Public Perception of Mammals and Mammal Conservation in Fairfax County, Virginia

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By

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DEDICATION

This thesis is dedicated to my family. Thank you for everything.

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ABSTRACT

PUBLIC PERCEPTION OF MAMMALS AND MAMMAL CONSERVATION IN FAIRFAX COUNTY

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A social survey was conducted to investigate public perception of mammals and mammal conservation issues in Fairfax County, VA, including local level of knowledge of mammals; perception of wildlife issues and participation in environmental activities; and support of mammal conservation issues, education, and policies. In general, local knowledge was low in some aspects. However, the majority of subjects thought that many urban wildlife issues were local concerns and threats, partook in several environmental actions, and strongly supported mammal environmental issues, education, and laws.

The frequencies and percentages of demographic groups were found. Demographic groups included residency, age, gender, occupation, education level, household annual income, environmental group membership, and formal environmental education. Pearson's chi-square test, one-way ANOVA, regression, or independent groups t-test were used to investigate variables between demographic groups.

Local level of knowledge varied, depending on the type of knowledge tested. No one (0%) knew the correct number of local mammal species in the area; however, most people (62%) were able to correctly identify four mammal species from photographs. Many subjects knew that certain mammal species occurred locally, but, they also thought other mammals inhabited the area when they did not. Occupation influenced both the mammal identification and knowledge of wildlife mammal species indices. Residency, gender, and age also affected the knowledge of wildlife mammal species index.

Occupation played a role in willingness to plant a wildlife garden. Participation in ecological activities (such as recycling; buying organic and eco-friendly products; using energy saving light bulbs and devices; and watching nature television programs) appeared to be high, with people doing many of the activities 'occasionally' to 'frequently'. In the participation in ecological activities index, age, occupation, income, formal ecological education, and environmental group membership were factors in participation.

In the urban wildlife concern index, just 35.1% of survey participants thought that all six listed urban wildlife issues (mammal induced flooding; mammals attacking people; mammal species attacking pets; wildlife mammal property damage; vehicle collisions caused by mammal species; and mammal diseases) were local concerns. Females generally considered more issues to be concerns than did men.

For environmental threat perception, urban development (72.7%) and habitat degradation (61.3%) were seen as the most serious threats. In the environmental threat perception index, the listed environmental issues were overall seen as 'moderate' threats

to local mammals. Women thought that the listed environmental issues were generally greater threats than men did.

Most people considered mammal conservation 'important' (35.3%) or 'very important' (59.3%), especially older subjects and people with a higher level of education education. Nearly every participant (95%) seemed to support more mammal conservation in schools, though slightly more women backed it than men. Most people viewed mammal conservation laws as 'very important' (42.2%) or 'important' (51%) but women (47.4%) and members of environmental groups (60%) tended to think that laws were slightly more important than men (37.5%) and non-members did (38.2%), respectively. Subjects were nearly evenly split on how effective they thought the current mammal conservation laws were, such as the Endangered Species Act and Marine Mammal Protection Act. Slightly more people believed these laws were 'ineffective' (32.6%) or 'very ineffective' (9.6%) than 'effective' (26.7%) or 'very effective' (3%). Only household annual income influenced perception of effectiveness of the laws. However, most people (73.4%) said they supported both laws. Older subjects and people with more education were more likely to support them than younger individuals and subjects with less education. Occupation and education level also had an effect. Most people also 'agreed' (39.4%) or 'strongly agreed' (30.8%) with the creation of new mammal conservation laws. Ecological group membership influenced support of the creation of new legislation. Lastly, the majority of people (67.6%), especially those with formal environmental education (81.8%), stated that if a politician or political party backed mammal conservation legislation, people would view that politician or political

party more favorably. People with more formal environmental education perceived politicians who supported conservation legislation more favorably than subjects without formal ecological education.

1. Introduction

Up until the mid-twentieth century, the United States was mostly a rural and agricultural nation (Adams et al., 2006). In present times, however, most of the population (80%) in the continental U.S. resides in urban areas (U.S. Census Bureau, 2001; Adams et al., 2006). Urban encroachment into wilderness areas has caused an increase in human-wildlife encounters and conflicts (Casey et al., 2005; Raik et al., 2005; Adams et al., 2006). Though socio-economic factors, such as public awareness and attitudes, influence many ecological issues they are often disregarded in conservation management (Kellert, 1985; Raik et al., 2005; Adams et al., 2006; Talbot, 2008). Contemporary urban wildlife managers need to consider not only the biological factors but also the socio-economic aspects when handling human-wildlife conflicts and creating conservation policy (Kellert, 1985; Raik et al., 2005; Adams et al., 2006). To address wildlife conservation concerns, many governments, including the U.S., are now seeking public perception as part of the management process (White et al., 2005). Public perception of mammals and mammal conservation has been little studied in Fairfax County, Virginia. This thesis investigates public opinions of mammals and conservation in Fairfax County, Virginia, including local level of knowledge of mammals, perception of wildlife issues and participation in environmental activities, and support of mammal conservation issues, education, and policies.

Many human activities, such as urban development and increasing demands for resources, have caused severe environmental impacts (Adams et al., 2006; Kellert, 2008; Talbot, 2008) and a rise in human-wildlife conflicts (Casey et al., 2005; Raik et al., 2005; Adams et al., 2006). Socio-economic factors are considered by many to be the main causes of environmental problems (Kellert, 1985; Kellert, 2008). The severity of ecological issues demonstrates that the relationship between human society and the environment must be evaluated in conservation efforts (Kellert, 1985; Kellert, 2008). Stress on the Earth's ecosystems also indicates that a more in depth study of nature and ecology is necessary to better understand and solve the problems (Woodwell, 2008).

Although socio-economic issues cause many ecological impacts, most wildlife management programs take into account only biological assessments, and do not sufficiently address social aspects such as human perception (Kellert, 1985; Raik et al., 2005; Adams et al., 2006; Morzillo et al., 2007; Talbot, 2008). This disregard of social factors has led to a bias of focusing mainly on commodity and financial measures of benefits when evaluating species (Kellert, 1985; Kellert, 2008). Studying social characteristics in addition to biological aspects may help increase comprehension of the issues and lead to more effective conservation strategies in management (Kellert, 1985; Adams et al., 2006; Kellert, 2008). Since encounters between species and people are becoming more frequent, it is necessary to incorporate human tolerance of species and issues into conservation administration to guarantee the continued survival of species, especially in the cases of large carnivorous mammals (Morzillo et al., 2007).

Public opinion is an essential component of wildlife preservation and management

(Kellert, 1985; White et al., 2005). In recent years, the general public has progressively become more active in conservation decision-making (White et al., 2005). Stakeholders in North America, such as the general public, are usually more involved in environmental decision-making than in many other parts of the world (White et al., 2005). Because public interest and participation in environmental management has increased, many wildlife managers are taking public opinion and concerns more into account in management policy (White et al., 2005).

Many governments around the world are now beginning to research public perception before implementing new ecological policies (White et al., 2005). In the U.S., it is governmental policy to consult and educate the public as part of management (Casey et al., 2005). The Endangered Species Act of 1973 mandated that in addition to the ecological and scientific attributes of species, the historic, educational, aesthetic, and recreational properties, must also be taken into account in species conservation (Endangered Species Act, 1973). For certain species, such as the mountain lion (*Puma concolor*), it is required that wildlife managers consider public opinion when reworking or making new management policies for this particular species (Casey et al., 2005).

Wildlife managers need to investigate the opinions and knowledge levels of residents and other stakeholders in order to successfully integrate public perception into the decision making process (Casey et al., 2005). Gathering data on public perception from different groups is thought to be a key factor of successful ecological management (Minnis, 2001). Urban wildlife issues are very complicated and the involvement and expertise of stakeholders from a diverse range of backgrounds are necessary to solve

intricate problems (Raik et al., 2005). However, public involvement in conservation issues may vary by group or person. Local residents often request that they be allowed to participate in the decision-making process, but different groups and individuals in the general public have diverse expectations on their levels of involvement in management (Raik et al., 2005).

Understanding public perception may help wildlife managers better preserve species and alleviate ecological problems (Casey et al., 2005; Raik et al., 2005; White et al., 2005; Adams et al., 2006). Social surveys can be used to find out about public attitudes and values, perceptions of issues, human-wildlife interactions, and support of species and species conservation-related issues (White et al., 2005). Studies may also determine actual human behavior, predict future behavior (White et al., 2005), or reveal changes in behavior over time (Goedeke, 2004). Investigating public concerns and attitudes towards species, conservation issues, or wildlife policy can help ascertain potential problems people may have with conservation management, including opinions of proposed, present, and future conservation strategies and initiatives (Casey et al., 2005; Raik et al., 2005; Morzillo et al., 2007). Research in social perceptions may also indicate support for current and new environmental legislation (Howard and Parsons, 2006; Scott and Parsons, 2005; White et al., 2005).

Research into public perception may indicate low levels of knowledge of species or ecological problems (Parsons et al., 2003; Scott and Parsons, 2004; Casey et al., 2005), the need for more conservation education, and public misconceptions of wildlife species or ecological concerns (Goedeke, 2004). Studying present day viewpoints can improve

understanding of how a person's background influences opinion, and perhaps provide insight on how perceptions might be changed for the better in the future (Driscoll, 1995). Potential tensions between groups might be avoided if diverse and contrary public attitudes and perceptions of wildlife or conservation issues are identified before making policy (Raik et al., 2005).

1.1. Values, Attitudes, And Public Perception

Public acceptance and support of species and environmental issues are often affected by perceptions of their attributes and value (Goedeke, 2004; Driscoll, 1995). Reactions to ecological issues are also affected by personal beliefs and responses to available information (Stern et al., 1995b). Furthermore, conflicts between humans and wildlife influence public perceptions and attitudes towards species and issues (Elmore et al., 2007). An assessment of public opinions may uncover greater public support of wildlife conservation than what is usually assumed (Kellert, 1985). In many cases, people may be willing to give up certain benefits to protect certain species that are valued (Kellert, 1985).

Perception of animals or ecological issues can be influenced by a number of factors. Some values that species are judged upon include perceived importance, usefulness, responsiveness, intelligence, lovability (Driscoll 1995), and aesthetics or attractiveness (Kellert, 1985; Driscoll, 1995; Kellert, 2008). Humans also derive many different values from wildlife species, including: utilitarian (commodity and sustenance); humanistic (emotional bonding); symbolic (the environment in communication and

thought); naturalistic (exploration of nature); dominionistic (mastery over the environment); spiritual (Kellert, 2008); recreational (nature-based activities like bird-watching or hunting); ecological (the importance of the relationship between species and habitats) (Kellert, 1985); moralistic (rights and spiritual importance of species); and scientific (human knowledge and understanding of species) values (Kellert, 1985; Kellert, 2008). In addition, people may find it difficult to form opinions or attitudes about a species if they are not familiar with a species, if they don't have daily contact with a species, or if they are unaware that the species inhabits or used to inhabit their region (Morzillo et al., 2007). Because the species is not within a person's mind frame this can result in many 'don't know' responses when inquired about that species (Morzillo et al., 2007).

Perceptions can also be influenced by negative factors like fear (Goedeke, 2004; Morzillo et al., 2007; Kellert, 2008). Urban residents are often stunned to learn large carnivorous mammals like bears reside in their area, and usually react by become frightened of them and worried about human safety, although in some urban areas, like Louisiana, there have been no bear attacks in recent history (Cotton, 2008).

Demographics that may influence public perception or attitudes towards mammals or environmental issues include residency (Kellert et al., 1995; Raik et al., 2005; Scott and Parsons, 2005; Morzillo et al., 2007), gender (Driscoll, 1995; Stern et al., 1995a; Stern et al., 1995b; O'Connor et al., 1999; Parsons et al., 2003; Palmer and Dann, 2004; Casey et al., 2005; Howard and Parsons, 2006; Morzillo et al., 2007), age (Stern et al., 1995a; O'Connor et al., 1999; Parsons et al., 2003; Casey et al., 2005; Howard and

Parsons, 2006; Morzillo et al., 2007), education level (Parsons et al., 2003; Palmer and Dann, 2004; Casey et al., 2005; Morzillo et al., 2007), household annual income (Parsons et al., 2003; Palmer and Dann, 2004; Casey et al., 2005; Morzillo et al., 2007), occupation (Parsons et al., 2003; Howard and Parsons, 2006), environmental group membership (Rawles and Parsons, 2005; Morzillo et al., 2007), and formal environmental education (Pooley and O'Connor, 2000; Bright and Tarrant, 2002; Rideout, 2005).

People have distinct and diverse opinions and principles towards species, nature, and management strategies (Raik et al., 2005). Public perception can vary greatly by group (Adams et al., 2006). Some people, like many animal rights supporters, believe that the environment (Kellert, 2008) and animals (Driscoll, 1995) should be valued for themselves, and not because they are useful to or benefit humans. As seen in many studies (Kellert, 1985; Driscol, 1995; Casey et al., 2005; Raik et al., 2005), not all species are valued the same. Large, attractive mammal species and companion animals are usually more accepted and garner more public support than species that are deemed less attractive, such as rodents or many non-mammals (Driscol, 1995). In many cases, species that are not viewed as charismatic and that are involved in human-wildlife conflicts may receive little public support (Elmore et al., 2007).

Environmental education can help change viewpoints of or behavior towards species or issues (Pooley and O'Connor, 2000; Goedeke, 2004; Casey et al., 2005; Rideout, 2005), and may also lead to feelings of compassion for a species (Goedeke, 2004). In many cases, formal environmental education, such as classes, can help change perceptions of ecological issues. In Rideout's (2005) study on short-term environmental

education in college students, most participants had stronger pro-environmental viewpoints after taking the classes, which lasted at least three semesters.

The development of ethics and empathy towards wildlife may be a fundamental part of successful conservation endeavors (Kellert, 1985). Kellert (2008) argues that unless we change our morals and principles regarding the environment, we will not be able to successfully solve modern day ecological dilemmas. In addition, nature deeply affects the physical and mental well being of humans, and human dependence on the environment encourages ecological accountability (Kellert, 2008; Woodwell, 2008).

Appreciation and awareness of nature and the environment can lead to changes in ethics or perceptions of nature, which in turn can lead to shifts in policies (Goedeke, 2004; Kellert, 2008). Public perception can also influence the way animals are treated and can change over time. Environmental action is often the consequence of a combination of public perception, scientific research and knowledge, and environmental regulations (Talbot, 2008). For instance, by the 1960s, many whale species were in great decline or endangered due to over harvesting. At the time, whales were mostly viewed as a commodity that needed to be dominated, and although most people knew they were mammals, they were perceived as and treated like they were overgrown, hideous fish (Kellert, 2008). But as scientific exploration, education, and awareness of them increased, and pro-whale industries like whale-watching became successful, attitudes about whales began to quickly shift in the U.S. and other countries. People began to consider whales as beautiful and intellectual creatures, which led to changes in policies,

including the creation of strong mammal conservation laws, such as the U.S. Marine Mammal Protection Act of 1972 (Kellert, 2008).

1.2. Local Level Of Knowledge

Opinions are influenced by current knowledge of a species (Goedeke, 2004; Rideout, 2005; Morzillo et al., 2007). Ignorance of a species' life history and role in the ecosystem can lead to human-wildlife conflicts (Goedeke, 2004). However, as public awareness of a species or conservation issue increases, conservation support of that species or issue can also rise (Goedeke, 2004). Knowledge of environmental issues may induce eco-friendly behaviors and also increase the desire to look for solutions (Stern et al., 1985; O'Connor et al., 1999). In addition, in some cases, knowledge about a particular species, may lead to more positive attitudes toward that species (Morzillo et al., 2007).

