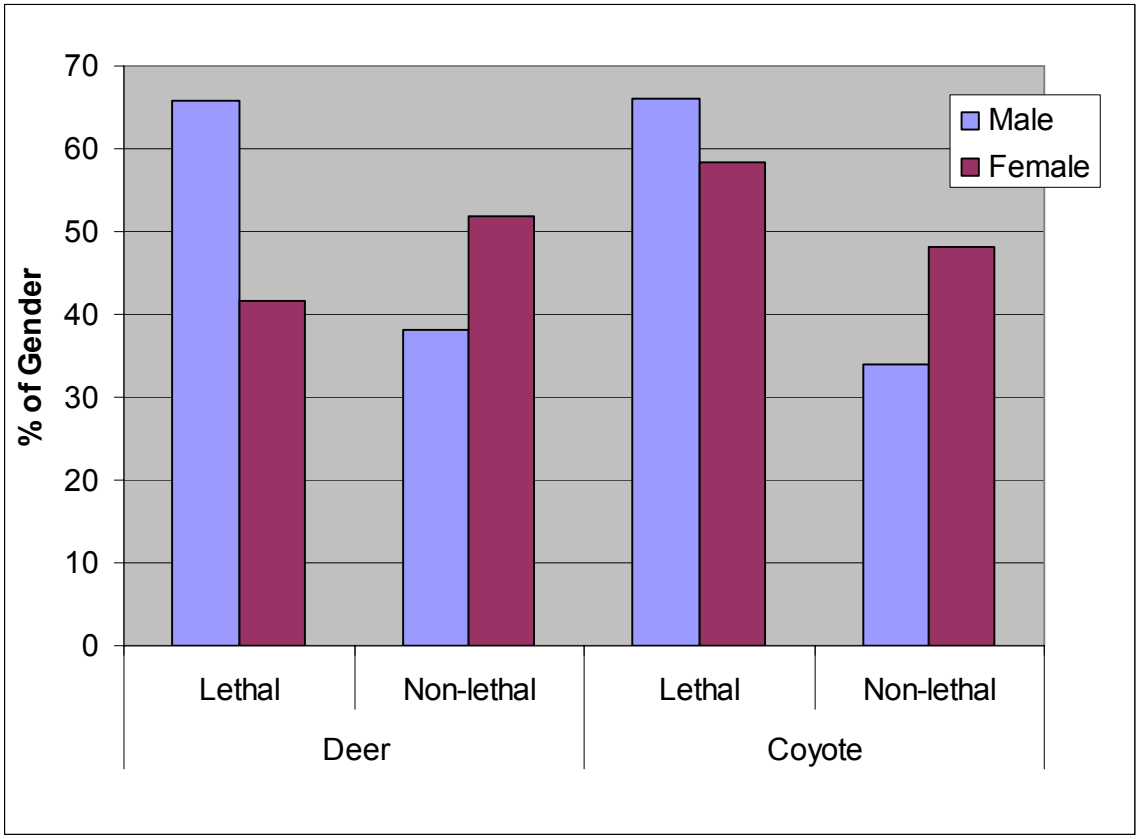


Figure 5: Respondents preference of lethal or non-lethal management methods by gender for each species.



COYOTE (*CANIS LATRANS*) USE OF SUBURBAN AND RURAL HABITATS IN WESTERN GEORGIA

ABSTRACT

Over the past fifty years, coyotes (*Canis latrans*) have expanded their range and established themselves as dominant carnivores throughout the southeastern U.S. in both rural areas and suburban areas. However, since coyotes are relatively new to the Southeast, only a handful of studies have been conducted on them in habitats in this region. No research has been done on coyotes in suburban areas of the southeast. Though we know that coyotes have moved into suburban areas, it is not known if they are using them in the same way as rural areas. The goals of my study were to determine if there were differences in site use, coyote detection, coyote body condition and coyote movement times between suburban and rural sites. I used data from digital game cameras to address these questions. I found coyotes preset at all eight of my study sites during at least one season throughout the year. I found little support that coyotes were using suburban and rural sites differently. My models supported the hypothesis that biological seasons effected movement detection of coyotes at site and movement in and out of sites. During most of the year I found no difference in body condition between development areas. However, during gestation season, often thought as the most stressful

season, body condition was increased in suburban areas. Though there was no support for time of movement differences between seasons, there was strong support for more movement during late nocturnal hours in rural sites. Both body condition and time of movement data may suggest that suburban sites provide improved habitat for coyotes in the southeast. Further research on food resources and movement through these areas may help to better understand coyote population's use of this area.

INTRODUCTION

Eastward Range Expansion

The coyote (*Canis latrans*), a long persecuted predator of the West, has moved eastward across the U.S. expanding its range regardless of the eradication efforts and land development by humans (Parker 1995). Prior to European settlement, the coyote's range consisted mostly of the central plain states of the U.S. (Gompper 2002b; Parker 1995). Since the early 1900s, coyotes have crossed the Mississippi and have colonized every state in the continental U.S. and portions of southern Canada (Parker 1995). With the removal of wolves (*C. lupus* and *C. rufus*), coyotes extended their range eastward to fill this niche as the dominate canid predator (Gompper 2002b; Parker 1995).

The size of coyote home ranges is highly variable, generally associated with early successional habitat (Gese and others 1988; Grinder and Krausman 2001b; Holzman and others 1992; Howard and Del Frate 1991; Parker 1995; Person and Hirth 1991) which has increased with human development. Also, coyotes are opportunistic hunters and have a varied diet including fruits, insects, lagomorphs, rodents, bird eggs, reptiles, and deer

(Dumondet al. 2001; Fedriani and others 2001; Gipson and Sealander 1976; Hernandez and Delibes 1994; Hoerath 1990; Pattersonet al. 2000; Quinn 1997a). As such adaptable hunters, coyotes have been shown to keep mesomammal predator populations stable through inter-specific competition or predation (Henke and Bryant 1999).

Social Classes and Seasonal Differences

Coyotes are territorial animals with a well developed social organization (Sacks and others 1999b; Windberg and Knowlton 1988). Coyotes can be classified into social groups: pack members (alphas or betas), pups, and transients (Bowen 1978; Geseet al. 1996). Alphas are the dominant breeding adults in a territory (Gese and others 1996), and are the main participators in howling, scent-marking and territory defense, especially during breeding season (Gese 2001; Gese and Ruff 1998). Resource demands are highest during spring and early summer due to reproduction (Sacks and others 1999a). Betas are often young from the previous breeding that have not yet dispersed (Parker 1995). Transients are adults that show no site attachment or territory defense (Bowen 1978). Pups and transients are most susceptible to mortality during the fall and winter dispersal season when they venture into new unfamiliar territories (Gese 2001; Grinder and Krausman 2001a; Harrison 1992; Holzman and others 1992; Sacks and others 1999a).

Coyotes in Southeastern Rural Habitats

Three telemetry studies have been done to investigate habitat use and movement patterns of coyotes in the Southeast (Chamberlain and others 2000; Holzman and others 1992; Sumner and others 1984). Holzman et al. (1992) reported higher coyote use of brushy areas and young pine plantations and less use of pastures, agricultural areas, and

mature pine plantations in Georgia. Diurnal movements of coyotes favored habitats with sufficient cover and nocturnal activities were focused in early successional habitats for foraging (Holzman et al. 1992). Coyotes did not appear to need large tracts of forest to be successful (Holzman et al. 1992). This may suggest that suburban development will not limit the use of these areas. Chamberlain et al. (2000) suggested seasonal differences in selection of habitat when looking at various habitat scales. Radio-collared adults in southeastern studies have shown higher movement than juveniles (Holzman et al. 1992; Sumner et al. 1984). Holzman et al. (1992) reported lower movement during the gestation period (late spring) as compared to the rest of the year. Summer et al. (1984), in contrast, reported lower activity levels during fall months as compared to other seasons. These studies suggest that site use by coyotes may change depending on seasons. Coyotes were more active from 1800 to 0500 hours than during daytime hours (Holzman et al. 1992; Sumner et al. 1984). Results from winter months showed higher rates of nocturnal movements than during the rest of the year and may be due to social behaviors (Sumner et al. 1984). This increase in night activity also coincides with hunting seasons and may be an example of coyotes avoiding human persecution (Dumond et al. 2001).

Studies in the South have also investigated the body condition and nutrition of coyotes in these habitats. In south Texas body condition was seen to vary depending on seasons, especially is coyotes greater than 1.5 years of age (Windberget al. 1991). Greatest measurements of intraperitoneal fat (IPF) deposits and body mass were seen in the fall with levels decreasing to the spring (Windberg and others 1991). This higher

condition in fall may be due to increased levels of fruit availability (Hoerath 1990; Windberg and others 1991; Wooding and others 1984). Windberg et al. (1991) suggests that the decrease in condition to spring is a result of the increased stress from breeding activities. Results from Dumond and Villard (2000) also suggest this as they found only a significant decrease in body condition across winter months among breeding females.

Coyotes in Suburban Habitats

Coyotes have been documented using various urban areas throughout the country. A coyote was even captured in New York City's Central Park (Martin 1999). In Los Angeles, coyotes were noted foraging throughout residential areas during nocturnal hours (Way 2000). Use of parks and residential areas have also been documented during daylight hours (Grinder and Krausman 2001b). It is agreed among studies done on activity times that coyotes have a higher nocturnal activity than diurnal activity in all areas (Andelt 1985; Holzman and others 1992; Sequin and others 2003; Shargo 1988). McClennen et al.(2001) found, however, in northwest Wyoming that coyotes living in suburban or agriculturally developed areas showed greater activity during nocturnal periods than those in undeveloped areas. In Tucson, coyote activity hours were mostly concentrated near midnight instead of near sunset and sunrise as seen in more rural areas (Andelt 1985; Grinder and Krausman 2001b). These studies suggest that this shift in activity times is an adaptation in order to avoid human contact (McClennenet al. 2001). In southeastern Colorado, coyotes were shown to adjust their activity patterns to avoid human persecution from ranchers (Kitchenet al. 2000). Andelt (1985) also suggested that increased human persecution or development caused coyotes to reduce diurnal activity.

A study done on the coast of California suggests that density of coyotes can be increased when new food sources are introduced (Rose and Polis 1998). Fedriani et al. (2001) reported that in their most urban study area up to 25% of coyote diet was composed of anthropogenic foods. Quinn (1997a) reported fruits, house cats, and squirrels as most abundant food items found in coyote diet in urban areas of western Washington. Mixed agricultural habitats had the greatest number of mammals and residential areas were second (Quinn 1997a). Suburban areas may be supplying increased food supplies relative to more rural areas and affecting the distribution and condition of coyotes across the urban-rural gradient.

Monitoring Coyotes in Suburban Habitats

Like most predators, coyotes are elusive animals, which make it more difficult for biologists to study their movements and behaviors. Most studies have monitored suburban/urban coyote populations through foot-hold trapped individuals and/or radio telemetry of captured animals (Fedriani and others 2001; Grinder and Krausman 2001a; McClennen and others 2001; Person and Hirth 1991; Quinn 1997b). Trapping, however, in urban areas has some added complexity. There is an increased chance of capturing non-target species from neighboring homes, as well as, a negative public perception of trapping wildlife (Andelt and others 1999; Armstrong and Rossi 2000). In Massachusetts, box traps were attempted for coyote capture because of higher public acceptability, however, these proved to be very ineffective due to the wariness of coyotes (Wayet al. 2002). The use of sirens and howling surveys has been done in rural areas to assess relative abundance of coyotes (Crawford and others 1993). In an urban/suburban

area increased sound interference would most likely affect results of the surveys and makes them incomparable to rural sites. Quinn (1995) also attempted public sighting data to record habitat use of coyotes in Washington but concluded that reports were inconsistent with telemetry data.

Scent/track stations have been a popular way to look at predator presence in an area, but for coyotes this may not be the most effective tool. In captivity coyotes have been shown to be reluctant to step within one meter of novel stimuli (Harris and Knowlton 2001). Coyote behaviors such as urination, scratching and rolling may erase any track data (Bullardet al. 1983; Sumner and Hill 1980; Woelfl and Woelfl 1997). Scent/track stations also do not allow the differentiation between individuals or the number of individuals that visit a station at a time (Sargeantet al. 2003).

During the past few years, the use of infrared game cameras has become more common in attempting to view animal behavior (Koerth and Kroll 2000; Martorelloet al. 2001; Peterson and Thomas 1998; Wolfet al. 2003). The use of cameras to sight predators is less intrusive and less expensive than trapping (Martorello and others 2001). Peterson and Thomas (1998) tested TrailMaster cameras on a captive coyote population and found them effective for monitoring coyote movements, especially on active trails or at den sites. The use of cameras at scent stations could eliminate or reduce some of the common problems of traditional scent/track stations. Cameras provide information on condition of the animal, the possibility of distinguishing between individuals and age classes, and the time of visitation. Camera data resistant to precipitation and is not affected by animal behaviors, such as rolling or scratching. This technique also allows

differentiation between domestic dogs and coyotes. Sequin et al. (2003) used cameras to monitor a coyote population that was also being monitored using radio telemetry. They had difficulty in acquiring pictures of resident individuals and had only a 1.6% photo-capture success rate even when coyotes were known to be in the area (Sequin and others 2003). It was observed, however, that wariness of coyotes to the stations appeared to decline in areas where human activity was common (Sequin and others 2003).

Occupancy and Detection

Like many monitoring projects done on carnivores, camera data results in simple presence or absence information on coyotes at specific study sites. Traditionally, this data would be used to determine a basic occupancy rate for these sites, defined as the percentage of sites occupied at a specific time (Sumner and Hill 1980). By looking at potential patterns in occupied sites, I aimed to understand which areas coyotes where using and how regularly sites were used. Many papers have discussed how these raw proportions of occupancy have an inherent bias in them. These rates are calculated with the assumption that if an individual is at a site it will be detected. The probability of seeing animals that are at a site is almost always less than 1 (MacKenzieet al. 2002; Royle and Nichols 2003). To get an accurate estimate of occupancy, we need to account for an imperfect detection rate. This detection rate is the probability of detecting a species at a specific time given that it is present. Most occupancy studies have been done in either avian or herpetological research (Luiselli 2006; MacKenzie and Bailey 2004; Tucker Jr. and Robinson 2003), and few occupancy studies on mammals; specifically carnivores, have been published (O'Connellet al. 2006).

Robust Design Occupancy

In studies that continue through multiple seasons or years, it is interesting to compare how occupancy and detection may vary across time. This is estimated by combining the single season occupancy model with Pollock's robust design model (MacKenzieet al. 2003; Pollocket al. 1990). Pollock's robust design consists of primary (closed) sampling periods and secondary (open) seasons. During the primary seasons the population is assumed to be closed to changes in site occupancy. The secondary periods lie between the primary periods and are considered open to changes in occupancy. Monitoring occurs during the primary sampling period. The robust design occupancy model assumes that detection at a site is independent of other sites and that there is no heterogeneity in the data that is not accounted for in the models. It also assumes that there are no false detections of the species.

Objectives

Since coyote behavior and populations tend to vary greatly with location and available resources biological information from other areas can not be assumed to be applicable to coyote populations in the Southeast. Only a handful of studies have investigated habitat use, movements and body condition of coyotes in the Southeast and none have investigated coyotes in suburban communities. The goals of my study were to evaluate 1) coyote occupancy and detection in relation to human development and seasonal changes; 2) temporal movement patterns of coyotes in relation to human land use; and 3) possible nutritional differences in coyote populations relative to human land use and season.

Through presence/absence data obtained from digital motion-sensor cameras located in rural and suburban areas, I estimated occupancy and detection rates. I hypothesized that occupancy would be affected by human land use but there would be no seasonal differences in occupancy. I predicted that suburban areas would have higher occupancy rates than rural areas. I also hypothesized that detection would be more strongly affected by biological seasons rather than human land use. I predicted that pup rearing season would have the lowest detection rates while breeding season would have the highest.

In addition to presence/absence data, the cameras provided data on time of visit and a visual of individuals. I used this data to address two hypotheses: first, was that the time of visit would vary between levels of human use. I predicted that in suburban areas coyotes would show increased visitation at cameras between the hours of 2300 and 0500. The second hypothesis was that body condition of coyotes would vary across levels of human use, but not across seasons. I predicted that coyotes in suburban areas would be in better body condition than those in rural areas.

STUDY AREA

The study occurred in western Georgia in Muscogee, Harris, and Meriwether counties. All eight of the sites were on public land. Study sites were greater than 3.2 km apart and thus were considered to be independent sample units (Roughton and Sweeny 1982). An even number of sites were placed in suburban and rural areas so as to compare areas of varying human development.

The four rural sites were located in Harris and Meriwether counties. Blanton Creek WMA (32˚ 46.602'N, 85˚ 54.937'W), located in Harris County and owned by Georgia Power, is located in the Greenville slope district of the southern Piedmont. Elevation ranges from approximately 160 m to 220 m. The site is 1,945 hectares and lies along the Chattahoochee River. Most of site (45%) is pine-hardwood mix. Other habitats on site include bottomland hardwoods, upland hardwoods, old fields, planted pines, and permanent wetlands. Game species hunted on the WMA include deer, turkey, squirrel, rabbit, quail, dove, ducks, raccoon, and woodcock. Monitoring occurred on a section of the property located across route 103 in the northeast corner of the property. This area contained a stream, ridge and a large planted field (Georgia DNR 2004).

Joe Kurz WMA (33˚ 06.982'N, 84˚ 32.426'W), a 1,466 hectare property, is located on the eastern side of Meriwether County about 1.2 km northeast of Gay, Georgia along the Flint River. The rolling hills of the property include 65% upland pine/hardwood with other habitat types including old fields, openings, and bottomland hardwood. Deer, turkey, squirrel, rabbit, quail, dove and ducks are all hunted on the property (Georgia DNR 2004). The monitored section on this property was located along an old road bed and trails that lay between a slope to White Oak Creek and an open field used as a campground.

The first Mead property was located approximately 7 km northeast of Blanton Creek WMA (33˚ 51.051'N, 85˚ 5.839'W) The property lay between Sand Creek and Flat Shoals Creek and consisted of planted pines, three food plots, and bottomland hardwoods. The second Mead property was located in southeastern Harris County (32˚

41.787'N, 84˚ 45.73'W), just west of Waverly Hall. The site included a 6-year old pine stand, a 20-year old pine stand, and a clearcut.

All four of the urban/suburban sites were in Muscogee County. The county has an elevation of 91.44 meters above sea level (www.city-data.com) and an average precipitation of 123.37 cm (www.noaa.gov). The first urban/suburban site was located on Standing Boy Creek Tract (32˚ 33.869'N, 85˚ 2.213'W), a 639 hectare property managed by Georgia DNR (Georgia DNR). The study sites on this property were along the southern boundary which formed the northern boundary of a suburban neighborhood and in small wooded areas within the neighborhood.

The next urban site, located on the Columbus Metropolitan Airport (32˚ 31'N, 84˚ 57'W), was fenced and bordered by interstate I-185, a shopping center, four-lane road, a residential area and a car dealership lot.

The remaining two urban/suburban sites were in Columbus city parks. Cooper Creek Park (32˚ 30.754'N, 85˚ 5.029'W), located on the northeastern side of Columbus, was 76 hectares in size and included a picnic shelter and tables, trails, tennis courts, a softball field and a lake. The other park site was located on Flat Rock Park (32˚ 32.933'N, 84˚ 52.928'W) and had shelters with tables and grills and covered 78 hectares (www.columbusga.org/parksandrec). Both parks bordered residential areas.

METHODS

Camera Study Design

I set cameras in both the rural (n = 4) and urban/suburban (n = 4) sites throughout the study area. At least nine cameras were placed at each site for seven nights within each biological season in order to accommodate different capture probabilities throughout the year of different classes of individuals. I divided the year into four seasons based on coyote biology: dispersal (September though 14 December), breeding (15 December through February), gestation (March through April), and pup rearing (May through August; Grinder and Krausman 2001). I spaced camera stations an average distance of 0.2 kilometers ($\pm$ 0.1 kilometers) apart and marked with a Garmin E-trex Vista GPS unit. Each station was placed near a game trail or a roadside to maximize chance of visitation (Harris and Knowlton 2001; Peterson and Thomas 1998; Sequin and others 2003). I wore cotton gloves during camera set up to reduce human scent on the camera station (Sequin and others 2003). Sensitivity of motion detection on cameras were all standardized (Peterson and Thomas 1998). I alternated time between photos on the cameras to detect if one time setting was more efficient for capturing coyotes. Odd numbered cameras had a one-minute time lapse. Even numbered cameras had a three-minute time lapse. I set only one site at a time due to the limited number of cameras. Sites were alternated between rural and suburban to avoid temporal bias.

I used bait and lures in conjunction with digital motion sensor cameras. A variety of baits and lures were tested through trial scent stations to determine highest canid response in the study area. I placed a long range canid lure, Carmen's Canine Call

(Windberg and Knowlton 1990a), with a food lure, Caven's Hiawatha Valley, at each camera station as an attractant. Halfway through study, I added red fox urine to stations to provide new scent for coyotes that may have become habituated to other scents. All lures had similar response in the tests so I felt that changing the baits throughout the study would not affect comparisons between samples. If feces of bobcat or coyote was located during field days, I used it with gland lure as an attractant (Howardet al. 2002). I set baits with a dirt hole set and used a post set for lures. I used both sets at each camera site throughout the study to maximize number of visits to the stations and to standardize the attractant through all seasons. In addition to increasing the number of visits, baits caused the animal to hesitate so that an accurate picture could be taken by the digital camera. If a coyote was captured in consecutive pictures only a few minutes apart it was assumed that it was the same visit and only the first photo-capture was used for analysis.