Local level of knowledge about wildlife is generally low in many urban areas (Scott and Parsons, 2004; Casey et al., 2005; Adams et al., 2006). Many people in the U.S. consider certain mammals, such as rats, mice, and squirrels, urban wildlife. However, they are unaware of the numbers of species that live in developed urban areas, are unable to identify common species, and do not know which species inhabit their region (Adams et al., 2006). In Scott and Parson's (2004) study, almost half of subjects (46% out of 200 surveyed) underestimated the number of cetaceans in the local waters.

The news and television media increases and spreads public awareness of issues, by making certain local ecological concerns nationally or globally known (Talbot, 2008).

Because of increases in environmental knowledge, the public now understands that governmental involvement is necessary to help solve environmental issues (Talbot, 2008). Newspapers and other media are currently reporting urban wildlife issues, such as coyote sightings and deer overpopulation, more often than in the past (Adams et al., 2006). But there are still many misconceptions about urban wildlife species, including the belief that carnivorous mammals do not reside in urban areas (Adams et al., 2006).

In many cases, education of misunderstood species can be used as an effective means to alleviate conflict (Goedeke, 2004). Scientific knowledge and ecological education have led to increased public awareness and support of many environmental issues (Rideout, 2005). For example, in the late 1800s to the 1970s, lack of knowledge of manatees led to much fear and misunderstanding, which caused great harm to their livelihood (Goedeke, 2004). But as scientific knowledge of the manatees' life history increased and people became educated, public perceptions began to change, and manatees began to recover and thrive (Goedeke, 2004). If local level of knowledge is found to be low in an area, wildlife and natural resource agencies may need to consider educating local residents about a species' life history to ease human-wildlife issues (Casey et al., 2005).

However, ecological education does not always guarantee pro-environmental attitudes (Bright and Tarrant, 2002). Many other factors besides environmental knowledge, such as emotions, influence ecological attitudes and behaviors (Pooley and O'Connor, 2000; Bright and Tarrant, 2002; Rideout, 2005). In addition, in some instances, formal ecological education may only strengthen analytical thinking without

altering a person's position on an issue (Bright and Tarrant, 2002). Even after taking formal ecological education classes, some people may still have negative attitudes towards specific issues (Bright and Tarrant, 2002).

Certain groups within a population may be more knowledgeable of mammals and conservation issues than other groups. In several studies, people that participate in wildlife or conservation activities or people that are active in environmental organizations tend to be more knowledgeable than those that do not participate or non-members (Parsons et al., 2003; Scott and Parsons, 2004; Rawles and Parsons, 2005). Local residents or people who are familiar with the area where species occur may have a higher level of knowledge than non-residents or individuals who are unfamiliar with the area (Scott and Parsons, 2004; Casey et al., 2005). In many highly educated and affluent areas, there tends to be greater levels of awareness and knowledge (Parsons et al., 2003; Casey et al., 2005). In one study, Pennsylvanian college students who took formal ecological modules over three semesters tended to have stronger pro-environmental perceptions than students who did not take the environmental classes (Rideout, 2005).

Gender and age may have a role in knowledge levels. In South-eastern Arizona near Saguaro National Park (a suburban area), males tended to be a little more knowledgeable of mountain lions and their behaviors than females (Casey et al., 2005). In this study, age as well as education level did not affect knowledge levels. Though the majority of people usually can't identify local species and are unaware of what species inhabit their region (Adams et al., 2006), in this suburb most people (74.6%; out of 493 people) were able to correctly identify a photograph of their tracks (Casey et al., 2005).

Though only 8% people knew that mountain lions resided in their county, almost half (48.7%) were aware that the mammal populated the surrounding areas (Casey et al., 2005). In other urban areas, such as in Scotland, there were significant relationships between knowledge levels of marine mammals and gender, and knowledge levels and age (Scott and Parsons, 2004). However, there was little association between marine mammal knowledge and profession (Scott and Parsons, 2004).

1.3. Participation In Natural Activities And Perception Of Conservation Issues

In the U.S. wildlife-watching and interest has increased (Adams et al., 2006). Participation in wildlife-watching and other outdoor activities is now greater than involvement in traditional activities such as fishing and hunting (U.S. Census Bureau, 2001; Adams et al., 2006). Close interaction with a particular habitat or species may affect knowledge levels and perception (Casey et al., 2005). In one study conducted in the D.C. metropolitan area, most of the residents of St. Michaels, MD (a rural area near D.C.), who rely on the marine ecosystem for their livelihood, knew more about marine environmental threats than people in urban and suburban areas with little to no daily contact with the ocean (Sheridan, 2005). In another study, East Texan respondents who were knowledgeable about black bears or who had seen them in the wild tended to have more positive attitudes about the local species (Morzillo et al., 2007).

The general public is usually more aware of well-publicized and global environmental problems (Sheridan, 2005; Adams et al., 2006) and opportunities (Parsons et al., 2003) than local issues. People that do not have many daily interactions with

marine mammals or the ocean habitat seem to be only aware of highly publicized ecological topics, which are not always the most pressing concerns for a species (Sheridan, 2005). For example, in the D.C. area, many people consider oil spills a threat to marine mammals, but there have not been any major spills along the U.S.'s east coast (Sheridan, 2005).

In the U.S. the majority of people living in urban areas are not aware of how to deal with a problematic wildlife species, and do not fully understand human-wildlife relations (Adams et al., 2006). Local residents do not always consider certain urban wildlife issues as concerns, even when local wildlife authorities deem them problems. Though mountain lions are probably greater threats to humans than other predatory species, such as wolves, they are often not seen as a huge threat (Kellert et al., 1995). Mountain lion attacks and sightings often go unnoticed by the vast majority of the American public (Kellert et al., 1995). In Arizona, the majority of people in a suburban area located next to a park did not think attacks by mountain lions were problems (Casey et al., 2005). Another example is deer overpopulation. In many suburban and urban areas, deer population density is too high (Raik et al., 2005; Adams et al., 2006). But most people in Missouri (a state with high deer density in its urban and suburban areas) are fond of and support the protection of the species, and in general do not approve of any deer population management since they do not think there is a population issue with deer (Adams et al., 2006).

However, attitudes and behaviors toward a species can change if conflict increases (Morzillo et al., 2007). Some Missouri residents approve of deer population

management if they are adversely affected by the problem (Adams et al., 2006). In addition, though many people presently have positive viewpoints about bears (Kellert et al., 1995), local residents may exterminate large carnivorous mammal species like bears, if they are discouraged, fearful, and believe that no pragmatic management solutions are available (Cotton, 2008).

In urban and suburban areas, human-wildlife conflicts that are considered concerns include wildlife property damage (Raik et al., 2005; Morzillo et al., 2007; Fairfax County Environmental Quality Advisory Council, 2008; Fairfax County Police Department Animal Services Division, 2009), apprehension of the dangerousness of animals (Raik et al., 2005; Fairfax County Park Authority, 2007a; Morzillo et al., 2007; Cotton, 2008; Fairfax County Environmental Quality Advisory Council, 2008; Fairfax County Park Authority, 2009a), and fear of diseases (Centers for Disease Control and Prevention, 1998; Raik et al., 2005; Fairfax County Environmental Quality Advisory Council, 2008; Fairfax County Police Department Animal Services Division, 2009). Wildlife damage often consists of 'dumpster diving', chewing of wooden buildings, equipment, or other objects (Cotton, 2008), and destruction of plants and crops (Elmore et al., 2007; Cotton, 2008). Some people are afraid of large carnivorous species like wolves and bears (Adams et al., 2006), and may fear that they will attack people (Cotton, 2008). Species like bats, which can be rabies carriers (Centers for Disease Control and Prevention, 1998; Adams et al., 2006; Fairfax County Environmental Quality Advisory Council, 2008), are often subjected to fatal control methods (Adams et al., 2006). Other wildlife issues include flooding from animal built dams (Fairfax County Park Authority,

2006a; Fairfax County Park Authority and Pless, 2009) and wildlife mammals attacking pets (Fairfax County Park Authority, 2009b; Fairfax County Environmental Quality Advisory Council, 2008) or other animals (like livestock) (Elmore et al., 2007). Lastly, vehicle collisions are a concern in many urban and suburban areas that have high numbers of deer (Raik et al., 2005; Adams et al., 2006; Fairfax County Environmental Quality Advisory Council, 2008; Fairfax County Police Department Animal Services Division, 2009).

People participate in a wide range of ecological activities and conservation practices. Involvement in natural activities or eco-friendly practices is usually done to better the quality of life (Adams et al., 2006) or out of concern for the environment (Sheridan, 2005). People may be willing to give up a service or even change their ways to protect something they value, such as a species or the environment (Kellert, 1985).

Wildlife activities that people participate in include nature walks (i.e. observing nature outdoors; Morzillo et al., 2007), hiking (Morzillo et al., 2007), wildlife-watching tours like whale-watching (Rawles and Parsons, 2005), and amateur wildlife-watching like bird-watching (Palmer and Dann, 2004; Talbot, 2008). More wildlife activities are visiting parks or zoos or nature centers (Orams, 2002), watching nature programs on T.V. like 'Animal Planet' (Morzillo et al., 2007), bird feeding (Orams, 2002; Martinson and Flaspohler, 2003; Palmer and Dann, 2004), and feeding other wildlife species besides birds (Orams, 2002; Palmer and Dann, 2004). Activities like bird-watching and enjoying nature (like nature walks) outnumbered interest in hunting (Talbot, 2008).

Types of conservation practices include recycling (Rawles and Parsons, 2005; Sheridan, 2005), using public transportation (Shapiro et al., 2002), avoiding buying products tested on animals (Driscoll, 1995; Rawles and Parsons, 2005), purchasing organic or environmentally friendly products (Palmer and Dann, 2004; Rawles and Parsons, 2005), using energy saving light bulbs or devices (Rawles and Parsons, 2005), educating others on environmental issues (Palmer and Dann, 2004; Sheridan, 2005), carpooling (Sheridan, 2005), donating to environmental or nature or animal organizations (Sheridan, 2005), and volunteering at environmental or nature or animal organizations (Palmer and Dann, 2004; Rawles and Parsons, 2005). Another environmental practice is wildlife adoptions or sponsorships, such as whale or wolf adoptions. Many environmental and non-profit organizations, such as Defenders of Wildlife (2008) and World Wildlife Fund (2008) raise donations for their conservation efforts by offering their members the opportunity to sponsor a wildlife animal through an adoption program.

The majority of people in Driscoll's (1995) study in the U.S. found that product testing on animals was considered unacceptable among 133 participants. Only 44% of people supported products tested on animals. Age, occupation, and gender did not seem to influence support. However, in a second sample, Driscoll (1995) found that animal shelter workers seemed to support products tested on animals less (only one person or 10% supported animal testing). This seems to indicate that involvement with animals may affect activities.

In another survey in the continental U.S., most respondents replied they would partake in many voluntary environmental activities (O'Connor et al., 1999). The

majority of people in the study replied that they were willing to participate in environmental actions such as buying and using energy efficient technologies and a car with good gas mileage. However, most subjects were less willing to car pool and take public transportation. This may suggest that people are less likely to participate in actions that impede their personal freedoms.

In Sheridan's 2005 study, which was conducted in the Washington D.C. metropolitan area, the majority of people (out of 240 subjects) said they would participate in certain ecological activities to benefit the environment. Activities that people stated they would do to help the environment included educating others on environmental issues (45%), recycling (75%), and donating to environmental organizations (80%). However, just 14% stated they would carpool for ecological reasons. Most people surveyed considered recycling to be 'very important'. Rural residents in the D.C. area, who live near the ocean and who are active in marine activities, tended to be more active in environmental groups or at least were familiar with ecological organizations. Urban residents in D.C. with little marine contact did not participate in many ocean activities, and suburban residents in Vienna, VA (part of Fairfax County) seemed to be somewhere in the middle (Sheridan, 2005).

People who are active in conservation or nature groups may participate in ecological activities more often. In the last fifty years, membership in these groups has rapidly increased (Talbot, 2008). In Rawles and Parsons' study (2005), people who were whale watchers tended to participate in conservation activities more often than people who didn't. The majority of subjects stated that they recycled (83.1%), used energy

saving bulbs (60%), and purchased cosmetics not tested on animals (73%). Moreover, many people also used other energy efficient devices (42.4%), bought organic and eco-friendly products (45.8%), and volunteered at environmental organizations (27.1%).

Many governmental agencies, such as the Fairfax County Park Authority (2007b), and non-profit organizations, like the National Wildlife Federation (Palmer and Dann, 2004), also encourage people to learn about and plant wildlife gardens or habitats and native plant species. Some programs like National Wildlife Federation's Backyard Wildlife Habitat (BWH) program offers certification of the habitat (Palmer and Dann, 2004). Planting wildlife habitats and native plants have many environmental advantages including conservation of local native plant populations, providing and improving habitat for birds and other animals, preventing the proliferation of invasive species (Palmer and Dann, 2004; Fairfax County Park Authority, 2007b), aesthetics, maintaining soil nutrients, decreasing erosion and runoff (Fairfax County Park Authority, 2007b), increasing awareness of human wildlife conflicts, reducing chemical pollutants, connecting with nature, fostering positive ecological attitudes, and gaining skills and knowledge of animals, gardening, conservation, and plants (Palmer and Dann, 2004). Types of animals people may want to attract to their wildlife habitats include butterflies, other invertebrates, hummingbirds, songbirds, mallard ducks, rabbits, bats, other mammals, fish, amphibians, and reptiles (Palmer and Dann, 2004). In 2002, most of the certified participants in National Wildlife Federation's BWH program were female, and tended to be older, had a higher level of education, and had greater incomes than the general U.S. public (Palmer and Dann, 2004).

It is often assumed that a high threat perception of an ecological issue increases participation in pro-ecological behaviors (O'Connor et al., 1999). In the study of risk perception, it is debated how education is linked to threat assessment, ecological values, and green behaviors. It is thought that knowledge directly influences actions by increasing attention and commitment to green issues, and by offering social signals for suitable pro-environmental conduct (O'Connor et al., 1999). In this scenario, behavior is not affected by ecological ethics and risk assessment, and particularly pertains to unpredictable ecological issues like climate change (O'Connor et al., 1999). In another opinion, education can strengthen or reduce threat assessment, which is obliquely linked to ecological actions (O'Connor et al., 1999). However, O'Conner et al. (1999) argues that threat perception, environmental education, ecological beliefs, as well as demographics all have a strong impact on environmental behavior.

Some of the most prominent ecological crises we are facing today include climatic disruption (global warming) (Lovejoy, 2008; Talbot, 2008; Woodwell, 2008), chemical discharges, and air pollution (Talbot, 2008). Other primary environmental threats are loss of biodiversity (due to chemical, physical, and biotic disturbances), pollution (toxicity), and human overpopulation (Talbot, 2008; Woodwell, 2008). Human overpopulation and urban encroachment into wilderness areas can greatly affect mammal population dynamics and biodiversity (Adams et al., 2006) and puts pressure on the local ecosystems (Marsh et al., 2003).