Occupancy & Detection Models

Data from cameras was recorded as presence or absence of coyotes at each camera site for each trap night. Seven continuous trap nights were recorded for each site during each of the six seasons. I included variables for development level, suburban vs. rural, and season of collection in data set and then entered data into Program MARK (White and Burnham 1999). Parameters of occupancy, colonization, local extinction, and detection were estimated using Robust Design Occupancy model with logit-link function (MacKenzie and others 2003; MacKenzieet al. 2006). Occupancy rate is the proportion of sites occupied. Colonization rate estimates a change in occupancy during an open season and represents the number of sites occupied that were not occupied during the

previous season. Local extinction rate also reflects a change in occupancy during open seasons by estimating the number of previously occupied sites that are no longer occupied in the next season. The final parameter estimated for each closed season was the detection rate; the probability of a species being detected at a site given it occurs at that site (MacKenzie and others 2003; MacKenzie and others 2006).

I selected models comparing parameters across sites and seasons by ranking them using Akaike Information Critieron with small sample size adjustment (AICc) (Akaike 1973; Burnham and Anderson 2002). To assess over-dispersion in model fit, I used the most parameterized model for Bootstrap Goodness of Fit test. I ran one hundred simulations to obtain mean c-hat (Burnham and Anderson 2002; Cooch and White 2005). I ran *a priori* occupancy models to test hypotheses on effects of seasons and human development on occupancy and detection.

Time of Capture

I recorded time of capture for each photo-capture on each photo. I gave each capture a time code of one or zero. A one was assigned to the capture if it occurred between 2300 and 0500. If the capture occurred during any other time period it I assigned a time code of zero. I used SAS 9.1 to run logistic regression models (PROC LOGISTIC) including site and season variables and used Excel XP construct models tables. I then ranked competing models using AICc values (Akaike 1973; Burnham and Anderson 2002).

Body Condition

I assessed body condition of each photo-capture of a coyotes visually. If coyote was captured on more than one photograph, the photograph with the clearest angle was used for condition estimate. Coyotes were ranked on a three point scale with one equaling a poor condition individual, a two equaling an average individual, and a three equaling a coyote in very good condition. Characteristics like visible ribs, poor pelage, etc. were used to rank coyote condition. Like time of capture data, I ran logistic regression models (PROC LOGISTIC) in SAS 9.1 and constructed AICc tables constructed in Excel XP. I constructed four models that included both season and site of capture as variables.

RESULTS

Camera Data

From October 2004 through February 2006 5,715 photos where taken over 2,949 trap-nights. Non-target species were captured in 3,258 photos. Species included red fox, gray fox, deer, opossum, raccoon, cat, dog, squirrel, chipmunk, human, bobcats, other rodents, and various bird species. Coyotes were captured in 143 photos and the trap-night success was 3.5% across the study.

A priori Models

I selected nine *a priori* occupancy models to address the original hypotheses of this project (Table 1). The models examined development (suburban vs. rural) and seasonal changes in occupancy and detection rates. I calculated c-hat and adjusted all

models to 1.0854 which incorporated over-dispersion with in AICc (QAICc; Burnham and Anderson 2002; Cooch and White 2005). Of these models, two had the greatest support with ΔQAICc values of less than 2.0. The top models included one that allowed detection to vary seasonally and the null model. There was some support for models allowing occupancy and detection to vary by development levels (ΔQAICc = 3.2 and 3.4 respectively). I averaged the top five models to estimate parameters for occupancy and detection (Table 2)(Burnham and Anderson 2002). The overall weighted occupancy for my west Georgia sites was 0.315. There was little support for the small difference in the average use of sites in suburban and rural areas (Figure 1). There was no support for colonization and extinction rates varying among development levels.

Modeling Occupancy Changes across Seasons

Because of my low sample size, models that varied for colonization and extinction by season were penalized significantly by parameter number. To investigate these differences in seasonal occupancy changes, I held either colonization or extinction rates constant to test if one type of movement contributed more to the changes in occupancy changes between seasons. I compared these to the top models from my *a priori* model set (Table 3). Parameter estimates for colonization and detection rates were obtained through weighted average estimates from this final set (Burnham and Anderson 2002). Top models were used from an *a priori* model set as comparison. Also, the model showing variation in both colonization and extinction rates across seasons is in the model set for comparison. I constructed an additional three models holding various parameters constant to allow more accurate modeling of other parameters. Of this model

set, the top models contained seasonal variation in only extinction probability and seasonal variation in only detection probability. I attempted to include both of these in one model, however with such small sample sizes, all parameters were not estimated. In order to combine detection and extinction changes in one model, I held most of the seasons of detection constant except for pup rearing; whose estimate had the greatest difference from other seasons. This model did have support with a ΔQAICc of 2.26. The model allowing colonization to change by season had minimal support with a ΔQAICc of 6.68. Estimates of extinction and colonization were averaged between these six models to get weighted parameter estimates and 95% confidence limits (Figure 2) (Burnham and Anderson 2002).

Time of Capture

I compared four models for effects on time of capture (Table 4). The null model had the most support; however the model showing site differences was also a top model (ΔAICc < 2). The odds ratio estimate indicated that the likelihood of capture between 2300 and 0500 was 1.43 times more likely in rural areas. There was less support for season or site and season interaction effecting time of capture.

Body Condition

Overall coyote body condition appeared healthy throughout the year. I saw no evidence of disease in any of the coyote individuals that where photo-captured. I compared four models for site and seasonal effects on coyote body condition (Table 5). The best model indicated that body condition varied by site and season and season. The null model was also included in the top models with a ΔAICc of 1.72. There was less

support for site with a ΔAICc of 3.82 and little support for seasonal effects with a ΔAICc of 5.471.

DISCUSSION

Cameras as Tool for Monitoring Coyotes

Digital cameras proved to be a useful tool for monitoring coyotes in my study area. Trap night success was 3.5% overall for my study. This rate was higher than photo-capture success of 1.6% found by Sequin et al. (2003). I saw no evidence of coyotes avoiding cameras stations even after they had previously visited. Unlike the previous study, coyotes were often captured in multiple photos during the same visit or recaptured on a different night during the same photo-trapping session (Sequin and others 2003). Two differences in study methods may have caused a difference in trap success rate between the two studies. The first difference was that no bait was set at their camera stations to draw coyotes to the location and often coyotes were recorded traveling within close proximity of the station without being captured (Sequin and others 2003). The second difference between our two studies is that foot-hold trapping was done intermittently throughout the other study (Sequin and others 2003). Coyotes have been reported to have an increased wariness of humans and traps in areas where there has been previous trapping due to learned social behavior (Harris and Knowlton 2001; Sacks and others 1999a).

Occupancy Rates

My study results revealed that approximately 30% of the sites I sampled were used by coyotes. I found that coyotes in my study area used urban areas at nearly the

same rate as rural areas. Although traditionally coyotes are often thought of as a rural species, they have adapted very well to human development in many areas throughout North America (Andelt and Mahan 1980; Gompper 2002a; Grinder and Krausman 2001b; Hill and others 1987; Quinn 1997b; Wayet al. 2001a). Quinn (1997a) showed that coyotes readily used food sources such as house cats and squirrels in urban areas. Quinn (1997b) found from telemetry data in western Washington that, although coyotes were found throughout urban areas of various development levels, his data suggested that coyotes preferred more undisturbed urban areas. My study sites included both areas where little construction or disturbance was occurring and areas directly near construction and activity. Sample sizes were too small to effectively evaluate these areas differently; however, coyote presence was often detected in areas where activity was occurring. Even in the study sites near human activity, there were corridors or cover. Andelt and Mahan (1980) found that urban males coyote readily used areas near houses and streets. Home ranges of coyotes in Tuscon, Arizona contained large portions of park and residential areas (Grinder and Krausman 2001b). My data suggest that coyotes in western Georgia are using residential areas and parks similarly to coyotes from these studies.

Detection Rates

The weighted average estimate of detection rate for my study was 0.106. I found little support for detection varying by the degree of human development; however detection rate was affected by biological season. Pup rearing season detection rate was substantially lower than the other three seasons. Trapping of swift fox in Colorado also

showed this drop in detection from March through September, with the lowest detection rates during June and July (Finley et al. 2005). The most probable reason for lower detection during this season may be seasonal differences in the attractiveness of my baits. During the summer months accessibility of food such as fruit and insects is increased (Hoerath 1990). This increase in food may result in less movement and a lower attractiveness of the bait used at the camera stations relative to other months. Both male and female coyotes in Mississippi had their smallest documented home range or core area during the summer (Chamberlain et al. 2000). Coyotes in northern Utah also displayed smaller territories and home ranges during periods of high prey abundance (Mills and Knowlton 1991) Also the gland lure used may not have been as attractive because it was outside breeding season and defense of territories tends to be reduced (Gese and Ruff 1997). In agreement with these findings, previous trapping and monitoring efforts in the Southeast have concentrated efforts during fall, winter, or spring (Chamberlain et al. 2000; Holzman et al. 1992; Sumner and Hill 1980).

O'Connell et al. (2006) reported coyote occupancy rates of 0.94 and detection rates of 0.21. These rates are substantially higher than the rates I found. The difference in number of sampling occasions was most likely the reason for difference in detection rates. Sampling occasions for my study were individual nights; totaling seven per session. O'Connell et al. (2006) used weeks as sampling occasions which should increase detection probability significantly. O'Connell et al. (2006) also recommends at least twelve weeks for 95% accuracy in estimates of site occupancy. During these twelve weeks they assumed no changes in occupancy. Because of limited time and cameras,

sites were only sampled for a maximum of six weeks. Between these six primary sampling periods, I assumed changes in occupancy at sites. Other papers also suggest that increasing the number of sampling occasions would increase the accuracy of estimates for coyotes and other species with a low detection rate (Finley and others 2005; MacKenzie and Royle 2005; Moruzziet al. 2002).

Modeling Occupancy Changes across Seasons

Though I found little support that human development levels affect coyote occupancy rates, I found support for seasonal effects on site occupancy of coyotes. Colonization rates appear stable among seasons as a weighted average of 0.33 (Fig. 1). With the four confidence intervals almost completely overlapping, it is understandable that our seasonal colonization model had minimal support. My top model in this second set of models supports seasonal changes of extinction rates across seasons (Table 3). In this study local extinction rates illustrate the rate at which coyotes are leaving areas that they had occupied during the previous season. Coyotes moved into new sites for three out of four season changes at approximately 0.60 or higher. This increase in site use between these seasons is not surprising. A previous study in by Chamberlain et al. (2000) reported males varying their habitat preference across seasons. In contrast, Grinder and Krausman (2001b) found no seasonal differences in home ranges of coyotes in Tucson. The seasonal shift from breeding season to gestation season is the one seasonal change where extinction rates are low (0.215). The overall occupancy of sites during this season is less than the other four seasons. Like other seasonal behaviors, this has been seen in other areas. Andelt et al. (1979) reported that breeding pairs increased their activity

around den sites from breeding season through to pup rearing season. Their study also showed coyotes' habit of moving den sites at least once with moves averaging 1.1 km (Andelt and others 1979; Wayet al. 2001b). This movement later into the breeding season may account for why I found extinction rates to be higher between gestation to pup rearing season as compared to breeding season to gestation.