Many human activities are the causes of species declination, including urban development (Kellert, 1985; Czech et al., 2001; Talbot, 2008) and habitat fragmentation

(McKinney, 2008), degradation, or destruction (Kellert, 1985; Elmore et al., 2007; Morzillo et al., 2007; Talbot, 2008; Cotton, 2008; McKinney, 2008; Woodwell, 2008). Habitat loss from economic growth (from activities such as housing development, farming, and logging) is one of the main causes of wildlife endangerment (Kellert, 1985; Czech et al., 2001; Talbot, 2008), especially for endangered species (Talbot, 2008). Many urbanized areas are so fragmented that less than a fifth of downtown sections are vegetated, leaving only small lots of green space for different species to inhabit (McKinney, 2008). Species that require vast amounts of habitat, such as large carnivores, may struggle to recover their population once it is decimated simply due to the lack of habitat (Morzillo et al. 2007). Urban expansion can also cause overpopulation of some species (Adams et al., 2006; McKinney, 2008) and a decrease in population size (under-population) of other animals (Adams et al., 2006; Lovejoy, 2008; McKinney, 2008).

Exotic species are also one of the main threats to native species (Kellert, 1985; Czech et al., 2001; Talbot, 2008). Invasive non-native species generally tend to out compete indigenous species in urbanized areas (McKinney, 2008). In McKinney's (2008) examination of animal and plant species richness studies, all 21 non-avian vertebrate studies reviewed showed decreases in species richness in moderate to highly urbanized areas throughout the world. Nearly every study examined (14 out of 16 studies) in low to moderately urbanized areas observed decreases in non-avian vertebrate species. Only 2 vertebrate studies in low to moderately urbanized areas revealed increases in species richness, and these were exotic species. Other threats to mammal species in urban and suburban areas that influence population dynamics include lack of

natural predators and prey (Adams et al., 2006). For some species, over-harvesting (by hunting or trapping) (Morzillo et al., 2007) and eradication efforts (Elmore et al., 2007) are also some of the principal causes of species declination.

Noise pollution can be a huge threat to certain species, such as whales, that rely heavily on or are easily disturbed by sound, which may incite changes in their natural behaviors (National Research Council, 2005). Alterations in behavior may include avoidance of an area, deviation from migration paths, cessation of communication between individuals or groups, hearing loss, and increases in aggression (National Research Council, 2005). Sewage pollution can cause a large range of health anomalies, including reproduction issues, immunological problems, ingestion of pathogens, and heavy metal contamination (Marsh et al., 2003). Nutrient pollution from farm runoff can cause increases in algae blooms, which reduces the oxygen content of water, chokes waterways, and causes the death of water wildlife (Boesch et al., 2001). Wildlife-watching can greatly stress particular mammal species, and may cause disruptions in their natural reproduction, eating, social, and sleeping patterns (Bejder and Samuels, 2003). Animals can ingest and get entangled and injured by litter (Marsh et al., 2003). Oil pollution is also a threat to certain species, especially those that rely on large bodies of water (Talbot, 2008). Car injuries to many types of mammals are threats in urban areas (Raik et al., 2005; Adams et al., 2006; Fairfax County Police Department Animal Services Division, 2009).

In Czech et al.'s (2001) study (450 men and 193 women), the majority of people (56% of men and 53% of women) surveyed in the U.S. knew that habitat loss was the

most serious cause of species population declines. Over a third of people (36% of men and 35% of women) believed toxic chemical pollution was the main threat. However, very few subjects (3% of men and 1% of women) realized that invasive species were a major cause. Most participants in the study realized economic factors caused the majority of wildlife species endangerment.

In the D.C. area, particular environmental concerns were seen as a huge threat to marine mammals, while other issues were thought to be little to no threat (Sheridan, 2005). The majority of people gave marine litter, exotic species, oil spills, and toxic chemicals a 'serious' ranking, while reduction of available prey received a 'moderate' status (Sheridan, 2005). Nutrient pollution, sewage bacteria, and air pollution were mostly graded as either 'serious' or 'moderate' (Sheridan, 2005). Military activities and climate change were usually seen as a 'minor' risk (Sheridan, 2005). Lastly, whale-watching was seen as 'minor' or 'no' threat to marine mammals (Sheridan, 2005). In a suburban area of Arizona, the public thought that urban expansion, declination of habitat and prey species, and increased human-wildlife encounters were reasons for mountain lion population loss (Casey et al., 2005).

Public perception of these issues can vary by group. Population characteristics, such as gender, age, and education, can influence threat perception (O'Connor et al., 1999). O'Connor et al. (1999) stated that women who were environmentally inclined were more willing than ecologically focused men to change personal environmental behaviors in their lives to solve climate change. This is perhaps because women may view the earth as in danger more often than men do (Bord and O'Connor, 1997). But

men, older, and also highly educated people were more likely to support climate change legislation and policies even if all the threats of global warming are still unknown (O'Connor et al., 1999).

Participation in conservation activities or acceptance of issues may be influenced by people's perception of the circumstances surrounding an issue. Overall, illegal harvesting is considered a minor threat in the endangerment of animals (Czech et al., 2001), though, for some species like the Louisiana black bear, overharvesting can cause serious population declines (Cotton, 2008). In Sheridan's (2005) marine mammal survey in the D.C. area, people seemed to have strong views against whaling, and they supported whale hunting only under specific circumstances. A quarter of participants (out of 240 people) were extremely against whale hunting and a third of subjects were simply against it. About 17% were for whale hunting only if it was just done by native cultures, and another 17% backed it merely for scientific research. In Driscoll's (1995) attitude survey, most people in the U.S. seemed to approve of fishing (92.5% out of 133 subjects) but subjects seem to have mixed opinions on whether they supported hunting (56.4% of subjects approved of hunting). Driscoll (1995) found that 8 out of 10 animal shelter workers (80%) did not support hunting, but 7 workers (70%) approved of fishing. Therefore, people who regularly interact with animals may have different attitudes.

1.4. Support Of Mammal Ecological Issues, Environmental Law, And Conservation Education

Public awareness influences governmental involvement and the creation of ecological legislation and regulations (Talbot, 2008). The U.S. government is generally

more active during time periods of greater public awareness of human-induced ecological changes than in times of less interest (Talbot, 2008). Though ecological issues will probably have more severe and lasting impacts on human society than any other problem, public ecological concerns have not been the U.S. government's main priority in policy making (Woodwell, 2008). Despite this, both the U.S. government and public have overall been more aware and involved in ecological issues in the last fifty years than in prior decades, though the public has not been overly aware of the current Bush administration's attempt to weaken existing environmental regulations (Talbot, 2008). Environmental issues need to become the focus of governmental principles (Talbot, 2008; Woodwell, 2008) and human society (Kellert, 2008) to have a chance to be successfully solved.

Public perception of the environment and ecosystems can have huge impacts on policy. Public opinions often lead to personal environmental involvement and actions, which in turn may lead to the formation of laws (Talbot, 2008). The general public can influence the creation of legislation by applying public pressure on the government (Talbot, 2008; Woodwell, 2008) and by taking a personal active role in policy making (Kellert, 2008). Public participation in the wildlife management process could increase local support of species and policies (Kellert, 1985) by instilling a sense of ownership of the issue (Lee Talbot personal communication, 2005). When people feel they are part of an issue, they may be more inclined to protect a species or an area and support local laws (Lee Talbot personal communication, 2005).

Concern and support for conservation policies are high in many urban areas (Parsons et al., 2003; Casey et al., 2005; Scott and Parsons, 2005; Sheridan, 2005). In a recent survey done in the D.C. metropolitan area, most participants (90% of 240 people) stated that they would participate in certain ecological activities to benefit the environment, including following conservation policies (Sheridan, 2005). In addition, support for mammal conservation measures and strategies can be high for mammal species in urban areas even if local knowledge levels of that species are low (Casey et al., 2005; Morzillo et al., 2007).

Many factors influence public support of conservation issues, such as a species' perceived value or attributes (Driscoll, 1995; Goedeke, 2004). The general public in the U.S. regards mammals as one of the important groups of taxa to preserve (Czech et al., 2001). People tend to want to protect species, such as mammals, that are large, attractive, perceived to be similar to humans, thought to be intelligent, or that have the ability to feel emotions or pain (Kellert, 1985).

In the U.S., large mammals seem to be very well-liked and mammals also rate high as 'important' species (Driscoll, 1995). Driscoll (1995) stated that it might be easier to gather support for ecological matters involving large mammal species, like otters, than to get support for similar issues involving animals generally not liked, such as reptiles or fish. But though many large mammals are seen as 'charismatic mega-fauna', some negatively viewed mammals are often persecuted. To increase support of conservation for negatively viewed species, more education may be needed for species that are seen as less attractive or that are not accepted (Driscoll, 1995). Opinions of undesirable qualities

and values of animals may affect environmental policies regarding those species (Kellert, 1985; Driscoll, 1995). Negative perceptions of species have led to extermination policies or even the torture of animals (Goedeke, 2004).

Lack of understanding of laws can lead to disdain, lack of support, and, in some cases, maltreatment of species. In some cases, registering a species under a conservation law, such as the Endangered Species Act of 1973 (ESA), may obstruct protection of that species if stakeholders don't believe it is essential (Elmore et al., 2007). Many laws have been passed to protect marine life and mammals, including the Marine Mammal Protection Act of 1972 (MMPA) and the ESA. The manatee was also protected in Florida by an 1893 manatee state law (Goedeke, 2004). Though the MMPA and ESA have been effective in helping many species, initially they, and the Florida manatee state law, seemed to have little effect in preserving the manatee: throughout the 1970s manatees were often injured and tortured since they were not well understood and were seen as an undesirable species by the public (Goedeke, 2004).

Acceptance of species has led to support of conservation law. By 1996, once manatees were well-liked, most people in Florida considered manatee protection laws to be either 'very important' or 'somewhat important' (Goedeke, 2004). Furthermore, although some species of large cats are seen as 'dangerous' (Driscoll, 1995), in a suburban area of Arizona, the majority of residents supported the preservation of mountain lions in the nearby park (83% out of 493 people) and the nearby mountains (86%), and thought that efforts to protect mountain lion populations were 'important' (90%) (Casey et al., 2005).

There can be a wide range of opinions and indecision in environmental voting patterns. For example, in O'Connor et al.'s study in the U.S. (1999), subjects had mixed views on hypothetic climate change-related legislation. For almost every situation, most people voted 'probably yes' or 'probably no'. An increase in gas taxes was the only policy that overwhelmingly received a 'definitely no' vote. In the above survey, the majority of people would probably not support an energy use tax on businesses. Though it was close, they also would not vote for federal governmental backing for an international group to implement treaties to reduce climate change. Most subjects stated that they would vote 'probably yes' to conserve rainforests and to increase car fuel efficiency, and, to a lesser extent, they would also vote for heating and cooling standards in public buildings. Though people did not support a huge increase in gas taxes, they did narrowly support a tax on 'gas guzzlers' (cars that used gas inefficiently).

Many demographics play a role in support of environmental issues and regulations. Gender, age, and education level may affect support for mammal protection. In Czech et al.'s study (2001), both genders in the U.S. valued species conservation nearly the same, but women participants seemed to support more species conservation than men. More females (62% out of 643 people) backed strengthening the Endangered Species Act than males (45%; Czech et al., 2001). In Morzillo's et al.'s (2007) study in Texas, subjects who were members of ecological groups, males, people with high incomes, and younger participants were more likely to support a larger local black bear population.

In another suburban area, more females than males believed that certain mammals like mountain lions should be protected in every region, and females tended to disagree with the phrase 'mountain lions should not be protected under any situations' more often than males did (Casey et al., 2005). Participants who were between the ages of 18 and 40 years old generally opposed the concept that mountain lions should be protected just within natural areas like a park, and thought that they should be protected in other areas too. While subjects older than 55 thought mountain lions should be captured or shot near human settlements (Casey et al., 2005). In this study, as education increased, people supported conservation more. However, some demographics like length of residency did not seem to affect what people thought about mammal protection (Casey et al., 2005).

Demographics, such as gender, age, and education, play a role in support of voluntary environmental actions and proposed ecological legislation for climate change. In O'Connor et al.'s study (1999) females supported voluntary ecological actions more often than men, while men backed proposed new federal legislation more frequently than did women. Age and education were also factors in voting intention; older and highly educated subjects were more likely to support legislation than younger and less educated survey participants.

In places with high education and income levels, there is generally greater support for conservation issues and policies (Parsons et al., 2003; Casey et al., 2005). Education level affects opinions of environmental concerns (Van Liere and Dunlap, 1980; Stern et al., 1985) and support of ecological regulations (Van Liere and Dunlap, 1980). Sometimes support of mammal protection policies vary depending on the circumstances.

In Arizona, most people who reside near Saguaro National Park, a highly suburbanized area, supported mountain lion protection, opposed regulations that would only protect the mammal within natural areas, and were against reinstating a bounty. However, most residents thought they should be captured, or shot, if conflicts with humans arise, or for public safety (Casey et al., 2005).

In the D.C. area, there appears to be strong support for marine mammal conservation (Sheridan, 2005). In Sheridan's (2005) study, most of the subjects, especially those that live near the ocean, considered marine conservation 'very important' or 'important'. However, D.C. area residents were mixed on their views on the effectiveness of federal regulations and protection. Most respondents in the study (38% out of 240 people) were uncertain. About 29% believed marine mammals were adequately protected, while another 29% disagreed and said they were not effectively protected. A small percent (approximately 5%) said they were protected too much. These mixed viewpoints may indicate the support of the creation of new legislation for mammal conservation (Sheridan, 2005).

A few studies have shown public support for more mammal and urban wildlife educational opportunities. A negative viewpoint can be shifted to a more positive perception through education, which can lead to public support of the species (Goedeke, 2004). It is thought that education of the public was the key that helped save the manatee. Over the course of just two decades, public education lead to a shift in perception that helped save the species, which are now regarded as gentle and benevolent (Goedeke, 2004). As positive values (which are related to knowledge levels) increase,

support to protect animals also increases (Goedeke, 2004). Therefore, it may be necessary to educate people on the aesthetic or utilitarian uses (commodity and usefulness) of species that are currently not valued much, to garner support for their preservation (Kellert, 1985).

Woodwell (2008) argues that more public environmental welfare should be taught in schools. Urban wildlife management classes are not usually taught in most university wildlife biology programs (Adams et al., 2006). In traditionally taught wildlife management programs, the focus of course work or training generally only focuses on the biological aspects of wildlife, such as taxonomy, and does not include the social, economical, and political issues surrounding wildlife management, such as wildlife laws, urban wildlife issues, and human-wildlife conflict resolution (Adams et al., 2006). Furthermore, the public, including some authorities in the field, do not realize that there is much scientific literature on urban wildlife issues (Adams et al., 2006). At George Mason University, the largest university in the Fairfax County area, the graduate level environmental program focuses on both science and social science (in particular policy) and in recent years, urban wildlife-related seminars have also been offered. Undergraduate urban wildlife classes have also been developed (E.C.M. Parsons personal communication, 2009).

1.5. Urban Wildlife Issues And Public Perception In Fairfax County

Fairfax County is a rapidly developing suburban environment. It is the most populous jurisdiction in both the Commonwealth of Virginia and Washington D.C.

metropolitan area (Fairfax County Government, 2009a). Population, education levels, and income are high in the area compared to the national average (Fairfax County Government, 2009a).

Though Fairfax County is highly urbanized, mammal diversity is rich. Out of the 118 mammal species currently recorded in Virginia, forty-seven species have been reported in the Fairfax County area (Virginia Department of Game and Inland Fisheries, 2009). Mammal species present in the area include white-tailed deer, little brown bats, northern river otters, red foxes, grey foxes, coyotes, American beavers, two subspecies of the striped skunk, and raccoons (Table 1; Virginia Department of Game and Inland Fisheries, 2009).