Time of Capture

The null model for time of capture was the top model however there is little difference in the evidence to support the model predicting differences by site. This model predicted that coyotes in rural areas were observed between the hours of 2300 to 0500 more often than coyotes in urban areas. This is contrary to my hypothesis. Most studies agree that the majority of coyote activity occurs at night (Grinder and Krausman 2001b; McClennen and others 2001; Quinn 1997b; Shargo 1988). McClennen et al. (2001) found increased diurnal coyote activity in undeveloped areas as compared to suburban/agricultural sites. My study had no completely undeveloped areas to compare with suburban and agricultural sites. Grinder and Krausman (2001b) looked at activity times in parks and residential areas and found similar results with movement times from 2100 to 0300 being less in these areas than more natural areas. They suggest that coyotes in Tucson had no need for temporal avoidance of human areas because they could find enough cover in these areas (Grinder and Krausman 2001b). Quinn (1997b) reported that increased night movements occurred as habitat quality decreased. This suggests that rural sites in my study area may be lower quality habitat for coyotes and results in increased evening foraging time.

Body Condition

My hypothesis on site effects on body condition was supported by my data. There was little support for seasonal effects alone. Site effects were only seen during gestation season. This may be because of the increased stress that is placed on breeding coyotes by pups. Though sex was not a variable that I was able to measure in this study, it was obvious during breeding season that many of the poor condition coyotes in rural areas were lactating females. This data suggests that during periods where nutritional needs are high, needs may be more easily met in suburban areas versus rural areas. Grinder and Krausman (2001b) suggest that urban parks and residential areas may provide enough food for coyotes to meet their nutritional needs without having to travel long distances. Shargo (1988) noted some collared individuals specifically moving into residential areas to forage at night.

MANAGEMENT IMPLICATIONS

Monitoring Eastern Coyotes

In western Georgia, densely vegetated landscape makes visual monitoring of coyotes impossible. Digital game cameras have proven to be useful in acquiring data on coyote movement and behavior in both urban and rural sites. Cameras not only provide valuable data, but are less labor intensive than other methods like scent stations and trapping. In order to increase detection probabilities and accuracy of occupancy estimates, camera stations should be run for longer periods rather than adding additional sites. Even though my camera stations proved to be a successful monitoring tool,

detection probability of coyotes was still less than 1. Detection rates should be estimated in any monitoring program collecting presence/absence data to reduce underestimation of coyote presence. Though I found it challenging with small sample sizes, occupancy and detection probabilities for coyotes can be estimated and used to better understand the coyote population in the Southeast. Occupancy data would be most useful if done in conjunction with other monitoring techniques to increase data in models. Setting cameras in areas where animals are tagged/marked and can be identified or in conjunction with telemetry research can increase data on animals movements and which individuals are using which areas.

Coyotes in western Georgia

In my study area, coyotes occupied both suburban and rural sites at similar rates. If coyotes are not discriminating between these two areas for use, managers and biologists should not discriminate in our management and monitoring plans. Suburban landscapes should be considered in developing monitoring and/or control methods for coyotes in the Southeast.

Biological seasons had the strongest effect on occupancy and detection probabilities of coyotes in this area. Extinction rates from my models suggest that coyotes in western Georgia are using different areas depending on seasons. The only exception to this is during breeding and gestation seasons coyotes appear to be staying near active den sites. Detection rates of coyotes in these areas are equal through most seasons except during the summer months. In order to maximize trapping or monitoring effort, projects should be done when both movement and detection rates are at their

highest and coyotes are most vulnerable. According to my results, fall and late spring would be the most effective times to do monitoring and/or trapping of coyotes.

Data on body condition and time of capture suggests that suburban areas may provide more readily available food sources for coyotes, especially during seasons of high stress. Suburban areas appear to have enough cover to allow use throughout the year and all times of the day. This possibly higher habitat quality in suburban areas suggests that coyote populations in suburban areas will persist and may possibly increase. Local wildlife managers should consider how problem individuals will be handled as this species is most likely a permanent part of our communities.

TABLES AND FIGURES:

Table 1: Model table from Program MARK for occupancy and detection probabilities of coyotes in western Georgia October 2004 - February 2006. C-hat was adjusted to 1.0854 to account for over-dispersion. Models investigate relationship of occupancy with season changes and different levels of human development.

Model	QAICc	Delta QAICc	QAICc Weights	# Par	QDeviance
Ψ(.) ε(.) γ(.) p(s)	774.5686	0	0.43917	7	758.1337571
Ψ(.) ε(.) γ(.) p(.)	775.6206	1.052	0.25953	4	766.8042933
Ψ(d) ε(.) γ(.) p(s)	777.1082	2.5396	0.12336	8	757.9081721
Ψ(d) ε(.) γ(.) p(.)	777.8342	3.2656	0.08581	5	766.5841072
Ψ(.) ε(.) γ(.) p(d)	778.0542	3.4856	0.07687	5	766.8042473
Ψ(.) ε(s) γ(s) p(.)	781.7512	7.1826	0.0121	10	756.6348443
Ψ(.) ε(.) γ(.) p(.)	785.5048	10.9362	0.00185	8	766.3047909
Ψ(.) ε(.) γ(.) p(d*s)	786.1998	11.6312	0.00131	11	757.9140593
Ψ(.) ε(d) γ(d) p(.)	946.0547	171.4861	0	6	932.267459

Ψ= occupancy, ε = colonization, γ = extinction, p = detection , s = seasonal change, d = change in level of human development

Table 2: Weighted parameter estimates of Occupancy (Ψ) and Detection (p) differences among different levels of human development and different seasons and 95% confidence limits from *a priori* models for western Georgia October 2004 – February 2006.

Parameter	Estimate	Lower Confidence Limit	Upper Confidence Limit
Ψ - Urban Areas	0.3054	0.1420	0.5384
Ψ - Rural Areas	0.3253	0.1596	0.5767
p- Dispersal Season	0.1149	0.0734	0.1763
p - Breeding Season	0.1061	0.0679	0.1632
p - Gestation Season	0.1304	0.0865	0.1918
p - Pup Rearing Season	0.0738	0.0456	0.1222
p – Urban Areas	0.1063	0.0684	0.1634
p - Rural Areas	0.1063	0.0683	0.1634

Table 3: Model set investigating changes in occupancy through variation in extinction and colonization rates by season for western Georgia October 2004 – February 2006. C-hat adjusted to 1.0854 to account for overdispersion.

Model	QAICc	Delta QAICc	QAICc Weights	# Par	QDeviance
Ψ(.) ε(.) γ(s) p(.)	773.1309	0	0.48191	7	756.6961489
Ψ(.) ε(.) γ(.) p(s)	774.5686	1.4377	0.23484	7	758.1337571
Ψ(.) ε(.) γ(.) p(.)	775.6206	2.4897	0.13878	4	766.8042933
Ψ(.) ε(.) γ(s) p(pr)	775.8957	2.7648	0.12095	8	756.6957711
Ψ(.) ε(s) γ(.) p(.)	779.8147	6.6838	0.01705	7	763.3798968
Ψ(.) ε(s) γ(s) p(.)	781.7512	8.6203	0.00647	10	756.6348443

Ψ= occupancy, ε = colonization, γ = extinction, p = detection , s = seasonal change, d = change in level of human development, pr = pup rearing season estimated different than other seasons

Table 4: Seasonal and site effects on whether coyotes time of photo-capture varied throughout the diurnal period in western Georgia October 2004 – February 2006.

Model	-2 log (Likelihood)	AIC	AICc	Delta QAICc	Likelihood Delta QAICc	QAICc Weights	# Par
Null Model	151.265	153.265	153.302	0.000	1.000	0.488	1
Site	150.405	154.405	154.516	1.214	0.545	0.266	2
Season	147.202	155.202	155.579	2.278	0.320	0.156	4
Site* season	148.301	156.301	156.678	3.377	0.185	0.090	4

Table 5: Seasonal and site effects on ranked body condition of photo-captured coyotes in western Georgia October 2004 – February 2006.

Model	-2 log (Likelihood)	AIC	AICc	Delta QAICc	Likelihood Delta QAICc	QAICc Weights	# Par
Site* season	129.419	139.419	139.996	0.000	1.000	0.612	5
Null Model	137.610	141.610	141.722	1.726	0.422	0.258	2
Site	137.596	143.596	143.822	3.826	0.148	0.090	3
Season	134.890	144.890	145.467	5.471	0.065	0.040	5

Figure 1: Weighted estimates of occupancy rates between suburban and rural sites and 95% confidence intervals for western Georgia October 2004 – February 2006.