Fairfax County residents frequently encounter many wildlife mammal species. Deer are overabundant in the area (Fairfax County Environmental Quality Advisory Council, 2008) so it is not uncommon to see them foraging in residential areas (Fairfax County Park Authority, 2009a). Squirrels are also plentiful and are familiar sights in many people's yards (Fairfax County Park Authority, 2009a). In the last few years, there have been several news articles and reports of coyote sightings in the county (Fairfax County Environmental Quality Advisory Council, 2008). Foxes often visit residential areas when searching for food (Fairfax County Park Authority, 2009a).

In Fairfax County, mammal wildlife concerns include deer overpopulation issues such as vehicle collisions, frustration over animal property damage to trees, land, or houses (Fairfax County Environmental Quality Advisory Council, 2008; Fairfax County Police Department Animal Services Division, 2009), flooding from animal-built dams

(Fairfax County Park Authority, 2009b), and fear of animal diseases like rabies (Centers for Disease Control and Prevention, 1998; Fairfax County Environmental Quality Advisory Council, 2008). Other wildlife concerns are fear of animals like coyotes (Fairfax County Environmental Quality Advisory Council, 2008; Fairfax County Park Authority, 2009a) or foxes (Fairfax County Park Authority, 2007a), exotic species especially invasive plants (Fairfax County Environmental Quality Advisory Council, 2008; Fairfax County Park Authority, 2009c), and misconceptions of wildlife and issues (Fairfax County Environmental Quality Advisory Council, 2008). As Fairfax County becomes increasingly urbanized, more human-wildlife conflicts or interactions are likely to occur.

Public perception of mammals and mammal conservation has not been studied extensively in the Fairfax County area. One unpublished study was done in 2005 on public perception of marine mammals in the D.C. metropolitan area, which included a study site in Fairfax County (Sheridan, 2005). Another George Mason University graduate student recently completed her master's thesis on public perception of coyotes in the D.C. area, which included surveying students at George Mason University (Draheim, 2007). The Fairfax County Government has conducted social surveys on deer in the past (Fairfax County Environmental Quality Advisory Council, 2008) but it was not possible to attain these data. The Virginia Department of Game and Inland Fisheries agency has developed wildlife management plans for white-tailed deer (Virginia Department of Game and Inland Fisheries, 2007) and black bears (Virginia Department of Game and Inland Fisheries, 2002). These management plans contain data on public

perception, but are statewide plans and do not focus solely on the county.

The Fairfax County Government offers many kinds of public information and educational opportunities to address local wildlife concerns. Types of information include brochures that are available at many of the area's parks or on their website (Fairfax County Environmental Quality Advisory Council, 2008), recommendations on how to deal with the issues (Fairfax County Police Department Animal Services Division, 2009; Fairfax County Park Authority, 2009d; Fairfax County Park Authority, 2006b), public wildlife education classes and workshops (Fairfax County Police Department Animal Services Division, 2009; North Virginia Soil and Water Conservation District, 2009), and the Environmental Quality Advisory Council's (EQAC) annual report on the environment (Fairfax County Environmental Quality Advisory Council, 2008). The EQAC's 2008 report emphasizes the importance of public input and education in alleviating wildlife problems, and focuses on key local ecological issues such as deer and geese overpopulation, coyotes, and wildlife borne diseases (Fairfax County Environmental Quality Advisory Council, 2008).

The Fairfax County Park Authority suggests four main steps that the public can use to help reduce wildlife conflicts (Fairfax County Park Authority, 2006c). The Park Authority advocates tolerance or public comprehension that most behaviors that cause conflicts are seasonal and temporary (Fairfax County Park Authority, 2006c). Another recommendation is 'wildlife proofing' property (Fairfax County Park Authority, 2006c). An example of this would be wrapping trees with hardware cloth to prevent beaver damage (Fairfax County Park Authority, 2006c). The third step is certain harassment

techniques such as filling in woodchuck burrows (Fairfax County Park Authority, 2006c). For harassment techniques it may be necessary to get a permit or permission from the property owner (Fairfax County Park Authority, 2006c). As a last resort, population control (which always requires a permit) can be tried (Fairfax County Park Authority, 2006c).

Deer overpopulation is one of the main wildlife-related environmental problems in Fairfax County (Fairfax County Environmental Quality Advisory Council, 2008). Though the actual population number for the whole Fairfax County population is not known, the white-tailed deer population is thought to be above the carrying capacity in many of the area's parks according to the Fairfax County Environmental Quality Advisory Council (2008). While white-tailed deer are abundant in contemporary times, they were uncommon in Virginia in the early 1900s (Fairfax County Park Authority, 2006c). Most of the local deer population is in poor health. The majority of individuals in most herds are in either fair or poor health, some are very gaunt, and very few are in excellent or good physical states (Fairfax County Environmental Quality Advisory Council, 2008).

There are few natural controls or conditions that exist in Fairfax County to help keep the population in balance. There is a lack of the deer's natural predators in the county like wolves and mountain lions (Fairfax County Environmental Quality Advisory Council, 2008). Sport hunting has nearly vanished from the area (Fairfax County Environmental Quality Advisory Council, 2008). Though there is some recreational hunting and targeted hunting of deer to help reduce population size, hunting does not

have enough of an impact on the local deer population to help solve Fairfax County's deer-related problems (Fairfax County Environmental Quality Advisory Council, 2008). One possible natural control is disease, such as epizootic hemorrhagic disease (Fairfax County Environmental Quality Advisory Council, 2008). However, since it has only recently manifested in the population, it is unknown how this disease will affect the current deer population over time (Fairfax County Environmental Quality Advisory Council, 2008).

As an area becomes more urbanized, the local deer herds are often pushed into smaller, fragmented natural habitats, which are unable to support their high population densities (Fairfax County Environmental Quality Advisory Council, 2008). Once they exhaust the plant wildlife in these habitats, they generally move into local neighborhoods to forage for food, which causes human-wildlife conflicts (Fairfax County Environmental Quality Advisory Council, 2008). In Fairfax County deer-related wildlife issues and complaints include car crashes, the spreading of Lyme disease (Fairfax County Environmental Quality Advisory Council, 2008), and the overconsumption of plants or gardens (Fairfax County Park Authority, 2006c; Fairfax County Environmental Quality Advisory Council, 2008).

The Insurance Institute for Highway Safety rates Virginia as one of the top states (#7) with the greatest amount of deer vehicle accidents in the U.S. (Fairfax County Environmental Quality Advisory Council, 2008). About 4,000 to 5,000 deer-related car accidents occur in Fairfax County annually (Fairfax County Police Department Animal Services Division, 2009; Fairfax County Park Authority, 2009d; North Virginia Soil and

Water Conservation District, 2009). Estimated car damage is about $1,982 per automobile (Fairfax County Park Authority, 2009d; North Virginia Soil and Water Conservation District, 2009). Though some figures from the Insurance Institute for Highway Safety indicate that the average insurance claim is much higher, ranging from $2,600 (for car damages only) to $11,000 (when also considering physical injuries).

Deer are also responsible for property damage to ornamental plants (Fairfax County Environmental Quality Advisory Council, 2008; Fairfax County Police Department Animal Services Division, 2009; North Virginia Soil and Water Conservation District, 2009), which cost residents about a million dollars or more yearly (North Virginia Soil and Water Conservation District, 2009). Deer not only browse on ornamental plants but also consume vast amounts of threatened and endangered species (Fairfax County Environmental Quality Advisory Council, 2008). Over browsing is so prevalent that visible browse lines are widespread occurrences in most local parks (Fairfax County Environmental Quality Advisory Council, 2008). Decimation of local native plant life, especially the plant understory, affects smaller vertebrate and invertebrate species that have difficulties in contending with deer for resources (Fairfax County Environmental Quality Advisory Council, 2008; Fairfax County Police Department Animal Services Division, 2009; North Virginia Soil and Water Conservation District, 2009). Eradication of the understory leads to decreases of food supplies and living areas for other species (Fairfax County Police Department Animal Services Division, 2009; North Virginia Soil and Water Conservation District, 2009), which may in turn cause population declines of animals especially native birds (Fairfax County Environmental Quality Advisory

Council, 2008).

The Fairfax County Board of Supervisors implemented the Fairfax County Deer Management Plan in 1998 to tackle deer overpopulation issues (Fairfax County Environmental Quality Advisory Council, 2008; North Virginia Soil and Water Conservation District, 2009). In 1997, it was proposed that certain human wildlife management procedures, including deer population control, should only be implemented if there is adequate public backing (Fairfax County Environmental Quality Advisory Council, 2008). The Fairfax County Government recommends that residents deter deer from their property by erecting an eight-foot tall fence (Fairfax County Park Authority, 2009a) and by planting less favorable native plants (Fairfax County Environmental Quality Advisory Council, 2008; Fairfax County Police Department Animal Services Division, 2009; North Virginia Soil and Water Conservation District, 2009). The Government also provides information on what to do during or to avoid car collisions with deer (Fairfax County Police Department Animal Services Division, 2009; Fairfax County Park Authority, 2009d), including practicing defensive driving (Fairfax County Park Authority, 2006b). Though county officials hold seminars or programs to educate the public about the issues (Fairfax County Police Department Animal Services Division, 2009; North Virginia Soil and Water Conservation District, 2009), many management methods, such as fencing and planting undesirable native plant species, are becoming less and less successful as deer population density continues to increase (Fairfax County Environmental Quality Advisory Council, 2008). Other management initiatives include compiling data from residents on deer damage; examining herd size; and supervised

hunts or using police sharpshooters to help reduce overpopulation (North Virginia Soil and Water Conservation District, 2009).

In the Virginia Department of Game and Inland Fisheries' deer management plan (2007), some respondents supported reducing white-tail deer populations in Virginia, while others thought that deer were not overpopulated in the state but that the true problem was lack of adequate deer habitat. Deer-related damage to ornamental plants and vehicle collisions also seemed to be concerns among some participants (Virginia Department of Game and Inland Fisheries, 2007). A few subjects in the statewide survey considered the deer population in Fairfax County to be too large (Virginia Department of Game and Inland Fisheries, 2007). However, in a 2005 survey reported in the deer management plan, 62% of parents of high school students who partook in a deer education project (13 out of 21 people) thought that deer population size in Fairfax County was 'just right' (Virginia Department of Game and Inland Fisheries, 2007). County administrative officials in a different 2005 survey stated that they thought that residents would consider the white-tail deer population to be 'too large' (Virginia Department of Game and Inland Fisheries, 2007).

Beavers are thought to be a 'keystone' species because of their ability to positively affect ecosystems (Fairfax County Park Authority and Pless, 2009). Beaver populations are uncommon in the eastern U.S (Fairfax County Park Authority, 2006a). In 1911, beaver and other animals such as the Carolina parakeet, bison, and elk were eradicated in Virginia (Fairfax County Park Authority, 2006c). The beaver is a reintroduced native species (Fairfax County Park Authority, 2006c; Fairfax County Environmental Quality

Advisory Council, 2008).

Animal built structures such as beaver dams help improve water quality by removing impurities and pollution from local waterways (Fairfax County Park Authority, 2006a). Beaver dams form pools and wetlands, which are excellent habitats for plant life and other animal species (Fairfax County Park Authority, 2006a; Fairfax County Park Authority, 2009a; Fairfax County Park Authority and Pless, 2009). Their dams also help reduce soil erosion (Fairfax County Park Authority and Pless, 2009) and control flooding (Fairfax County Park Authority, 2009a; Fairfax County Park Authority and Pless, 2009).

One in every five wildlife complaints in Fairfax County is related to beavers (Fairfax County Park Authority, 2006c). Local human wildlife concerns involving beavers include property damage of trees, flooding damage to property (Fairfax County Park Authority, 2006a; Fairfax County Park Authority and Pless, 2009), the creation of ponds that are too deep for human uses (Fairfax County Park Authority, 2006a), and changing the water flow of a stream (Fairfax County Park Authority and Pless, 2009). The Fairfax County Park Authority tries to reduce conflicts by educating the public about the beaver's life history and offers tips on how to minimize property damage like covering trees with hardware cloth (Fairfax County Park Authority and Pless, 2009).

In Fairfax County, there are four main wildlife diseases that are considered concerns in the area (Fairfax County Environmental Quality Advisory Council, 2008). Three of them are mammal-related diseases: rabies, diseases caused by fecal coliforms, and (indirectly) Lyme disease (Fairfax County Environmental Quality Advisory Council, 2008). The fourth disease, West Nile, is mosquito and bird-related (Fairfax County

Environmental Quality Advisory Council, 2008).

Rabies is a disease that affects the central nervous system, and it is transmitted through the salvia of an infected mammal (Centers for Disease Control and Prevention, 1998; Fairfax County Environmental Quality Advisory Council, 2008). Many mammal species can be carriers of rabies, including skunks, raccoons (Centers for Disease Control and Prevention, 1998; Fairfax County Environmental Quality Advisory Council, 2008), bats (Centers for Disease Control and Prevention, 1998; Fairfax County Environmental Quality Advisory Council, 2008; Fairfax County Park Authority, 2009a), foxes (Centers for Disease Control and Prevention, 1998; Fairfax County Park Authority, 2007a; Fairfax County Environmental Quality Advisory Council, 2008), coyotes (Centers for Disease Control and Prevention, 1998), groundhogs, cats, and dogs (Fairfax County Environmental Quality Advisory Council, 2008). Bats are usually the primary carriers of rabies in the U.S. (Centers for Disease Control and Prevention, 1998). However in Fairfax County, the majority of rabies cases have involved raccoons (Fairfax County Environmental Quality Advisory Council, 2008). Infected foxes and skunks have also been responsible for some of the local cases of rabies, while bats have only been an occasional carrier in the area (Fairfax County Environmental Quality Advisory Council, 2008). Dogs and cats are sometimes secondary transmitters, spreading the virus after being infected by wildlife (Fairfax County Environmental Quality Advisory Council, 2008).

By the end of 2006 (during the time this survey was conducted), there had been 59 confirmed rabies cases in Fairfax County (Virginia Department of Health, 2006).

Raccoons accounted for 37 of those occurrences, foxes were responsible for 8 instances, and there were 5 reported cases of skunks carrying rabies. A total of 637 rabies cases occurred in Virginia that year (Virginia Department of Health, 2006). In 2008, there were 39 cases of rabies in Fairfax County, and most of them (24) were raccoon-related (Virginia Department of Health, 2008). The Fairfax County Government suggests several preventative measures, including avoiding contact with a suspected infected animal, contacting the Fairfax County Animal Services Department to deal with the mammal, and seeking medical help if there is contact with an animal's saliva or if wounded (Fairfax County Environmental Quality Advisory Council, 2008).

Fecal coliform diseases are usually caused by exposure to waters contaminated with excessive animal feces, usually from geese or sometimes ducks, and occasionally from mammal species like deer, raccoons, foxes, dogs, and cats (Fairfax County Environmental Quality Advisory Council, 2008). Sicknesses from fecal coliform are generally not acute (Fairfax County Environmental Quality Advisory Council, 2008). Local government management strategies include monitoring pollution in local waters (like streams), and educating the public on reducing exposure to potentially polluted waters (Fairfax County Environmental Quality Advisory Council, 2008).

White-tailed deer may increase exposure to Lyme disease since they are often infested with deer ticks (*Ixodes scapularis*), which carry the bacteria responsible for the disease (Fairfax County Environmental Quality Advisory Council, 2008; Fairfax County Police Department Animal Services Division, 2009). Deer can inadvertently transport infected deer ticks throughout the county (Fairfax County Police Department Animal

Services Division, 2009; Fairfax County Park Authority, 2006b). Rodents are also sometimes infested with deer ticks (Fairfax County Environmental Quality Advisory Council, 2008). In Fairfax County, there were 102 reported cases in 2006 and 158 cases in the first ten months of 2007 (Fairfax County Environmental Quality Advisory Council, 2008). Management tools include educating the public to reduce their exposure to the deer ticks such as outside clothing choices and insect repellents (Fairfax County Health Department, 2007; Fairfax County Environmental Quality Advisory Council, 2008).

In recent years there have been reports of coyotes in the D.C. region (Fairfax County Environmental Quality Advisory Council, 2008; Draheim, 2007). Many residents in Fairfax County are afraid that coyotes will attack them, their family, or pets (Fairfax County Environmental Quality Advisory Council, 2008; Fairfax County Park Authority, 2009b). People attacks are not a large concern, however, pet attacks are a slight issue in the area. Coyote pet attacks are pretty rare, and are most of time preventable (Fairfax County Environmental Quality Advisory Council, 2008). Coyotes tend to avoid contact with people (Fairfax County Park Authority, 2009b), and pet attacks usually only occur when coyotes are attracted to an area by another factor, such as outside pet food bowls or inappropriately discarded trash (Fairfax County Environmental Quality Advisory Council, 2008). Coyotes are very beneficial to the ecosystem. They help keep the rodent population in check (Fairfax County Environmental Quality Advisory Council, 2008; Fairfax County Park Authority, 2009b) and eat small deer fawns, but generally they do not hunt adult deer (Fairfax County Environmental Quality Advisory Council, 2008). They also like eating Canadian goose eggs, which in the future

may help keep the overabundant geese population in balance (Fairfax County Environmental Quality Advisory Council, 2008; Fairfax County Park Authority, 2009b). The Fairfax County Government does not have many management protocols in place for coyotes other than observation and education. The Fairfax County Police Department Animal Services Division's wildlife biologist monitors the population and also educates the public on the habits and benefits of coyotes (Fairfax County Environmental Quality Advisory Council, 2008). Like other species, the Fairfax County Government suggests using tight trashcan lids, and not leaving pet food or food out on compost piles during evening hours (Fairfax County Park Authority, 2009b). It is also mentioned that they are easily scared off by yelling (Fairfax County Park Authority, 2009b).

Some people are also fearful of foxes (Fairfax County Park Authority, 2007a). In addition to potential infections from rabies, foxes can also spread mange (caused by mites which irritates the skin and hair) to dogs, but not usually to humans or other pets (Fairfax County Park Authority, 2007a). One of the main complaints against foxes in the area is the noise factor: they may bark loudly during mating season (Fairfax County Park Authority, 2007a; Fairfax County Park Authority, 2006c). In addition there have been a few reports of them staring at people, taking newspapers, and meddling with bird feeders (Fairfax County Park Authority, 2009a). The Fairfax County Park Authority recommends several actions to dissuade foxes from an area, including acting intimidating by waving your arms and yelling to scare them off, placing bird feeders high off the ground far away from houses, and not leaving pet food unwatched outside (Fairfax County Park Authority, 2007a).

Other local wildlife mammals that people have concerns with include skunks, squirrels, and northern river otters. Skunks are beneficial to the environment since they eat insects and rodents (Fairfax County Park Authority, 2009a). Occasionally skunks may establish their burrows under someone's deck (Fairfax County Park Authority, 2009a). The Fairfax County Park Authority suggests blocking the burrow (first making sure that the animal is out before filling) or by placing mothballs in a container with holes in the tunnel (Fairfax County Park Authority, 2009a). People are sometimes concerned with squirrels living in their attics or chimneys (Fairfax County Park Authority, 2006c) but the most common squirrel worry is simply people not seeing them around (Fairfax County Park Authority, 2009a). The Virginia Department of Game and Inland Fisheries gives the northern river otter a status of 'State Special Concern' because they are sensitive to polluted waters since toxins easily bio-accumulate in their bodies (Virginia Department of Game and Inland Fisheries, 2009). Overharvesting of river otters is also a concern in Virginia (Virginia Department of Game and Inland Fisheries, 2009).

Lastly, the Fairfax County Park Authority advocates planting native species in resident's yards to attract wildlife species (Fairfax County Park Authority, 2007b). Types of recommended native plants include elderberries, spicebush, Virginia pine, paw paw, and cinnamon ferns (Fairfax County Park Authority, 2007b). Wildlife animal species that these plants can attract are birds and butterflies, and some plants like the trumpet creeper are hardy plants that can survive being excessively eaten by deer (Fairfax County Park Authority, 2007b).

Demographic and economic statistics for Fairfax County were also researched to

confirm that the sample population adequately represents the actual population. Current population size is over one million (Fairfax County Government, 2009b). Educational attainment for Fairfax County is higher than the national average. In 2006, 58.7% (±0.9%) of the Fairfax population had a bachelor's degree or higher (U.S. Census Bureau, 2006a). Nationally, only about 25.5% completed a college degree or higher (U.S. Census Bureau, 2006b). In 2006, the median age for Fairfax County was 38.4 (U.S. Census Bureau, 2006a). Median household and family incomes in the area were $100,318 (±1974) and $119,812 (±2664) in 2006, respectively (U.S. Census Bureau, 2006a). In 2006, people under 20 years of age accounted for 27.5% of the Fairfax County population (277,585 out of 1,010,443 people), 20 to 34 years olds made up 16.6% of residents (167,668 people), 35 to 54 year olds composed 33.5% of the local populace (338,970 people), 13.2% of inhabitants were 55 to 64 year olds (133,558 people), and 65 year old and older made up 9.2% (92,662 people; U.S. Census Bureau, 2006a). In 2006, about 40.9% of residents 16 years old and older (321,117 out of 785,314 people) in Fairfax County had professional jobs (includes civilian labor and military), 29.6% (232,536 people) had skilled or unskilled labor occupations (such as service, sales, agriculture, construction or production type jobs), 27% of people (212,160) older than 16 years old were not in the labor force (so either were non-workers or retired), and 2.5% of locals (19,501) were unemployed (U.S. Census Bureau, 2006a).

Table 1. Mammal species recorded in Fairfax County (Virginia Department of Game and Inland Fisheries, 2009)

Common Name	**Scientific Name**
Bat, little brown	*Myotis lucifugus lucifugus*
Myotis, northern	*Myotis septentrionalis septentrionalis*
Bat, silver haired	*Lasionycteris noctivagans*
Pipistrelle, eastern	*Pipistrellus subflavus subflavus*
Bat, big brown	*Eptesicus fuscus fuscus*
Bat, eastern red	*Lasiurus borealis borealis*
Bat, hoary	*Lasiurus cinereus cinereus*
Beaver, American	*Castor canadensis*
Bobcat	*Lynx rufus rufus*
Chipmunk, Fisher's eastern	*Tamias striatus fisheri*
Cottontail, eastern	*Sylvilagus floridanus mallurus*
Coyote	*Canis latrans*
Deer, white-tailed	*Odocoileus virginianus*
Fox, common grey	*Urocyon cinereoargenteus cinereoargenteus*
Fox, red	*Vulpes vulpes fulva*
Lemming, Stone's southern bog	*Synaptomys cooperi stonei*
Mink, common	*Mustela vison mink*
Mole, eastern	*Scalopus aquaticus aquaticus*
Mole, star-nosed	*Condylura cristata cristata*
Mouse, eastern harvest	*Reithrodontomys humulis virginianus*
Mouse, house	*Mus musculus musculus*
Mouse, meadow jumping	*Zapus hudsonius americanus*
Mouse, northern white-footed	*Peromyscus leucopus noveboracensis*
Mouse, prairie deer	*Peromyscus maniculatus bairdii*
Muskrat, large-toothed	*Ondatra zibethicus macrodon*
Otter, northern river	*Lontra canadensis lataxina*
Opossum, Virginia	*Didelphis virginiana virginiana*
Raccoon	*Procyon lotor lotor*
Rat, black	*Rattus rattus rattus*
Rat, Norway	*Rattus norvegicus norvegicus*
Rat, marsh rice	*Oryzomys palustris palustris*
Squirrel, northern grey	*Sciurus carolinensis pennsylvanicus*
Squirrel, talkative red	*Tamiasciurus hudsonicus loquax*
Squirrel, eastern fox	*Sciurus niger vulpinus*
Squirrel, southern flying	*Glaucomys volans volans*
Shrew, southeastern	*Sorex longirostris longirostris*
Shrew, pygmy	*Sorex hoyi winnemana*
Shrew, Kirtland's short-tailed	*Blarina brevicauda kirtlandi*
Shrew, least	*Cryptotis parva parva*
Skunk, striped	*Mephitis mephitis nigra*
Skunk, striped	*Mephitis mephitis mephitis*
Vole, common Gapper's red-backed	*Clethrionomys gapperi gapperi*
Vole, meadow	*Microtus pennsylvanicus pennsylvanicus*
Vole, pine	*Microtus pinetorum scalopsoides*
Weasel, least	*Mustela nivalis allegheniensis*
Weasel, long tailed	*Mustela frenata noveboracensis*
Woodchuck	*Marmota monax monax*

1.6. Goals And Implications Of Research

This project explores public perception of mammals, conservation, and urban wildlife issues. An ecological social survey was conducted in Fairfax County on local mammal knowledge, involvement in wildlife activities and public perception of mammal environmental issues, and support of mammal conservation, education, and legislation. Local level of knowledge of mammals in the general public was determined by testing knowledge of the number of the area's mammal species, ability to identify pictures of native mammal species, and awareness of local and non-local mammals. Local attitudes of mammals and conservation were studied by asking respondents questions that pertained to their involvement in ecological practices, perceptions of threats to local mammals, and concern of local urban wildlife issues. Subjects were also asked whether they desired planting a wildlife garden to attract wildlife. Lastly, public support of mammal conservation, policies, and education were also investigated. Various demographic groups were examined to determine whether they have similar or different levels of knowledge, attitudes, and support of mammals and mammal conservation issues. These groups included residency, gender, age, occupation, annual household income level, education level, formal environmental education, and environmental group membership.

This study on public perception of mammals and mammal conservation in Fairfax County has many implications. The data might assist local urban wildlife managers in alleviating human-wildlife conflicts. The ecological social survey will supply data on local attitudes and perceptions of mammals, environmental concerns, and mammal

conservation issues, which may be helpful in establishing urban wildlife management policy. It also assessed local level of knowledge of mammals and mammal conservation. The questionnaire may indicate low or high levels of knowledge of mammals, and ecological and urban wildlife issues. In addition, it may help determine if more mammal conservation education is needed in the area, and if there is local support for increased mammal conservation education in schools. Furthermore, the study may also infer support for or opposition against current and future federal mammal conservation legislation, policies, and laws. This research is one of the few studies on the subject conducted in the Fairfax County area, and could provide a basis for future work, and may be the first step in determining changing local attitudes over time.

2. Materials And Methods

2.1. Study Area And Sites

Fairfax County is located approximately 12 miles west of Washington D.C. in the Commonwealth of Virginia (City of Fairfax Government, 2009), and is part of the D.C. metropolitan area. It is comprised of 395 square miles or 252,828 acres (U.S. Census Bureau, 2000; Fairfax County Government, 2009b). About 140 square miles are forested or open lands, and 3 square miles are farmlands (Fairfax County Environmental Quality Advisory Council, 2008). In 2006, Fairfax County had an estimated population of 1,037,311 (Fairfax County Department of Systems Management for Human Services, 2006). Though highly urbanized, the Fairfax County Park Authority manages 420 parks, which encompass approximately 24,000 acres of public parkland (Fairfax County Park Authority, 2009e). State and federal parks account for about another 1,000 acres. Local, state, and federal parks total over a tenth of Fairfax County's land area (Fairfax County Park Authority, 2009f). Currently, 47 wildlife mammal species inhabit the area (Table 1; Virginia Department of Game and Inland Fisheries, 2009).

Sampling sites in this study consisted of George Mason University (Fairfax Campus) and a shopping center. George Mason University is the largest university in the region, and the Fairfax Campus is located in Fairfax, VA, in the Fairfax District of Fairfax County. The campus encompasses approximately 1.06 square miles or 677 acres

(George Mason University, 2008a). There are currently about 30,714 enrolled students (George Mason University, 2008b). Surveying at George Mason University was conducted at the main student campus center: the George W. Johnson Center. The second location was the Best Buy (store #273) located in Fair Lakes Shopping Center in Fairfax, VA. Fair Lakes Shopping Center is an extremely busy shopping center, which includes several popular restaurants and stores.

2.2. Survey Methodology

In the initial design of the survey, questions were devised and demographics were chosen. Previous studies and questionnaires were then examined to see how similar types of questions were asked, and to gather more ideas on the kinds of questions and demographics to use in the study. Question format and social survey design were also researched to avoid generating bias from the wording of the questions' sentence structure. After designing the survey, it was submitted to George Mason University's Human Subjects Board. In addition, the survey was reviewed by thesis committee members and, as suggested by White et al. (2005), pre-tested by a small sample of the target population for feedback and to verify question comprehension, and then revised again. The survey was conducted after the Human Subjects Board approved the final version of the questionnaire.

During the winter of 2006-2007, the social surveys were distributed to members of the general public at the study sites. Only adults, aged 18 and older, were surveyed. Data collection was completed by in-person interviews and was conducted from late

November 2006 through March 2007. To ensure an unbiased sample, sampling was conducted as described in Parsons (2003) and Parsons et al. (2003). Basically, individuals that passed by were asked to take the survey as soon as the previous participants were finished. Additional information on the subject topics was not provided to the respondents to avoid influencing their answers. Demographic information of the interviewee was collected to determine whether certain economic and social factors influence knowledge level of mammals, attitudes of conservation issues, participation in environmental activities, threat perception of ecological issues to mammals, and support of mammal conservation and related policies and education. A poster asking people to help a graduate student by taking a survey (which included pictures of mammals for photo identification) was used at both study sites.

At George Mason University's Johnson Center, questionnaires were handed out at kiosks (which are made available to organizations, vendors, and students) located on the lower level of the campus center during weekdays, during late November to early December 2006, near the end of the semester. Surveying was done at various times (usually early to late afternoons and also evenings for one to three hour time periods) to get a representative sampling of the population (both the undergraduate and graduate student populations, as well as the faculty and staff). At Best Buy, surveying was conducted on weekends (their busiest days: Friday, Saturday, and Sunday) during two hour time periods in the afternoon from late November to mid March. A small table was set up outside the front entrance of the store, and customers who walked by the table were asked if they would like to take a survey.

A total of 205 surveys (99 surveys at Best Buy, and 106 questionnaires at George Mason University) were collected. Since the study sites were not mutually exclusive populations, the results from both sites were combined to analyze the data. The response rate was 53.5%: 205 out of 383 people approached agreed to take the survey.

The frequencies and percentages of all the demographics were found. Pearson's chi-square test, independent groups t-test, one-way ANOVA, or regression were used to determine knowledge levels, participation in environmental practices and perception of wildlife problems, and support of conservation issues, laws, and education, between demographic groups for each individual question. The alpha level for all statistics is 0.05.

For some of the demographics, the percentages for both the total data (in which all the data were used) and valid data (in which the 'don't know' and non-response answers were dropped) were calculated. For all analysis between groups, only the valid data were used in analysis. In addition, all questions were assigned a number or a number plus a letter in the survey. Questions are referred to their number or number and letter throughout this thesis (in the manner of 'Question number' or 'Question number/letter'). A copy of the survey is located in the Appendix (Appendix A).