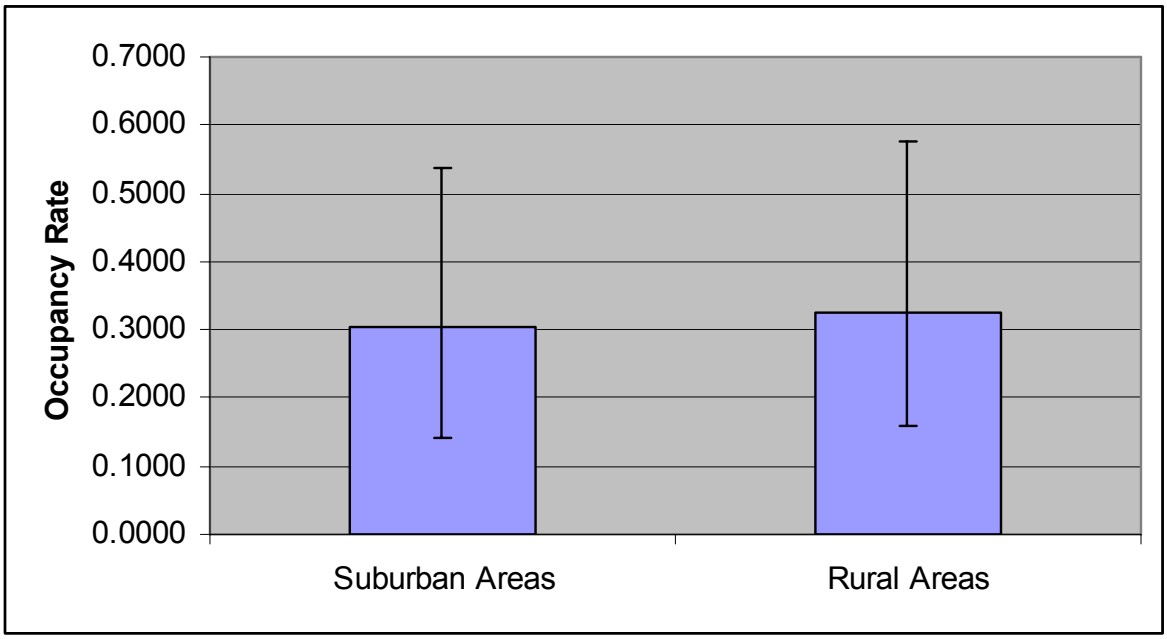
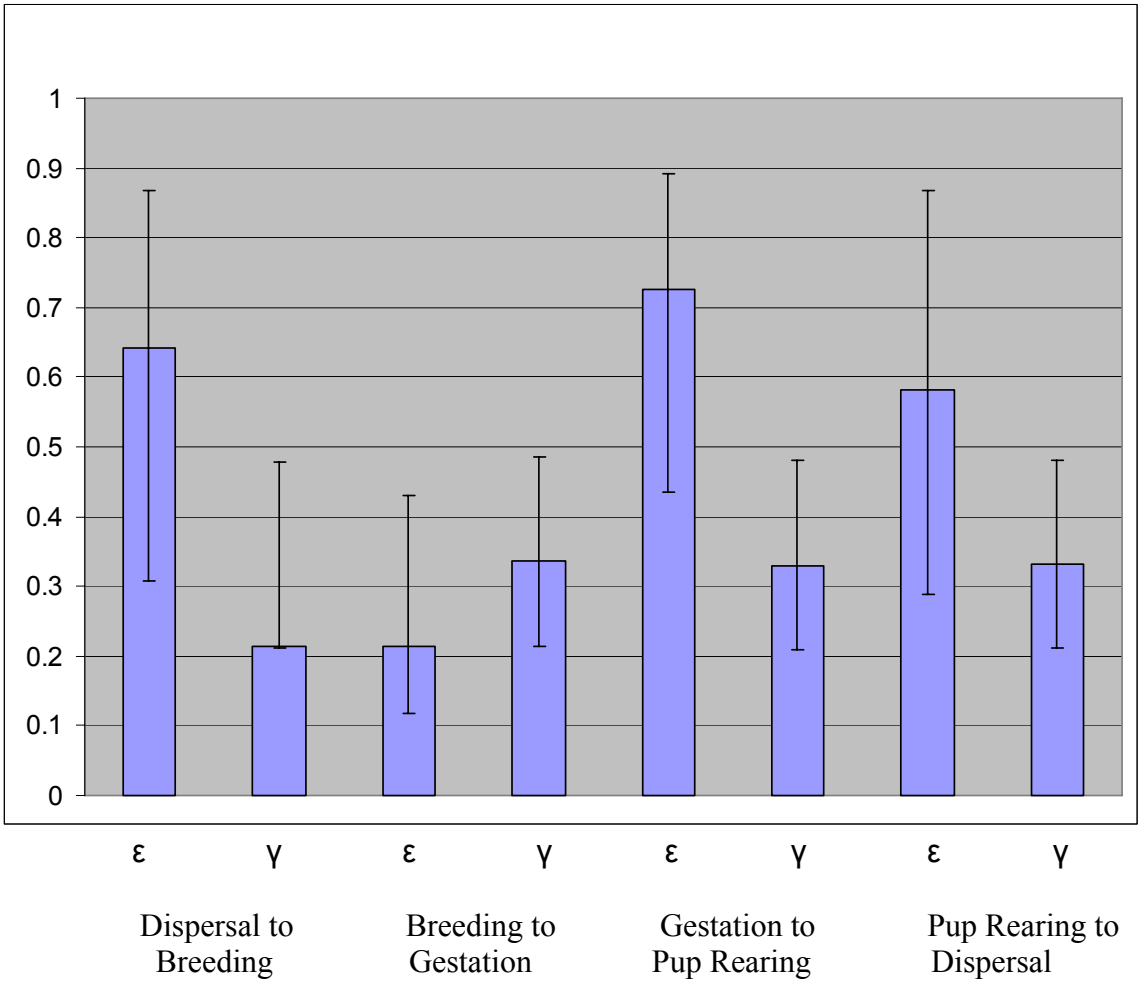


Figure 2: Weighted estimates of extinction (ε) and colonization (γ) rates by season with 95% confidence limits for western Georgia October 2004 – February 2006.



CONCLUSIONS AND FUTURE RESEARCH

Over the past hundred years, coyotes have expanded their range to encompass most of North America. With red wolves being removed from almost all of their range, coyotes have become the dominate predator in the southeastern U.S. Coyotes have been shown to adapt to new habitats, food sources, and social structures to be successful in a variety of areas. My study focused on understanding habitat use of southeastern coyote populations and how the public felt about this predator in their community. I used a mail survey to investigate the influence of recreation, wildlife preferences, wildlife interactions and demographic factors on the respondents' belief toward lethal control of deer and coyotes. I also used digital game cameras to investigate how coyotes in western Georgia were using a landscape with varying levels of human development throughout the year. My camera data provided important insights on coyote habitat uses, movements, and body condition.

Survey respondents from rural areas reported higher recreation participation and had significantly more interactions with both deer and coyotes than residents from suburban areas. Regardless of this, area of residence did not have a significant effect on beliefs towards wildlife management practices. Respondents' value of a wildlife species and general wildlife was the best predictor of management beliefs. Respondents who had a higher enjoyment or value in wildlife were associated with increase support of non-

lethal control methods. Also those who did not support hunting were less likely to support lethal control of wildlife species.

Both deer and coyotes were shown through our camera data to be living in both suburban and rural areas of western Georgia. The public in this area had interactions with both species but felt differently on how they should be managed. There was overall support from respondents for the use of lethal methods for deer and coyote management in western GA. Male respondents especially supported lethal method of control for both species. Female respondents were supportive of lethal methods for coyotes but not for deer. Coyotes also had a much lower preference score with our respondents than did deer. Female respondents most likely had emotional attachments to deer that they did not have for coyotes because of the potential threat they could pose to pets and children (Kellert 1985).

Data from my occupancy and detection models suggests that coyotes occupy suburban and rural areas similarly in western Georgia. There was no support that detection of coyotes differed between these two habitats. Because of these similarities, managers in this area should treat coyote populations in suburban and rural areas similarly in regards to monitoring and management programs. My data also revealed clues about movement patterns of these coyote populations. Biological seasons had the largest effect on occupancy and detection of coyotes in my study sites. Coyotes showed evidence of high movement between sites during most of the year. Only during breeding through gestation season did coyotes appear to keep activities focused around den sites. Detection rates also were similar across most seasons except for pup rearing season.

Information on these seasonal changes aides in setting guidelines for management and monitoring programs. My data suggests that management plans should focus activities in late fall and/or late spring when movement and detection rates are highest in order to get greater results for effort. Activity and body condition results suggest that suburban habitats are equal to or exceed the quality of rural habitats in western Georgia. This data suggests that coyotes are successful in these suburban habitats and that populations should at least remain present, if not increase, in these areas.

Digital game cameras proved to be a useful tool for monitoring coyotes in these habitats. To increase detection probabilities and improve accuracy of occupancy estimates stations should be for about three months. Telemetry monitoring in conjunction with camera stations would provide information about home ranges and more specific habitat use. More detailed information about suburban areas in the Southeast is still lacking.

Though western GA residents would support lethal management methods, respondents did not reveal that they felt coyotes were a major problem in their community. Coyotes were seen in each area during at least one season of the year, however, many suburban residents were unaware of their canid neighbors. Coyote occupancy in my study sites was approximately 30%. This appears to be below the cultural carrying capacity for these communities. My response rate was greater than 40%, suggesting that a large portion of the public have interest in wildlife issues in their community. If coyote populations begin to grow and cause increased problems, respondents identified television as their most preferred method of receiving wildlife

information. Managers should use the area media in these cases to educate and gain support for management programs for coyotes. I believe that in these communities more specific research should continue to better understand coyote use of suburban areas in the Southeast. Investigating food habits, specific movements of individuals, and identifying movements of packs or family groups may better prepare biologists and managers to address problems in the future. Also educating the public on these new predators in their communities may decrease the potential for human/ coyote conflict.

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APPENDIX 1: MAIL SURVEY

WILDLIFE EXPERIENCES
The first section of this survey contains questions about your experiences with wildlife in the wild and around your home.

1. In the past year, how many times have you participated in the following activities?
(Please circle the category that best describes your participation.)

N=NEVER
R =RARELY, ONCE OR TWICE A YEAR
O= OCCASIONALLY, 3 TO 5 TIMES A YEAR
F= FREQUENTLY, GREATER THAN 5 TIMES A YEAR

a. HUNTING	**a. N**	**R**	**O**	**F**
b. FISHING	**b. N**	**R**	**O**	**F**
c. TRAPPING	**c. N**	**R**	**O**	**F**
d. WATCHED OUTDOOR TV PROGRAMS	**d. N**	**R**	**O**	**F**
e. READ OUTDOOR MAGAZINES	**e. N**	**R**	**O**	**F**
f. BIRD WATCHING AROUND HOME	**f. N**	**R**	**O**	**F**
g. BIRD WATCHING AWAY FROM HOME	**g. N**	**R**	**O**	**F**
h. NATURE PHOTOGRAPHY	**h. N**	**R**	**O**	**F**
i. HIKING	**i. N**	**R**	**O**	**F**
j. CAMPING	**j. N**	**R**	**O**	**F**
k. OFF-ROAD VEHICLE RIDING	**k. N**	**R**	**O**	**F**

2. Do **deer** live within a mile of your home?
1 YES
2 NO
3 I DON'T KNOW

3. Have you ever seen a **deer** within a mile of your home?
1 YES
2 NO

4. Do **coyotes** live within a mile of your home?
1 YES
2 NO
3 I DON'T KNOW

5. Have you ever seen a **coyote** within a mile of your home?
1 YES
2 NO

IF YES:
a. How much do you think it weighed? **(Please circle one)**
1 0-20 POUNDS
2 20-40 POUNDS
3 40-60 POUNDS
4 60-80 POUNDS
5 80-100 POUNDS

b. What color was it? **(Please circle one)**
1 TAN
2 REDISH BROWN
3 DARK BROWN
4 BLACK
5 OTHER _____

6. While at your home, do you think you have ever heard a **coyote** howling?
1 YES
2 NO

7. Which of the following is a **deer** track? **(Please circle one)**

a **b** **c** **d** **e**

8. Have you ever seen a **deer** track near your home?
1 YES
2 NO

9. Which of the following is a **coyote** track? **(Please circle one)**

a **b** **c** **d** **e**

10. Have you ever seen **coyote** tracks near your home?

1 YES
2 NO

11. Have you ever had any crops damaged by **deer**?

1 YES
2 NO

12. Have you ever had any ornamental plants around your home damaged by **deer**?

1 YES
2 NO

13. Do you take any steps to prevent **deer** damage of your crops or around your home?

1 YES
2 NO

IF YES: please explain.

14. Have you ever had any crops damaged by **coyotes**?

1 YES
2 NO

15. Do you take any steps to prevent **coyote** damage of your crops?

1 YES
2 NO

IF YES: please explain.

16. Do you own livestock in GA?

1 YES
2 NO

IF YES:

a. Have you ever had any livestock injured by **coyotes**?

1 YES
2 NO

b. Do you take any steps to prevent **coyote** attacks on your livestock?

1 YES
2 NO

IF YES: please explain.