2.3. Analysis Methodology For Demographics

The frequencies and percentages of each demographic were found. Demographic groups included residency (Question 1), gender (Question 22), age (Question 23), occupation (Question 26), household annual income (Question 27), education level

(Question 28), formal environmental education (Question 2), and environmental group membership (Question 3). Only the valid data were used (i.e. 'don't know' and non-response answers were dropped during analysis). Demographics and methodology notes are summarized in Table 2. A number of other demographics were asked but were not used in analysis (see Appendix C for frequencies and percentages of unused demographics).

Table 2. Demographics and methodology notes.

Demographic	Question # in survey	Question Asked (Choices of answer given)	Other questions asked	Method Notes
Residency	1	1a: Are you a resident of Fairfax County? (yes/no)	1b: If no, where is your permanent address?	Chi square was also used to compare residency between study sites.
Gender	22	Are you? (male/female)	n/a	
Age	23	What is your year of birth?	n/a	The mean and median were found.
Occupation	26	What is your occupation?	n/a	Occupation was grouped into the following categories: 'professional', 'semi-professional', 'unskilled and skilled labor', 'retired', and 'non-workers'.
Household Annual Income	27	What is your household's combined annual income? ('under $25,000', '$25,000-$39,999', '$40,000-$54,999', '$55,000-$69,999', '$70,000-$84,999', '$85,000-$99,999', '$100,000-$114,999', '$115,000-$149,999', '$150,000 or more', or 'Prefer not to answer')	n/a	All of the groups were further collapsed into the following categories: 'under $40,000','$40,000 to $55,000', '$55,000 to $85,000', '$85,000 to $100,000', '$100,000 and over', and 'Prefer not to answer'.
Education Level	28	28a: What is the highest education level you've completed? ('jr. high', 'high school', 'college/undergraduate', 'master's', 'PhD', or 'other')	28b: If college or higher, what was your major or focus of study?	People who had an Associates degree, or who graduated from a tech school or business college, were put into the 'college/undergraduate' category.
Formal Environmental Education	2	2a: Do you have any formal environmental, conservation, mammal, nature, or animal education? (yes/no)	2b: If yes, please elaborate.	Three people who stated 'no' but who said they had a biology degree in Question 28b were added to the 'yes' group.
Environmental Group Membership	3	3a: Are you a member of an environmental, conservation, mammal, nature, or animal organization? (yes/no)	3b: If yes, which organization? 3c: If no, would you like to join one in the future? Why or why not?	

2.4. Analysis Methodology For Local Levels Of Knowledge

Types of local level of knowledge tests included knowledge of the number of wildlife mammal species in Fairfax County (Question 8), photograph identification (Question 9), and also knowledge of wildlife mammal species that reside in Fairfax County (Question 10). According to Adams et al. (2006), the majority of people in the U.S. generally do not know the numbers of species that reside in their area and can't recognize common wildlife species. Moreover, they are unaware of the types of wildlife species that inhabit their region.

One way to assess local levels of knowledge is to question participants on the number of wildlife species they think are in a region (Scott and Parsons, 2004). In the first knowledge question (knowledge of the number of wildlife mammal species in Fairfax County), subjects were asked if they knew how many local mammal species were in the Fairfax County area (Question 8). The question was designed in an 'open ended' or 'fill in the blank' style to prevent influencing subjects. In surveys in which subjects are given a range of numbers and told to mark a check box, they may be swayed to pick a higher number than they originally thought (E.C.M. Parsons personal communication, 2006). Pearson's chi-square was used to determine knowledge of the number of wildlife mammal species in Fairfax County between demographic groups.

For mammal photograph identification (Question 9), four colored photographs of local mammals were shown to the survey participants (see Appendix B). Using photographs to test local levels of knowledge has been conducted in several studies, including Casey's et al.'s (2005) study and Scott's and Parsons' (2004) study. Subjects

were asked to identify the mammal. Photograph A (Question 9a) was a picture of a grey fox (*Urocyon cinereoargenteus cinereoargenteus*), photograph B (Question 9b) was of a raccoon (*Procyon lotor lotor*), Photograph C (Question 9c) was an American beaver (*Castor canadensis*), and photograph D (Question 9d) was a photograph of a northern river otter (*Lontra canadensis lataxina*). These four species were chosen because they are commonly known species occurring in the study area. The frequency and percentages of each individual question were calculated.

All four questions were also put into a 'mammal identification' index to see if subjects could identify all four mammals (to measure the number of correct answers). Cronbach's alpha (α) was 0.6732. Independent groups t-tests were run on 'mammal identification' and the following demographics: residency, gender, formal environmental education, and environmental group membership. A regression was used on 'mammal identification' and age.

One-way ANOVAs were conducted on 'mammal identification' and the following variables: occupation, household annual income, and education level. A post-hoc comparison using the Scheffe test was done on the mammal identification/ occupation analysis to determine the significant differences between group means. Though the ANOVA showed a significant relationship between mammal identification and occupation, the Scheffe test did not indicate significant differences between any of the means. Therefore, the retired category (which had a small sample size) was dropped from the analysis, and the ANOVA and the Scheffe test were redone with only the other four categories (professional, semi-professional, skilled and non-skilled labor, and non-

workers).

For the last local knowledge question, knowledge of wildlife mammal species in Fairfax County, subjects were given a list of twenty mammal species and asked if the species were found in the wild in the area (Questions 10a to 10t). Participants were given a choice to mark either 'yes', 'no', or 'don't know'. Mammals chosen ranged from cats, bats, rodents, hoofed animals, fresh water mammals, small land mammals, and large carnivores (see Table 3 at the end of the section for a list of the local and non-local species). Mammals that were similar to local mammal species were chosen to limit guessing. For example, non-local species such mule deer and elk were added since white-tailed deer (a local species) was on the list. The percentages were found for each individual animal. The data were listed in a figure (see Figure 3 in the results section), which showed percent of correct answers (if the subject got the question right) and percent of incorrect answers (which included wrong and also 'don't know' or 'non-response' answers).

All twenty questions were then compiled into an index for 'knowledge of wildlife mammal species in Fairfax County' to determine how many answers people got right. Cronbach's alpha for the index was 0.858. Independent group t-tests were used on the index with the following demographics: residency, gender, formal environmental education, and environmental group membership. Regression analysis was used on 'knowledge of wildlife mammal species' in Fairfax County and age. One-way ANOVAs were used on the index and several variables. The demographics include occupation,

household annual income, and education level. A Scheffe test was conducted on occupation.

Table 3. List of wildlife mammal species that inhabit and do not inhabit Fairfax County.

Wildlife Mammal Species That Are Found In Fairfax County	**Wildlife Mammal Species That Do Not Inhabit Fairfax County**
• Bobcats (*Lynx rufus rufus*) • Coyotes (*Canis latrans*) • Little Brown Bats (*Myotis lucifugus lucifugus)* • House Mouse (*Mus musculus musculus*) • White-tail Deer (*Odocoileus virginianus*) • River Otters (*Lontra canadensis lataxina*) • Raccoons (*Procyon lotor lotor*) • Beavers (*Castor canadensis*) • Grey Fox (*Urocyon cinereoargenteus cinereoargenteus*) • Red Fox (*Vulpes vulpes fulva*)	• Lynx (*Lynx pardinus*) • Wolves (*Canis lupus*) • Vampire Bats (*Desmodus rotundus*) • Cotton Mouse (*Peromyscus gossypinus*) • Mule Deer (*Odocoileus hemionus*) • Elk (*Cervus elaphus*) • Sea Otters (*Enhydra lutris*) • Manatees *(Trichechus manatus*) • Brown Bear (*Ursus arctos*) • Black Bear (*Ursus americanus*)

2.5. Analysis Methodology For Participation In Natural Activities And Perception Of Conservation Issues

A variety of questions were chosen to investigate participation in and also perception of conservation and wildlife-related activities. Topics include willingness to plant a wildlife garden or habitat to attract wildlife species (Question 6) and urban wildlife concerns in Fairfax County (Question 13). Other questions investigated are participation in wildlife activities and conservation practices (Question 14) and threat level of ecological issues to Fairfax County mammals (Question 15).

For Question 6, willingness to plant a wildlife garden or habitat to attract wildlife species, subjects were questioned if they desired a wildlife garden to attract wildlife to determine interest in viewing wildlife in an active conservation role. They were given

the option to mark a box with the choices 'yes', 'no', or 'already have one'. If they expressed interest, they were also asked what species they hoped to attract. The frequency and percentage were calculated for this question. Pearson's chi-square was run between this variable and all of the demographics.

Perceptions of local urban wildlife concerns in Fairfax County were researched (Question 13). Subjects were given a list of six existing local urban wildlife issues and asked if they personally thought they were actual concerns in Fairfax County. The listed issues included flooding from animal built dams (Question 13a), property damage from mammals such as tree, land, and house damage (Question 13b), vehicle collisions with mammals (Question 13c), diseases from mammals such as rabies (Question 13d), mammals attacking people (Question 13e), and mammals attacking pets (Question 13f). They were given the option to select 'yes', 'no' and 'don't know'. The frequencies and percentages of each question were found (only the valid data were used).

All six variables from Question 13 were then put into an index ('number of urban wildlife issues that subjects thought were concerns in Fairfax County'). This was done to determine the number of issues (out of all six issues) subjects thought were actual local concerns. A t-test was run between the index and gender. Since a significant difference was found, chi-square tests were run between each individual question (Question 13a through 13f) and gender to figure out which issue gender differed on. T-tests were also done on 'number of urban wildlife issues that subjects thought were concerns in Fairfax County' and the following variables: formal environmental education, environmental group membership, and residency. ANOVAs were run between the index and each of

these demographics: occupation, household annual income, and education level. Regression analysis was conducted between the index and age.

In Question 14, participation in wildlife activities and conservation practices, survey participants were asked how often they participated in a list of eighteen wildlife or conservation-related activities. For each issue, they were asked to mark either 'frequently', 'occasionally' or 'never'. A diverse range of issues was chosen including: nature walks; hiking; wildlife-watching tours such as whale-watching tours; amateur wildlife-watching like bird-watching; visits to parks or zoos or nature centers; sponsoring a wildlife animal through an adoption program such as whale or wolf adoption; recycling; use of public transportation; avoid buying animal tested products; purchasing organic or eco-friendly products; using energy saving bulbs and other devices; educating others on environmental issues; carpooling; donating to environmental or nature or animal organizations; volunteering at environmental or nature or animal organizations; watching nature programs on television like 'Animal Planet'; bird feeding; and feeding other species (not birds). The frequencies and percentages were calculated for each activity. Subjects were also given a choice to fill in the black for 'other' non-listed activities (Question 14b).

The following statistics were used for analysis for the rest of the variables below, except as stated. A one-way ANOVA was conducted on each variable and the following demographics: occupation, annual household income, and education level. If the ANOVA was significant, a post hoc comparison using the Scheffe test was conducted to find significant differences between group means. A regression was done between every

variable and age. T-tests were done on the variables and the remaining demographics: formal ecological education, environmental group membership, residency, and gender.

All eighteen variables in Question 14 were compiled into an index ('participation in wildlife activities and conservation practices'). The index was compiled in order to investigate how often people participated in all of the listed activities. The answer 'never' was given a value of '0', 'occasionally' had a value of '1', and 'frequently' was given the value of '2'. Cronbach's alpha for the index was 0.8311, which indicated it was reliable**.** The index was analyzed as noted above.

For threat level of ecological issues to Fairfax County mammals (Question 15), subjects were given a list of twenty environmental issues, and asked to assess their threat level to local mammal species. Environmental issues include habitat degradation/damage, urban development, non-native/exotic species, global warming/climate change, car injuries, lack of available prey, lack of natural predators, litter, sewage pollution, farm runoff, tourism, chemical discharges, noise pollution, oil pollution, wildlife-watching, hunting or trapping, air pollution, military activities, mammal overpopulation, and mammal under-population. Threat level was given a rank of 'serious threat', 'moderate threat', 'minor threat', 'no threat', as well as 'don't know'. Participants were also given the option of listing additional threats (Question 15b). The frequencies and percentages were found for each individual environmental issue, and only the valid data were used.

All twenty environmental issue variables were put into an index named 'threat level of environmental issues to Fairfax County mammals' to study general threat level

perception of environmental issues on local mammals. The 'threat level of environmental issues to Fairfax County mammals' index was analyzed as mentioned above.

2.6. Analysis Methodology For Support Of Mammal Ecological Issues, Environmental Law, And Conservation Education

Several diverse topics were chosen to research support of mammal-related conservation issues. Topics included importance of mammal conservation (Question 11) and support of more mammal conservation education in schools (Question 12). Mammal conservation law and policy-related questions included importance of mammal conservation laws and policies (Question 16), effectiveness of current federal mammal conservation legislation (Question 18), support of current federal mammal conservation legislation (Endangered Species Act and Marine Mammal Protection Act) (Question 19), support of the creation of new federal mammal conservation legislation (Question 20), and how favorable politicians and political parties are viewed if they support mammal conservation legislation (Question 21).

For each variable, the frequency and percentages were calculated. The 'don't know' and 'non-response' answers were dropped and only the valid data were used in analysis. The following statistics were used on all the variables, except for Question 12 (see below for more information on Question 12). One-way ANOVAs were also done between every variable and demographics including occupation, education level, and household annual income. If there was significance, a Scheffe test was then done to see the significant differences between the means. A regression was used to determine the

effect of age on public perception of mammal conservation issues, legislation, or education. T-tests were conducted between the variables and the rest of the demographics, which are residency, gender, formal environmental education, and environmental group membership.

To investigate importance of mammal conservation (Question 11), subjects were asked how important they think mammal conservation is. They were given the choice to check if they thought mammal conservation was 'very important', 'important', 'neither important or unimportant', 'unimportant', 'very unimportant', or 'don't know'.

Participants were inquired if they supported more mammal conservation education in schools (Question 12). They either marked a box that stated 'yes' or 'no', and then asked to elaborate 'why or why not' (Question 12b) to find out their motivations behind their beliefs. Only the valid data of the first part of Question 12 was used in the rest of the analysis. Pearson's chi-square was used between support of more mammal conservation education in schools and all the demographics.

To research public perception on mammal conservation-related law, several mammal conservation law-related questions were examined. In Question 16, participants were requested to state their opinion on the importance of mammal conservation laws and policies. Answer selections included 'very important', 'important', 'neither important or unimportant', 'unimportant', 'very unimportant', and also 'don't know'.

Public perception of effectiveness of current federal mammal conservation legislation was researched (Question 18). Subjects were questioned how effective they thought federal mammal-related conservation laws like the Endangered Species Act and

Marine Mammal Protection Act are, and were given a choice to select 'very effective', 'effective', 'neither effective or ineffective', 'ineffective', 'very ineffective', and 'don't know'.

For Question 19, survey takers were inquired if they supported current federal mammal conservation legislation. They were given the statement 'I support the current federal legislation on mammal conservation such as the Endangered Species Act And Marine Mammal Protection Act'. They had to select either that they 'strongly agree', 'agree', 'neither agree or disagree', 'disagree', or 'don't know' what they thought about the statement. For the support of current federal mammal conservation legislation and occupation analysis the ANOVA showed significance but the Scheffe test did not, therefore the retired category was dropped, and the skilled and unskilled labor category was combined with the semi-professional category to see which group means differed from each other.