17. Do you hunt coyotes for sport?

1 YES
2 NO

18. Have you ever had a pet injured by a **coyote**?

1 YES
2 NO

19. Have you ever had a pet injured by another animal?

1 YES
2 NO

IF YES:

a. What type of animal injured your pet? **(Please circle all that apply)**

1 DOMESTIC DOG
2 DOMESTIC CAT
3 RACCOON
4 OPOSSUM
5 BOBCAT
6 SNAKE
7 OTHER _____

20. Have you ever been in a car collision with a **deer**?

1 YES
2 NO

21. How do you receive most of your information about wildlife?
(Please circle one)

1 TELEVISION
2 NEWSPAPER
3 MAGAZINES
4 INTERNET
5 PERSONAL CONTACT WITH A WILDLIFE PROFESSIONAL
6 OTHER _____

22. How would you prefer to receive information about wildlife?
(Please circle one)

1 TELEVISION
2 NEWSPAPER
3 MAGAZINES
4 INTERNET
5 PERSONAL CONTACT WITH A WILDLIFE PROFESSIONAL
6 OTHER _____

WILDLIFE PREFERENCES

The next section of questions is designed to gain an understanding of your preferences and beliefs regarding wildlife in your community and wildlife recreation.

Please rate the following statements by your level of agreement:

SA = STRONGLY AGREE
A = AGREE
D = DISAGREE
SD = STRONGLY DISAGREE

Wildlife Enjoyment

1. I enjoy watching wildlife while I'm outdoors. **1. SA A D SD**

2. I would enjoy seeing **deer** while outdoors. **2. SA A D SD**

3. I would enjoy seeing a **coyote** while outdoors. **3. SA A D SD**

4. I would enjoy seeing wildlife around my home. **4. SA A D SD**

5. I would enjoy seeing **deer** near my home. **5. SA A D SD**

6. I would enjoy seeing **coyotes** near my home. **6. SA A D SD**

7. I would be frightened by seeing a **coyote**. **7. SA A D SD**
in the wild.

8. I would be frightened by seeing a **coyote** near my home. **8. SA A D SD**

9. Wildlife should not be in urban areas. **9. SA A D SD**

10. Whether or not I see wildlife it is important to me to know they exist. **10. SA A D SD**

11. It is important to protect wildlife populations for future generations. **11. SA A D SD**

Wildlife Uses

12. I support hunting of wildlife as long as it does not endanger the health and survival of the wildlife population. **12. SA A D SD**

13. I support hunting as part of our cultural heritage and tradition. **13. SA A D SD**

14. I support hunting as a source of meat. **14. SA A D SD**

15. I support hunting wildlife to reduce the spreading wildlife diseases. **15. SA A D SD**

SA = STRONGLY AGREE
A = AGREE
D = DISAGREE
SD = STRONGLY DISAGREE

16. I support hunting wildlife to reduce the chance of spreading wildlife diseases to humans. **16. SA A D SD**

17. Wildlife should be managed to benefit humans. **17. SA A D SD**

Wildlife Damage

18. If a **deer** damaged my property, I would expect the government to take care of the problem. **18. SA A D SD**

19. If a **deer** damaged my property, I would take care of the problem. **19. SA A D SD**

20. If a **coyote** damaged my property, I would expect the government to take care of the problem. **20. SA A D SD**

21. If a **coyote** damaged my property, I would take care of the problem. **21. SA A D SD**

22. If a **coyote** injured my pet, I would expect the government to take care of the problem. **22. SA A D SD**

23. If a **coyote** injured my pet, I would take care of the problem. **23. SA A D SD**

24. Deer populations are important to Georgia, even if they cause some property damage. **24. SA A D SD**

25. Coyote populations are important to Georgia, even if they cause some property damage. **25. SA A D SD**

26. Which wildlife species is the least desirable species to have living near your home? **(Please circle one.)**

1 DEER
2 COYOTE
3 FOX
4 BOBCAT
5 RACCOON
6 POISIONOUS SNAKE
7 ARMADILLO
8 RATS

27. Please rate each of these on the scale below on their desirability of living near your home. **(Let 1 equal less desirable and 5 equal more desirable.)**

a. DEER _____1 2 3 4 5

b. COYOTE_____1 2 3 4 5

c. FOX_____1 2 3 4 5

d. BOBCAT_____1 2 3 4 5

e. RACCOON _____1 2 3 4 5

f. POISIONOUS SNAKE_____1 2 3 4 5

g. ARMADILLO_____1 2 3 4 5

h. RATS _____ 1 2 3 4 5

WILDLIFE MANAGEMENT

Because wildlife is an important community resource, it is important for wildlife agencies in your area to understand how you feel about the management of wildlife in your community. Please answer the following questions based on how you feel about the suggested management options.

1. In which of the following situations do you believe the **deer** population should be reduced? **(Please circle all that apply.)**

1 SHOULD NEVER REDUCE DEER POPULATION
2 INCREASE IN DEER/CAR COLLISIONS
3 DAMAGE TO COMMERCIAL CROPS
4 DAMAGE TO ORNAMENTAL PLANTS
5 SHOULD ALWAYS REDUCE DEER POPULATION

2. In your opinion would you rather see the **deer** population reduced through lethal or non-lethal methods if population reduction was needed? (Lethal is defined here as killing of the animal and removal of the remains.)

1 LETHAL
2 NON-LETHAL

3. If the government chose to use lethal methods to reduce the **deer** population, which of the following would you prefer? **(Please circle one)**

1 SHOOTING BY AGENCY PERSONNEL
2 ALLOWING PUBLIC BOW HUNTS
3 ALLOWING PUBLIC GUN HUNTS

4. Please rate each of the following lethal methods on their acceptability in your opinion by **circling a number** on the scale below **for each** of the following methods. **(Let 1 equal least acceptable and 5 equal most acceptable.)**

SHOOTING BY AGENCY PERSONNEL_____1 2 3 4 5
ALLOWING PUBLIC BOW HUNTS_____1 2 3 4 5
ALLOWING PUBLIC GUN HUNTS _____1 2 3 4 5

5. If the government chose to use non-lethal methods to reduce the **deer** population, which of the following would you prefer? **(Please circle one)**

1 FENCING OUT DEER
2 SCARE DEVICES
3 FERTILITY CONTROL
4 CHEMICAL REPELLENTS
5 LIVE TRAPPING AND MOVING

6. Please rate each of the following non-lethal methods on their acceptability in your opinion by **circling a number** on the scale below **for each** of the following methods. **(Let 1 equal least acceptable and 5 equal most acceptable.)**

FENCING OUT DEER_____1 2 3 4 5
SCARE DEVICES_____1 2 3 4 5
FERTILITY CONTROL _____1 2 3 4 5
CHEMICAL REPELLENTS_____1 2 3 4 5
LIVE TRAPPING AND MOVING_____1 2 3 4 5

7. If the government was not going to get involved, which of the following actions are you most likely to take yourself? **(Please circle one)**

1 SHOOTING (illegal outside of state hunting regulations)
2 FENCING OUT DEER
3 SCARE DEVICES
4 CHEMICAL REPELLENTS
5 I WOULD TAKE NO ACTION
6 OTHER _____

8. In which of the following situations do you believe the **coyote** population should be reduced? **(Please circle all that apply)**

1 SHOULD NEVER REDUCE COYOTE POPULATIONS
2 DAMAGE TO LIVESTOCK
3 SUSPECTED LOSS OF PETS
4 DISEASE TRASMISSION TO PETS
5 SHOULD ALWAYS REDUCE COYOTE POPULATIONS

9. In your opinion would you rather see **coyotes** reduced through lethal or non-lethal methods? (Lethal is defined here as killing of the animal and removal of the remains.)

1 LETHAL
2 NON-LETHAL

10. If the government chose to use lethal methods to reduce the **coyote** population, which of the following would you prefer? **(Please circle one)**

1 SHOOTING BY AGENCY PERSONNEL
2 ALLOWING PUBLIC HUNTS
3 FUMIGATION OR GASSING OF DENS
4 TRAPPING OR SNARE USE BY AGENCY PERSONNEL
5 ALLOWING PUBLIC TRAPPING

11. Please rate each of the following lethal methods on their acceptability in your opinion by **circling a number** on the scale below **for each** of the following methods. **(Let 1 equal least acceptable and 5 equal most acceptable.)**

SHOOTING BY AGENCY_____1 2 3 4 5
ALLOWING PUBLIC HUNTS _____1 2 3 4 5
FUMIGATION OR GASSING OF DENS_____1 2 3 4 5
TRAPS OR SNARES BY AGENCY_____1 2 3 4 5
ALLOWING PUBLIC TRAPPING _____1 2 3 4 5

12. If the government chose to use non-lethal methods to reduce the **coyote** population, which of the following would you prefer? **(Please circle one)**

1 FENCING OUT COYOTES
2 SCARE DEVICES
3 FERTILITY CONTROL
4 CHEMICAL REPELLENTS
5 LIVE TRAPPING AND MOVING

13. Please rate each of the following non-lethal methods on their acceptability in your opinion by **circling a number** on the scale below **for each** of the following methods. **(Let 1 equal least acceptable and 5 equal most acceptable.)**

FENCING OUT COYOTES _____1 2 3 4 5
SCARE DEVICES_____1 2 3 4 5
FERTILITY CONTROL _____1 2 3 4 5
CHEMICAL REPELLENTS_____1 2 3 4 5
LIVE TRAPPING AND MOVING_____1 2 3 4 5

14. If the government was not going to get involved which of the following actions are you most likely to take yourself? **(Please circle one)**

1 SHOOTING
2 POISONS (not currently a legal option)
3 FUMIGATION OR GASSING OF DENS
4 LETHAL TRAPPING OR SNARES
5 FENCING OUT COYOTES
6 SCARE DEVICES
7 GUARD DOGS / ANIMALS
8 CHEMICAL REPELLENTS
9 LIVE TRAPPING AND MOVING
10 I WOULD TAKE NO ACTION
11 OTHER _____

DEMOGRAPHICS
The final section is to ask you a few questions about yourself for statistical analysis.