Support of the creation of new federal mammal conservation legislation (question 20) was also researched. Subjects were shown a statement that said 'I support the creation of new legislation for mammal conservation' and then had to mark either that they 'strongly agree', 'agree', 'neither agree or disagree', 'disagree', or 'don't know' with the sentence.

Lastly, people were asked if a politician or political party supported mammal conservation legislation, how favorable would they view them (Question 21). They then chose they would view the politician or political party 'more favorably', 'neither favorably or less favorably', 'less favorably', or 'don't know'.

3. Results

3.1. Demographics

3.1.1. Residency

Most of the subjects (72.2%) were Fairfax County residents (Question 1; refer to Table 4 for details on statistics). Non-residents lived in other parts of the D.C. metropolitan area (VA: Arlington County, Fredericksburg, Loudoun County, Prince William County, Spotsylvania County, or Stafford County; Washington, D.C.; MD: Montgomery County), other areas of Virginia (Chesterfield, Norfolk, Portsmouth, Roanoke, Virginia Beach, or Yorktown), other places in Maryland (Lutherville), West Virginia, different states (California, North Carolina, Oklahoma, or New York), different countries (Haiti or U.K.), or did not specify where they reside (see Figure 1 for percentages of non-residents). Chi square analysis indicated that there is a moderate relationship between study sites and residency (χ^2 (1, N=205)=10.78, p=0.001, V=0.23). More people at Best Buy (82.8%) than at George Mason University (62.3%) were residents.

Table 4. Residency.

	N	%
Fairfax County Residents	148	72.2
Non-Residents	57	27.8
Total:	205	100.0

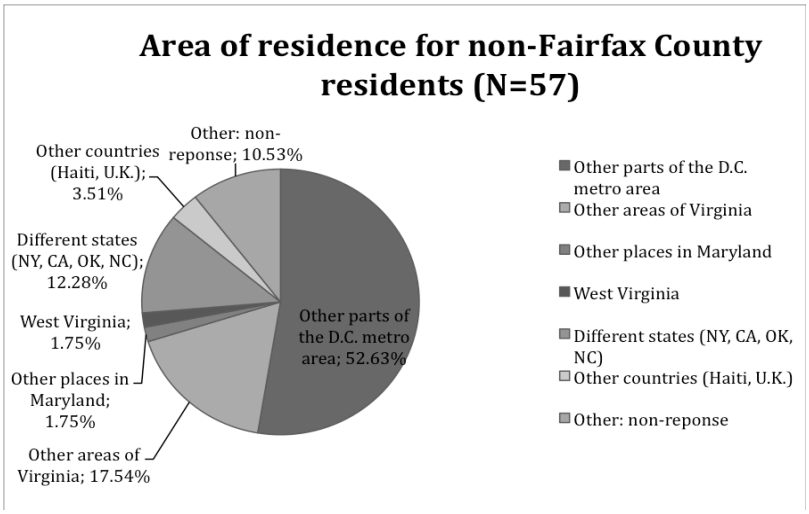

Figure 1. Area of residence for non-Fairfax County residents.

3.1.2. Gender

Nearly equal amounts of survey participants were female (50.5%) and male (49.5%) (Question 22). Three people did not state their gender. See Table 5 for more information.

Table 5. Gender. Percentages are listed for both valid data and total data.

	N	%
Female	102/102	50.5/49.8
Male	100/100	49.5/48.8
Non-response	n/a /3	n/a /1.5
Total:	202/205	100.0/100.00

3.1.3. Age

Approximately a quarter of respondents (25.9%) were eighteen to twenty years old (Question 23). Many of the subjects (43.3%) were between the ages of twenty-one

and thirty years old. About 11% of participants were age eighteen, 8.5% were nineteen years old, and 8% were twenty-two years of age. Only four people (2.0%) were sixty-five years old or older. The mean age was 30.1 and the median age was 25 years old.

3.1.4. Occupation

Most of the people (46.5%) surveyed had professional occupations (Question 26; see Table 6). Many respondents were non-workers (37.5%). Only three subjects (1.5%) were retired.

Table 6. Occupation. Percentages are listed for both valid data and total data.

	N	%
Professional	93/93	46.5/45.4
Semi-Professional	11/11	5.5/5.4
Skilled and Non-skilled Labor	18/18	9.0/8.8
Retired	3/3	1.5/1.5
Non-worker	75/75	37.5/36.6
Non-response	n/a /5	n/a /2.4
Total:	200/205	100.0/100.00

3.1.5. Household Annual Income

Forty-eight respondents (23.4% of 205 subjects) chose not to state their household annual income (Question 27; see Table 7 for more details). Out of the survey takers that answered (157 subjects), sixty respondents (38.2%) had household annual incomes of $100,000 or more. Thirty-seven people (23.6%) had incomes of $55,000 to $85,000, and nearly the same amount of participants (21.7%) had yearly household incomes under $40,000.

Table 7. Household annual income. Percentages are listed for both valid data and total data.

	N	%
Under $40,000	34/34	21.7/16.6
$40,000-$55,000	16/16	10.2/7.8
$55,000-85,000	37/37	23.6/18.1
$85,000-$100,000	10/10	6.4/4.9
$100,000 and over	60/60	38.2/29.3
Prefer not to answer	n/a /48	n/a /23.4
Total:	157/205	100.0/100.0

3.1.6. Education Level

The majority of subjects had a college undergraduate education (51%) (Question 28; refer to Table 8). Sixty respondents (29.4%) had only a high school education. About one fifth of participants (19.6%) have completed graduate school.

Table 8. Education level. Percentages are listed for both valid data and total data.

	N	%
High School	60/60	29.4/29.3
College/Undergraduate	104/104	51.0/50.7
Master's	29/29	14.2/14.2
PhD	11/11	5.4/5.4
Non-response	n/a /1	n/a /0.5
Total:	204/205	100.0/100.0

3.1.7. Formal Environmental, Conservation, Mammal, Nature, Or Animal Education

Most participants (71.1%) reported that they did not have formal environmental, conservation, mammal, nature, or animal education (Question 2; see Table 9 for more information). People with formal ecological education generally listed several kinds of

education. Types of formal environmental education included boy scouts (3.5%), classes (high school and/or college, not including environmental, conservation, mammal, nature or animal majors) (43.9%), workshops or presentations (5.3%), college or graduate school (environmental, conservation, mammal, nature or animal-related) majors (49.1%), or occupation (7%). The percentages add up to more than one hundred percent because several people gave two answers when listing types of ecological education.

Table 9. Formal environmental, conservation, mammal, nature, or animal education. Percentages are listed for both valid data and total data.

	N	%
Formal Environmental Education	59/59	28.9/28.8
No Formal Environmental Education	145/145	71.1/70.7
Non-response	n/a /1	n/a /0.5
Total:	204/205	100.0/100.0

3.1.8. Membership Of Environmental, Conservation, Nature, Or Animal Organizations

Only thirty-eight subjects (18.5%) were members of an environmental, conservation, mammal, nature, or animal organization (Question 3; see Table 10). The organizations with the greatest amount of membership were Sierra Club (n=6; 15.8%), People For the Ethical Treatment of Animals (PETA) (n=4; 10.5%), and World Wildlife Fund (WWF) (n=3; 7.9%).

Though most people (81.5%) answered they were currently not members of an ecological or animal-related organization, the majority of non-members (69.5% of 167

people) expressed a future interest in joining an organization. Only 121 non-members (out of 167 people) gave reasons why they would or would not become a member in the future. The most popular reasons of interest among non-members in joining an environmental group included the desire to protect, preserve, help, or save animals, nature or the environment (18.2%), and love of animals, nature, or the environment (14.1%). The main reason of non-interest among non-members in joining an ecological organization was lack of time (15.7%) and involvement in other organizations or activities (5.8%).

Table 10. Membership of environmental, conservation, mammal, nature, or animal organizations.

	N	%
Members	38	18.5
Non-members	167	81.5
Total:	205	100.0

3.2. Local Level Of Knowledge

3.2.1 Knowledge Of The Number Of Wildlife Mammal Species In Fairfax County

The majority of participants (70.2%) said that they did not know how many wildlife mammal species there were in the area (Question 8; refer to Table 11 for more details). Nearly all of the subjects that replied either underestimated or overestimated the total number of mammal species. Although no respondents correctly answered the exact number of mammal species in the area (47 species), two people (1%) were nearly right: they stated there were fifty species.

A chi square test and Cramer's V indicated that there is a strong association between age and knowledge of the number of mammal species: χ^2 (200, N=201)=237.58, p=0.035, V=0.49.

Chi square tests indicated that there were no significant associations between any of the other demographics and knowledge of the number of mammal species in Fairfax County. Residency (χ^2 (5, N=205)=5.44, p=0.365), gender (χ^2 (5, N=202)=3.32, p=0.650), and occupation (χ^2 (20, N=200)=15.80, p=0.729) did not have any influence on knowledge of the number of mammal species. Likewise, household annual income (χ^2 (20, N=157)=18.39, p=0.562), education level (χ^2 (15, N=204)=16.98, p=0.320), formal environmental education (χ^2 (5, N=204)=4.21, p=0.519), and environmental group membership (χ^2 (5, N=205)=2.64, p=0.755) also did not have any effect on knowledge of the number of local wildlife mammal species.

Table 11. Knowledge of the number of wildlife mammal species in Fairfax County.

Respondents answers	N	%
Less Than Twenty	13	6.3
More Than Twenty	11	5.4
Fifty	2	1
Seventy-Five	2	1
A Lot, Dozens, Hundreds, Thousands	33	16.1
Don't Know	144	70.2
Total:	205	100.0

3.2.2. Mammal Photograph Identification

The majority of people (93.7%) correctly identified that photograph A was a fox (Question 9a). Only sixteen respondents (7.8%) knew the exact species (common name)

of fox: they stated it was a grey fox (*Urocyon cinereoargenteus cinereoargenteus*). Nearly all survey takers (94.6%) accurately stated that picture B was a raccoon (Question 9b). Very few people misidentified it or responded they didn't know. Most people (82%) were able to identify that the third photograph (C) was a beaver (Question 9c). However, a few people gave two answers or confused the beaver with other small mammal species. One hundred and forty-four participants (70.2%) realized that photograph D was an otter (Question 9d). However, just twelve people (5.9%) knew the exact species (common name) of otter: they realized it was a river otter (*Lontra canadensis lataxina*). Almost a third of people either confused the otter with a different mammal or simply didn't know. Refer to Table 12 for more information.

An index was created using the four questions (see Figure 2). The 'mammal identification' index had a strong correlation (0.4102) however was not that reliable (α=0.6732), but the index was still used in analysis. The majority of people (61.7%) identified all four mammals correctly. Over one quarter of people (26.3%) recognized three out of the four mammals in the photographs.

The means of an ANOVA showed that occupation influenced mammal identification, F (3, 193)=3.98, p=0.009, η^2=0.058. The Scheffe test (.032) indicated that in general skilled and non-skilled laborers identified less photographs than professionals (see Table 13 and Table 14 for more details).

One-way ANOVAs did not reveal any significance between mammal identification and household annual income (F (4, 152)=1.08, p=0.369) or education level (F (3, 200)=1.65, p=0.180). A regression showed that age (F (1, 199)=0.01, p=0.909) did

not have an impact on picture identification. Independent groups t-tests revealed that residency, gender, formal ecological education, and environmental group membership also did not have any influence on mammal identification. Overall most Fairfax County residents (M=0.86, SD=0.23) and non-residents (M=0.82, SD=0.28) correctly identified either three or all four photographs (t (203)=1.13, p=0.258). Females (M=0.86, SD=0.25) and males (M=0.85, SD=0.23) recognized the same number of mammals (t (200)=0.38, p=0.707). People with (M=0.87, SD=0.20) and without (M=0.84, SD=0.26) formal environmental education did not significantly differ in mammal identification (t (202)=0.63, p=0.529). Members of environmental organizations (M=0.88, SD=0.17) and non-members (M=0.84, SD=0.26) also recognized the same number of mammals (t (203)=0.85, p=0.396).

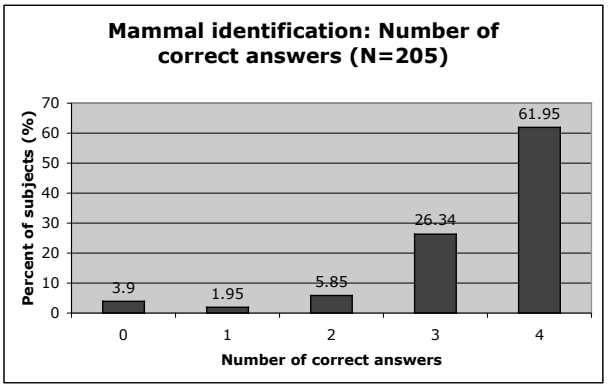

Figure 2. Mammal identification: Number of correct answers.

Table 12. Mammal photograph identification responses.

	Photo A/Fox % (N)	Photo B/Raccoon % (N)	Photo C/Beaver % (N)	Photo D/River Otter % (N)
Correct Answer	93.7 (192)	94.6 (194)	82 (168)	70.2 (144)
Incorrect Answer	1 (2)	1.5 (3)	12.2 (25)	13.2 (27)
Don't know	3.4 (7)	2.4 (5)	4.4 (9)	12.7 (26)
Non-response	2 (4)	1.5 (3)	1.5 (3)	3.9 (8)
Total:	100.0 (205)	100.0 (205)	100.0 (205)	100.0 (205)

Table 13. Occupation and mammal identification.

Number of photographs correctly identified (%)	Professional % (N)	Semi Professional % (N)	Skilled and Non-skilled Labor % (N)	Non-worker % (N)
0 (0)	1.1 (1)	0 (0)	16.7 (3)	4 (3)
1 (0.25)	0 (0)	0 (0)	0 (0)	5.3 (4)
2 (0.50)	7.5 (7)	9.1 (1)	5.6 (1)	4 (3)
3 (0.75)	19.4 (18)	27.3 (3)	33.3 (6)	33.3 (25)
4 (1.00)	72 (67)	63.6 (7)	44.4 (8)	53.3 (40)
N=197	N=93	N=11	N=18	N=75

Table 14. Mean and Standard Deviation (SD) of ANOVA of occupation and mammal identification.

Occupation	Mean	SD
Professional	0.90	0.18
Semi Professional	0.89	0.17
Skilled and Non-skilled Labor	0.72	0.36
Non-worker	0.82	0.26
Total:	0.85	0.24

3.2.3. Knowledge Of Wildlife Mammal Species In Fairfax County

Though there were many wildlife mammal species that participants knew in Fairfax County, there were some species that subjects were unaware that they resided in the area and other species that people thought were in the area when they were not (Question 10a through Question 10t; see Figure 3 for the full list of species and percentages of correct and incorrect answers for each individual species). The majority of subjects responded that raccoons (89.8%) and beavers (70.7%) commonly inhabit the

wild areas in Fairfax County. Most people (62.9%) accurately stated that little brown bats reside in Fairfax County, but 52.7% mistakenly believed that vampire bats were in the area or simply did not know. Very few subjects (16.6%) knew that bobcats are found in the wild in Fairfax County. Only 26.8% of people surveyed were aware that coyotes inhabit Fairfax County, and 48.3% knew that wolves were not in the region. Most survey takers (79.5%) realized that white-tailed deer inhabit the area and that elk was not a local species (62.9% of subjects). Slightly less than half of survey takers (45.9%) knew that river otters populated the area.