1. What is your gender?

1 MALE
2 FEMALE

2. What is your present age? _____**YEARS**

3. What is your ethnicity? **(Please circle one that best applies)**

1 CAUCASIAN OR WHITE
2 AFRICAN AMERICAN OR BLACK
3 HISPANIC
4 NATIVE AMERICAN
5 ASIAN
6 DUAL OR MULTIPLE ETHNICITIES
7 OTHER (please specify) _____

4. What is the highest level of education you have completed?**(Please circle one)**

1 SOME HIGH SCHOOL
2 HIGH SCHOOL DEGREE
3 SOME COLLEGE
4 COLLEGE DEGREE
5 POST-GRADUATE

5. What is your main occupation? **(Please circle one)**

1 HEALTH CARE
2 MANUFACTURING
3 AGRICULTURE
4 EDUCATION
5 BUISNESS
6 GOVERNMENT
7 LAW ENFORCEMENT/ FIRE AND EMERGENCY RESCUE
8 CONSTRUCTION
9 TOURISM SERVICE (restaurant, hotel, etc.)
10 OTHER _____

6. What is your annual household income? **(Please circle one)**

1 LESS THAN $20,000

2 $20,000-$40,000

3 $40,000-$60,000

4 $60,000-$80,000

5 $80,000-$100,000

6 $100,000-$120,000

7 $120,000-$140,000

8 GREATER THAN $140,000

7. In which county do you live? _____

8. In which types of organizations are you a member? **(Please circle all that apply.)**

1 HUNTING / FISHING
2 ENVIRONMENTAL PROTECTION / POLLUTION CONTROL
3 WILDERNESS PROTECTION
4 ANIMAL WELFARE / RIGHTS
5 BOY / GIRL SCOUTS
6 OUTDOOR RECREATION
5 NOT A MEMBER OF ANY OF THE ABOVE CATAGORIES

THANK YOU SO VERY MUCH FOR YOUR TIME AND EFFORT. PLEASE FEEL FREE TO SHARE ANY ADDITIONAL OPINIONS OR COMMENTS YOU HAVE ON THE BACK COVER OF THIS BOOKLET.

APPENDIX II: SURVEY RESULTS

FREQUENCY OF RESPONSES TO MAIL SURVEY

Question #2: Do **deer** live within a mile of your home?

4	**YES**	**(558)**
5	**NO**	**(82)**
6	**I DON'T KNOW**	**(68)**

Question #3: Have you ever seen a **deer** within a mile of your home?

3	**YES**	**(581)**
4	**NO**	**(126)**

Question #4: Do **coyotes** live within a mile of your home?

4	**YES**	**(286)**
5	**NO**	**(124)**
6	**I DON'T KNOW**	**(298)**

Question #5: Have you ever seen a **coyote** within a mile of your home?

3	**YES**	**(268)**
4	**NO**	**(434)**

IF YES:
a. How much do you think it weighed?

1	**0-20 POUNDS**	**(32)**
2	**20-40 POUNDS**	**(168)**
3	**40-60 POUNDS**	**(69)**
4	**60-80 POUNDS**	**(8)**
5	**80-100 POUNDS**	**(2)**

b. What color was it?

6	**TAN**	**(111)**
7	**REDISH BROWN**	**(78)**
8	**DARK BROWN**	**(29)**
9	**BLACK**	**(5)**
10	**OTHER**	
	a. Gray	**(14)**
	b. Redish Brown/Black	**(4)**
	c. Tan/Black	**(2)**
	d. Tan/Dark Brown/Gray	**(1)**
	e. Tan/Gray	**(6)**
	f. Other	**(14)**

Question #6: While at your home, do you think you have ever heard a **coyote** howling?

3 YES (254)
4 NO (444)

Question #7: Which of the following is a **deer** track? **(Please circle one)**

a 

(18)

b 

(209)

c 

(0)

d 

(408)

e 

(11)

Question #8: Have you ever seen a **deer** track near your home?

3 YES (445)
4 NO (230)

Question #9: Which of the following is a **coyote** track?

a 

(394)

b 

(5)

c 

(1)

d 

(8)

e 

(168)

Question #10: Have you ever seen **coyote** tracks near your home?

3 YES (114)
4 NO (554)

Question #11: Have you ever had any crops damaged by **deer**?

1 YES (266)
2 NO (436)

Question #12: Have you ever had any ornamental plants around your home damaged by **deer**?

3 YES (329)
4 NO (373)

Question #13: Do you take any steps to prevent **deer** damage of your crops or around your home?

3	**YES**	**(177)**
4	**NO**	**(523)**

Steps taken to prevent deer damage:

a.	fencing	66
b.	repellents/manufactured	23
c.	dogs	21
d.	human hair	14
e.	hunting/shooting	9
f.	human waste	6
g.	caging plants	6
h.	scare tactics	6
i.	change plants	6
j.	soap	5
k.	mothballs	4
l.	netting	3
m.	sprinkler	3
n.	scents	2
o.	alternate feeding – corn	2
p.	move plants closer to house	2
q.	DNR designed program	2
r.	white sheets/clothes	2
s.	tin pie pans	2
t.	egg spray	2
u.	cotton on ground	1
v.	reflectors	1
w.	motion lights	1
x.	rope	1
y.	scarecrow	1
z.	stopped planting garden	1
aa.	fishing line	1
bb.	garlic	1
cc.	peanut butter in foil on electric fence	1
dd.	seven dust on plants	1

Question #14: Have you ever had any crops damaged by **coyotes**?

3	**YES**	**(7)**
4	**NO**	**(684)**
5	**DON'T KNOW**	**(1)**

Question #15: Do you take any steps to prevent **coyote** damage of your crops?

1	**YES**	**(12)**
2	**NO**	**(678)**

Steps taken to prevent coyote damage of crops:

1.	fence	(5)
2.	dogs	(4)
3.	hunt/shoot	(2)
4.	trap	(2)

Question #16: Do you own livestock in GA?

3	**YES**	**(70)**
4	**NO**	**(635)**

IF YES:
a. Have you ever had any livestock injured by **coyotes**?

3	**YES**	**(8)**
4	**NO**	**(61)**

b. Do you take any steps to prevent **coyote** attacks on your livestock?

3	**YES**	**(19)**
4	**NO**	**(75)**

Steps taken to prevent coyote damage on livestock:

a.	hunt/shoot	(7)
b.	fence	(5)
c.	dogs	(4)
d.	trap	(2)
e.	keep close to house during calving	(1)

Question #17: Do you hunt coyotes for sport?

3	**YES**	**(26)**
4	**NO**	**(659)**

Question #18: Have you ever had a pet injured by a **coyote**?

3	**YES**	**(21)**
4	**NO**	**(660)**

Question #19: Have you ever had a pet injured by another animal?

3	**YES**	**(227)**
4	**NO**	**(458)**

Other animals reported to have injured pets:

1	**DOMESTIC/WILD DOG**	**(120)**
2	**DOMESTIC CAT**	**(30)**
3	**RACCOON**	**(17)**
4	**OPOSSUM**	**(18)**
5	**BOBCAT**	**(7)**
6	**SNAKE**	**(71)**
7	**OTHER**	

hawk (4), armadillo (4), fox (3), weasel (2), bear (2), human (2), horse (2), porcupine, skunk, hogs, alligator, duck, deer, cougar, turtle, chicken

Question #20: Have you ever been in a car collision with a **deer**?

3	**YES**	**(361)**
4	**NO**	**(329)**

Question #21: How do you receive most of your information about wildlife?

7	**TELEVISION**	**(435)**
8	**NEWSPAPER**	**(83)**
9	**MAGAZINES**	**(143)**
10	**INTERNET**	**(24)**
11	**PERSONAL CONTACT WITH A WILDLIFE PROFESSIONAL**	**(50)**
12	**OTHER**	**(19)**
13	**NEIGHBORS/ FAMILY**	**(26)**
14	**PERSONAL EXPERIENCE**	**(28)**

Question #22: How would you prefer to receive information about wildlife?

1	**TELEVISION**	**(387)**
2	**NEWSPAPER**	**(77)**
3	**MAGAZINES**	**(142)**
4	**INTERNET**	**(40)**
5	**PERSONAL CONTACT WITH A WILDLIFE PROFESSIONAL**	**(74)**
6	**OTHER**	**(25)**
7	**NEIGHBORS/FAMILY**	**(8)**
8	**PERSONAL EXPERIENCE**	**(12)**

WILDLIFE PREFERENCES

SA = STRONGLY AGREE A = AGREE D = DISAGREE SD = STRONGLY DISAGREE

	SA	A	D	SD
Wildlife Enjoyment:				
1. I enjoy watching wildlife while I'm outdoors.	450	191	25	10
2. I would enjoy seeing deer while outdoors.	384	221	43	30
3. I would enjoy seeing a coyote while outdoors.	119	180	185	189
4. I would enjoy seeing wildlife around my home.	301	224	94	58
5. I would enjoy seeing deer near my home.	268	215	112	81
6. I would enjoy seeing a coyote near my home.	71	84	266	250
7. I would be frightened by seeing a coyote in the wild.	92	167	231	182
8. I would be frightened by seeing a coyote near my home.	164	191	178	140
9. Wildlife should not be in urban areas.	103	240	196	132
10. Whether or not I see wildlife it is important to me to know they exist.	411	229	26	7
11. It is important to protect wildlife populations for future generations.	481	178	16	3
Wildlife Uses:				
12. I support hunting of wildlife as long as it does note endanger the health and survival of the wildlife population.	363	287	27	19
13. I support hunting as part of our cultural heritage and tradition.	302	284	81	30
14. I support hunting as a source of meat.	278	317	68	35
15. I support hunting wildlife to reduce the spreading of wildlife diseases.	290	329	52	19

16. I support hunting wildlife to reduce the chance of spreading wildlife diseases to humans.	391	304	73	26
17. Wildlife should be managed to benefit humans.	218	271	138	56
Wildlife Damage:				
18. If a deer damaged my property, I would expect the government to take care of the problem.	39	92	324	241
19. If a deer damaged my property, I would take care of the problem.	201	401	68	29
20. If a coyote damaged my property, I would expect the government to take care of the problem.	56	115	309	215
21. If a coyote damaged my property, I would take care of the problem.	205	379	71	37
22. If a coyote injured my pet, I would expect the government to take care of the problem.	64	115	310	204
23. If a coyote injured my pet, I would take care of the problem.	219	368	76	33
24. Deer populations are important to Georgia, even if they cause some property damage.	237	375	64	21
25. Coyote population are important to Georgia, even if they cause some property damage.	85	280	194	132

Question #26: Which wildlife species is the least desirable species to have living near your home?

1	**DEER**	**(28)**
2	**COYOTE**	**(40)**
3	**FOX**	**(4)**
4	**BOBCAT**	**(33)**
5	**RACCOON**	**(8)**
6	**POISIONOUS SNAKE**	**(276)**
7	**ARMADILLO**	**(80)**
8	**RATS**	**(165)**

27. Please rate each of these on the scale below on their desirability of living near your home. **(Let 1 equal less desirable and 5 equal more desirable.)**

	1	2	3	4	5
a. Deer	72	41	121	110	353
b. Coyote	318	137	130	51	61
c. Fox	187	114	185	111	100
d. Bobcat	290	124	136	69	76
e. Raccoon	153	129	201	109	102
f. Snake	509	79	54	14	40
g. Armadillo	366	123	111	46	47
h. Rat	579	50	30	10	29

WILDLIFE MANAGEMENT

1. In which of the following situations do you believe the **deer** population should be reduced? **(Please circle all that apply.)**

1 SHOULD NEVER REDUCE DEER POPULATION (58)
2 INCREASE IN DEER/CAR COLLISIONS (341)
3 DAMAGE TO COMMERCIAL CROPS (224)
4 DAMAGE TO ORNAMENTAL PLANTS (99)
5 SHOULD ALWAYS REDUCE DEER POPULATION (242)
6 AGREE WITH NONE OF THE ABOVE (23)

2. In your opinion would you rather see the **deer** population reduced through lethal or non-lethal methods if population reduction was needed?

1 LETHAL (378)
2 NON-LETHAL (305)

3. If the government chose to use lethal methods to reduce the **deer** population, which of the following would you prefer? **(Please circle one)**

1 SHOOTING BY AGENCY PERSONNEL (190)
2 ALLOWING PUBLIC BOW HUNTS (117)
3 ALLOWING PUBLIC GUN HUNTS (338)

4. Please rate each of the following lethal methods on their acceptability in your opinion by **circling a number** on the scale below **for each** of the following methods. **(Let 1 equal least acceptable and 5 equal most acceptable.)**

	1	2	3	4	5
SHOOTING BY AGENCY PERSONAL	239	61	97	67	230
ALLOWING PUBLIC BOW HUNTS	175	40	106	105	269
ALLOWING PUBLIC GUN HUNTS	1154	39	88	75	339

5. If the government chose to use non-lethal methods to reduce the **deer** population, which of the following would you prefer? **(Please circle one)**

1 FENCING OUT DEER (98)
2 SCARE DEVICESS (44)
3 FERTILITY CONTROL (230)
4 CHEMICAL REPELLENTS (29)
5 LIVE TRAPPING AND MOVING (260)

6. Please rate each of the following non-lethal methods on their acceptability in your opinion by **circling a number** on the scale below **for each** of the following methods. **(Let 1 equal least acceptable and 5 equal most acceptable.)**

	1	2	3	4	5
FENCING OUT DEER	214	77	128	99	176
SCARE DEVICES	226	95	155	114	103
FERTILITY CONTROL	190	72	114	73	245
CHEMICAL REPELLENTS	352	99	109	65	67
LIVE TRAPPING AND MOVING	160	51	88	102	293

7. If the government was not going to get involved, which of the following actions are you most likely to take yourself? **(Please circle one)**

1 SHOOTING (illegal outside of state hunting regulations)
2 FENCING OUT DEER
3 SCARE DEVICES
4 CHEMICAL REPELLENTS
5 I WOULD TAKE NO ACTION
6 OTHER _____

8. In which of the following situations do you believe the **coyote** population should be reduced? **(Please circle all that apply)**

1	**SHOULD NEVER REDUCE COYOTE POPULATIONS**	**(23)**
2	**DAMAGE TO LIVESTOCK**	**(245)**
3	**SUSPECTED LOSS OF PETS**	**(179)**
4	**DISEASE TRASMISSION TO PETS**	**(291)**
5	**SHOULD ALWAYS REDUCE COYOTE POPULATIONS**	**(299)**
6	**AGREE WITH NONE OF THE ABOVE**	**(8)**

9. In your opinion would you rather see **coyotes** reduced through lethal or non-lethal methods?

1	**LETHAL**	**(420)**
2	**NON-LETHAL**	**(268)**

10. If the government chose to use lethal methods to reduce the **coyote** population, which of the following would you prefer? **(Please circle one)**

1	**SHOOTING BY AGENCY PERSONNEL**	**(248)**
2	**ALLOWING PUBLIC HUNTS**	**(156)**
3	**FUMIGATION OR GASSING OF DENS**	**(40)**
4	**TRAPPING OR SNARE USE BY AGENCY PERSONNEL**	**(129)**
5	**ALLOWING PUBLIC TRAPPING**	**(65)**

11. Please rate each of the following lethal methods on their acceptability in your opinion by **circling a number** on the scale below **for each** of the following methods. **(Let 1 equal least acceptable and 5 equal most acceptable.)**

	1	**2**	**3**	**4**	**5**
SHOOTING BY AGENCY	157	58	98	90	286
ALLOWING PUBLIC HUNTS	206	68	93	98	225
FUMIGATION OR GASSING OF DENS	403	65	89	39	95
TRAPS OR SNARES BY AGENCY	217	92	110	92	182
ALLOWING PUBLIC TRAPPING	274	72	95	80	170

12. If the government chose to use non-lethal methods to reduce the **coyote** population, which of the following would you prefer? **(Please circle one)**

1	**FENCING OUT COYOTES**	**(61)**
2	**SCARE DEVICES**	**(20)**
3	**FERTILITY CONTROL**	**(235)**
4	**CHEMICAL REPELLENTS**	**(34)**
5	**LIVE TRAPPING AND MOVING**	**(309)**

13. Please rate each of the following non-lethal methods on their acceptability in your opinion by **circling a number** on the scale below **for each** of the following methods. **(Let 1 equal least acceptable and 5 equal most acceptable.)**

	1	2	3	4	5
FENCING OUT COYOTES	251	71	134	82	148
SCARE DEVICES	216	105	157	100	108
FERTILIITY CONTROL	155	60	101	86	285
CHEMICAL REPELLENTS	299	89	134	83	80
LIVE TRAPPING AND MOVING	105	42	75	101	363

14. If the government was not going to get involved which of the following actions are you most likely to take yourself?

1 SHOOTING	**(262)**
2 POISONS (not currently a legal option)	**(8)**
3 FUMIGATION OR GASSING OF DENS	**(9)**
4 LETHAL TRAPPING OR SNARES	**(23)**
5 FENCING OUT COYOTES	**(77)**
6 SCARE DEVICES	**(72)**
7 GUARD DOGS / ANIMALS	**(78)**
8 CHEMICAL REPELLENTS	**43)**
9 LIVE TRAPPING AND MOVING	**(46)**
10 I WOULD TAKE NO ACTION	**(165)**
11 OTHER	**(10)**

DEMOGRAPHICS

1. What is your gender?

1 MALE	**(486)**
2 FEMALE	**(207)**

2. What is your present age?

0-19	**(3)**
20-29	**(33)**
30-39	**(82)**
40-49	**(148)**
50-59	**(158)**
60-69	**(126)**
70-79	**(91)**
80+	**(42)**

3. What is your ethnicity?

1	**CAUCASIAN OR WHITE**	**(596)**
2	**AFRICAN AMERICAN OR BLACK**	**(77)**
3	**HISPANIC**	**(4)**
4	**NATIVE AMERICAN**	**(5)**
5	**ASIAN**	**(2)**
6	**DUAL OR MULTIPLE ETHNICITIES**	**(7)**
7	**OTHER**	**(3)**

4. What is the highest level of education you have completed?

0	**EIGHTH GRADE**	**(2)**
1	**SOME HIGH SCHOOL**	**(48)**
2	**HIGH SCHOOL DEGREE**	**(168)**
3	**SOME COLLEGE**	**(201)**
4	**COLLEGE DEGREE**	**(165)**
5	**POST-GRADUATE**	**(108)**

5. What is your main occupation?

HEALTH CARE	**(48)**
MANUFACTURING	**(54)**
AGRICULTURE	**(20)**
EDUCATION	**(61)**
BUISNESS	**(122)**
GOVERNMENT	**(30)**
LAW ENFORCEMENT/ FIRE AND EMERGENY RESCUE	**(25)**
CONSTRUCTION	**(54)**
TOURISM SERVICE (restaurant, hotel, etc.)	**(10)**
AVIATION	**(5)**
MECHANICAL	**(11)**
TECHNICAL	**(18)**
SALES/RETAIL	**(12)**
HOMEKEEPER	**(9)**
COMMUNICATION	**(5)**
MILITARY	**(10)**
LAND MANAGEMENT/ NATURAL RESOURCES	**(12)**
RETIRED	**(93)**
OTHER	**(90)**

6. What is your annual household income? **(Please circle one)**

1	**LESS THAN $20,000**	**(78)**
2	**$20,000-$40,000**	**(137)**
3	**$40,000-$60,000**	**(133)**
4	**$60,000-$80,000**	**(87)**
5	**$80,000-$100,000**	**(81)**
6	**$100,000-$120,000**	**(46)**
7	**$120,000-$140,000**	**(17)**
8	**GREATER THAN $140,000**	**(55)**

8. In which types of organizations are you a member?

1	**HUNTING / FISHING**	**(151)**
2	**ENVIRONMENTAL PROTECTION / POLLUTION CONTROL**	**(34)**
3	**WILDERNESS PROTECTION**	**(44)**
4	**ANIMAL WELFARE / RIGHTS**	**(29)**
5	**BOY / GIRL SCOUTS**	**(46)**
6	**OUTDOOR RECREATION**	**(106)**

APPENDIX III: NON-BIAS PHONE SURVEY SCRIPT

The following is the script to be used while conducting the phone survey. Please stick to the wording as closely as possible. Make sure that you have this and the list of possible questions about the survey in front of you before each call. In addition to recording the survey answers please also record date and time of conversation and the ID number of the person/household you are talking to. Words that are to be spoken are in italics. Other text is notes to you throughout the survey.

Hello. This is _____ calling from Auburn University. May I speak with _____?

(If that person is not in, ask if there would be a better time or day to reach them - Write it down. If they are unable to come to the phone or answer, please record reason.)

Continue here:
I'm calling as a follow-up to a survey about wildlife in your area that you have received in the mail. I will ask just a mini-version of that survey today. You have been specifically selected and your information is important to our research. This survey is completely voluntary and confidential. The survey will take about 5 minutes. If we come to any question that you would prefer not to answer, just let me know and I'll skip over it. OK?

1 YES
2 *NO (When would be a better time to call you back? WRITE* NAME AND TIME TO CALL BACK.)

Question #1:

Have you seen deer within a mile of your home?

1 YES *OR* *2 NO*

Question #2:

Have you seen a coyote within a mile of your home?

1 YES *OR* *2 NO*

Question #3:

Have you had crops or ornamental plants damaged by deer or coyotes?

1 YES *OR* *2 NO*

Question #4:

Do you do anything to prevent deer or coyotes damage on plants?

1 YES *OR* *2 NO*

Question #5:

Do you own livestock?

1 YES *OR* *2 NO*

IF YES: *Have you ever had any damaged by coyotes?*

1. *YES*
2. *NO*

Do you take any action to prevent coyote damage?

1. *YES*
2. *NO*

List:_____

Question #6:

Have you ever had a pet injured by a coyote?

1 YES *OR* *2 NO*

Question #7:

Do you participate in any outdoor or nature activities such as hunting, fishing, hiking, bird watching, off-road riding, nature photography or watching outdoor TV programs?

1 YES *or* *2 NO*

List responses:_____

Question #8:

Do you enjoy watching wildlife?

1 YES *OR* *2 NO*

Question #9:

Do you enjoy seeing wildlife around your home?

1 YES *OR* *2 NO*

Question #10:

Do you believe wildlife have value even if there is no human benefit?

1 YES *OR* *2 NO*

Question #11:

Do you support hunting of wildlife?

1 YES *OR* *2 NO*

IF NOT: *Would you be willing to share your reasoning for your opinion?*

Write brief summary: _____

Question #12:

Gender? M F (DO NOT ASK. Just answer)

Question #13:

Can I please have your age? _____

Question #14:

What ethnicity best describes you? _____

Thank you so much for your time and participation in our survey. Your answers are very important to the results of this study. Enjoy the rest of your evening.