All twenty questions were combined together into an index (see Figure 4). Cronbach's alpha (0.858) indicated the index was reliable. No one (0%) got all twenty questions right. Only 2.9% of participants got eighteen out of twenty questions (90%) correct. About 12.2% of survey takers answered twelve questions (60%) right, 9.3% got thirteen correct (65%), and 11.2% correctly responded to fifteen questions (75%). Most subjects (61%) answered eleven or more questions right.

Fairfax County residents (M=0.56, SD=0.22) and non-residents (M=0.47, SD=0.25) differed significantly on knowledge of wildlife mammal species in the area ($t(203)=2.55$, $p=0.012$) (see Table 15). Residents knew local mammal species slightly better than non-residents. Overall, residents got about eleven out of twenty questions right, while non-residents correctly answered a little over nine out of twenty questions.

In general, males (M=0.59, SD=0.23) were able to correctly answer slightly more questions about local wildlife mammal species than females (M=0.49, SD=0.23; $t(200)=$

-2.90, p=0.004; refer to Table 16). On the whole, males got nearly twelve out of twenty questions right and females answered about ten out of twenty questions correctly.

A regression showed there is a positive, weak, significant association between age and knowledge of wildlife mammal species in Fairfax County (F (1,199)=7.19, p=0.008, R^2=0.035, adjusted R^2=0.031; see Table 17 for more details). The predicted knowledge of wildlife mammal species in Fairfax County equation is: 0.45+0.003(age). For every additional unit of age, there is a 0.003 unit increase in knowledge of wildlife mammal species in Fairfax County. Older participants tended to be slightly more knowledgeable of local mammal species than people who were younger.

The means of an ANOVA showed that occupation influenced knowledge of wildlife mammal species in Fairfax County (F (4, 195)=4.14, p=0.003, η^2=0.08; see Table 18 and 19). The Scheffe test revealed that people with professional jobs and non-workers significantly differed in knowledge of local mammal species (0.009). Professionals were more knowledgeable of species.

In an ANOVA, there is no relationship between education level and knowledge of wildlife mammal species in Fairfax County (F (3, 200)=0.46, p=0.713). There was also no significance difference in the ANOVA between income and knowledge of wildlife mammal species in Fairfax County (F (4, 152)=1.64, p=0.167). Independent group t-tests revealed that formal ecological education and environmental group membership likewise had no impacts on knowledge. Subjects with formal ecological education (M=0.58, SD=0.24) and people without (M=0.53, SD=0.23) had similar levels of knowledge of local mammal species (t (202)=1.41, P=0.160). Members of environmental groups

(M=0.58, SD=0.23) and non-members (M=0.53, SD=0.24) also did not differ in mammal species knowledge (t (203)=1.06, p=0.292).

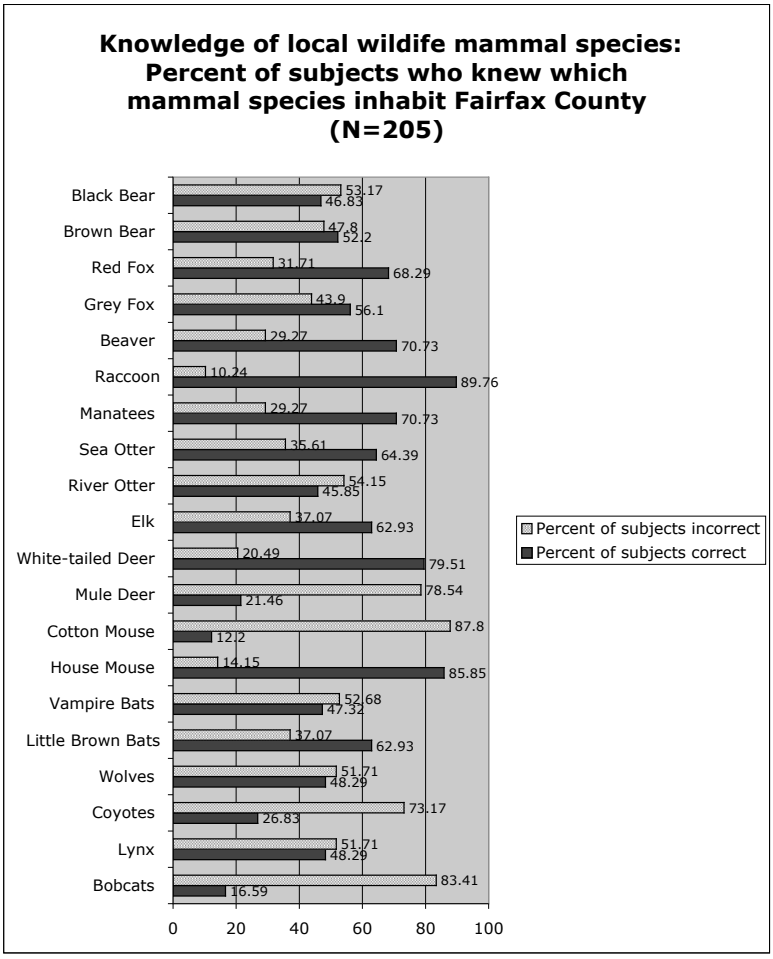

Figure 3. Knowledge of local wildlife mammal species: Percent of subjects who knew which mammal species inhabit Fairfax County.

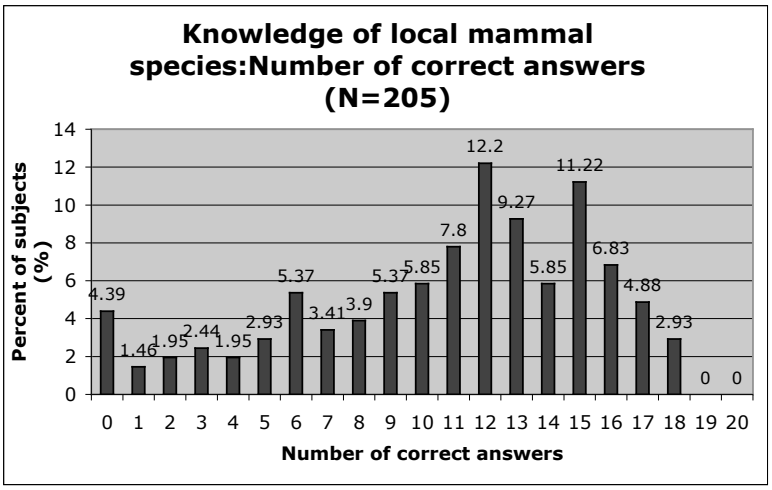

Figure 4. Knowledge of local mammal species: Number of correct answers.

Table 15. Summary of residency and knowledge of wildlife mammal species in Fairfax County.

Number Of Questions Correct (% correct)	Fairfax County Resident % (N)	Non-resident % (N)
0 (0%)	2.7 (4)	8.8 (5)
1-5 (5-25%)	10.1 (15)	12.3 (7)
6-10 (30-50%)	21.6 (32)	29.8 (17)
11-15 (55-75%)	48 (71)	42.1 (24)
16-19 (80-95%)	17.6 (26)	7 (4)
20 (100%)	0 (0)	0 (0)
Total:	100.0 (148)	100.0 (57)

Table 16. Summary of gender and knowledge of wildlife mammal species in Fairfax County.

Number Of Questions Correct (% correct)	Female % (N)	Male % (N)
0 (0%)	7.8 (8)	1 (1)
1-5 (5-25%)	9.8 (10)	11 (11)
6-10 (30-50%)	29.4 (30)	19 (19)
11-15 (55-75%)	46.1 (47)	47 (47)
16-19 (80-95%)	6.9 (7)	22 (22)
20 (100%)	0 (0)	0 (0)
Total:	100.0 (102)	100.0 (100)

Table 17. Summary and age and knowledge of wildlife mammal species in Fairfax County.

Number Of Questions Correct (% correct)	18-20 % (N)	21-30 % (N)	31-40 % (N)	41-50 % (N)	51-60 % (N)	61+ % (N)
0 (0%)	12.2 (6)	2.3 (2)	6.3 (1)	0 (0)	0 (0)	0 (0)
1-5 (5-25%)	10.2 (5)	12.5 (11)	6.3 (1)	7.7 (2)	0 (0)	0 (0)
6-10 (30-50%)	26.5 (13)	21.6 (19)	37.5 (6)	15.4 (4)	22.2 (4)	50 (2)
11-15 (55-75%)	42.9 (21)	47.7 (42)	25 (4)	61.5 (16)	61.1 (11)	25 (1)
16-19 (80-95%)	8.2 (4)	15.9 (14)	25 (4)	15.4 (4)	16.7 (3)	25 (1)
20 (100%)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Total:	100.0 (49)	100.0 (88)	100.0 (16)	100.0 (26)	100.0 (18)	100.0 (4)

Table 18. Occupation and knowledge of wildlife mammal species in Fairfax County

	Professional % (N)	Semi Professional % (N)	Skilled and Non-skilled Labor % (N)	Retired % (N)	Non-worker % (N)
0 (0%)	1.1 (1)	0.0 (0)	0 (0)	0 (0)	9.3 (7)
1-5 (5-25%)	5.4 (5)	0.0 (0)	16.7 (3)	0 (0)	17.3 (13)
6-10 (30-50%)	21.5 (20)	63.6 (7)	16.7 (3)	0 (0)	22.7 (17)
11-15 (55-75%)	53.8 (50)	36.4 (4)	50 (9)	66.7 (2)	38.7 (29)
16-19 (80-95%)	18.3 (17)	0 (0)	16.7 (3)	33.3 (1)	12 (9)
20 (100%)	0.0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Total:	100.0 (93)	100.0 (11)	100.0 (18)	100.0 (3)	100.0 (75)

Table 19. Mean and Standard Deviation (SD) of ANOVA of occupation and knowledge of wildlife mammal species in Fairfax County.

Occupation	Mean	SD
Professional	0.60	0.20
Semi Professional	0.48	0.11
Skilled and Non-skilled Labor	0.56	0.24
Retired	0.72	0.08
Non-worker	0.47	0.27
Total:	0.54	0.23

3.3. Participation In Natural Activities And Perception Of Conservation Issues

3.3.1. Willingness To Plant A Wildlife Garden Or Habitat To Attract Wildlife Species

Overall, about half of respondents (51.8%) claimed that they would plant either a wildlife garden or habitat in their yards to attract wildlife (Question 6; see Table 20). Over a third of survey takers (36.7%) said that they did not want one. Stated types of wildlife species people said they would like to attract include 'any' (i.e. no preference), 'birds', 'deer', 'local or native wildlife', 'rabbits', 'reptiles', 'squirrels', 'small mammals', and 'non-dangerous animals'.

A chi square analysis revealed that there is a moderate relationship between occupation and wanting a wildlife garden or habitat (χ^2 (8, N=194)=16.49, p=0.036, V=0.21; see Table 21 for more information). The majority of people in professional occupations (57.6%) and skilled and non-skilled labor (61.1%) stated that they wanted a wildlife garden. Semi-professionals (70%) said they did not desire to plant one.

Chi square analysis revealed that there is no relationship between wanting a wildlife garden and the rest of the demographics. Residency (χ^2 (2, N=199)=4.58, p=0.101), gender (χ^2 (2, N=196)=0.72, p=0.700), age (χ^2 (80, N=195)=81.95, p=0.419), and household annual income (χ^2 (8, N=155)=7.38, p=0.496) did not influence the desire to have a wildlife habitat. Education level (χ^2 (6, N=198)=3.05, p=0.803), formal environmental education (χ^2 (2, N=198)=4.23, p=0.121), and environmental organization membership (χ^2 (2, N=199)=4.67, p=0.097) also did not impact the yearning to have a garden.

Table 20. Willingness to plant a wildlife garden or habitat to attract wildlife species. Percentages are listed for both valid data and total data.

	N	%
Yes	103/103	51.8/50.2
No	73/73	36.7/35.6
Already have one	23/23	11.6/11.2
Non-response	n/a /6	n/a /2.9
Total:	199/205	100.0/100.0

Table 21. Occupation and willingness to plant a wildlife garden or habitat to attract wildlife species.

	Professional % (N)	**Semi Professional % (N)**	**Skilled and Non-skilled Labor % (N)**	**Retired % (N)**	**Non-worker % (N)**
Yes	57.6 (53)	20 (2)	61.1 (11)	0 (0)	50.7 (36)
No	31.5 (29)	70 (7)	33.3 (6)	33.3 (1)	36.6 (26)
Already have one	10.9 (10)	10 (1)	5.6 (1)	66.7 (2)	12.7 (9)
N=194	N=92	N=10	N=18	N=3	N=71

3.3.2. Urban Wildlife Concerns In Fairfax County

Participants thought that many of the listed urban wildlife issues were concerns, while others issues were not considered problems (Question 13a through 13f; refer to Figure 5). Many survey takers said that mammal induced flooding i.e. beaver dams (56.6%; Question 13a) and mammals attacking people (57.1%; Question 13e) were not concerns. The majority of participants (71.9%) stated that property damage caused by mammals, such as tree, land, or house damage, was an issue in the area (Question 13b). Most survey takers believed that mammal induced vehicle collisions (91%; Question 13c) and mammal diseases (68.2%; Question 13d) such as rabies were local problems. Ninety-six respondents (58.9%) stated that mammals attacking pets was an issue in Fairfax County (Question 13f).

An index was constructed out of all six variables. Several people only stated their opinion on five out of the six questions, and either left the sixth question blank or marked 'don't know'. Cronbach's alpha was 0.7954**.** Overall, 35.1% of subjects thought that all six urban and wildlife issues were concerns in Fairfax County (see Figure 6 and Table 22). About 22.7% considered one or two out of five or six topics to be something to worry about. Many people (24.2%) regarded three to five out of five or six issues to be problems.

Females (M=0.71, SD=0.31) and males (M=0.59, SD=0.33) significantly differed in their opinion of how many urban wildlife issues were concerns in the area (t (189)=2.53, p=0.012; refer to Table 23 for further information). In general, females thought that between four out of five issues or four out of six issues were local concerns. Males felt that approximately three out of five issues were problems in Fairfax County. Chi-square tests were also done using each individual issue and gender to see which ones females and males differed on. Overall, males (67.1%) did not consider flooding to be a concern, while females did (54.9%) (χ^2(1, N=156)=7.63, p=0.006, V=-0.221). More females (78.4%) thought that dams were a problem than males (64.4%) (χ^2(1, N=175)=4.23, p=0.040, V=-0.155).

A regression revealed that age did not influence viewpoint on the number of urban wildlife issues perceived to be dilemmas: F (1, 189)=1.67, p=0.198. One-way ANOVAs showed that household annual income (F (4, 145)=1.39, p=0.241) and education level (F (3, 190)=0.15, p=0.927) had no relationships with the number of wildlife issues that are seen as concerns in the area. An ANOVA showed that occupation

does not affect how many urban wildlife issues subjects believed were local problems (F (4, 186)=1.89, p=0.115).

Survey takers with formal environmental education (M=0.71, SD=0.27) and with no formal ecological background (M=0.62, SD=0.35) did not have different perceptions on how many wildlife issues are considered to be local concerns (t (191)=1.74, p=0.083). Members of environmental organizations (M=0.62, SD=0.34) and non-members (M=0.66, SD=0.33) had similar views on the number of urban wildlife issues perceived as local problems (t (192)=-0.63, p=0.531). Fairfax County residents (M=0.65, SD=0.32) and non-residents (M=0.64, SD=0.36) did not differ in their opinion on whether or not certain urban and wildlife issue are problems (t (192)=0.17, p=0.867).

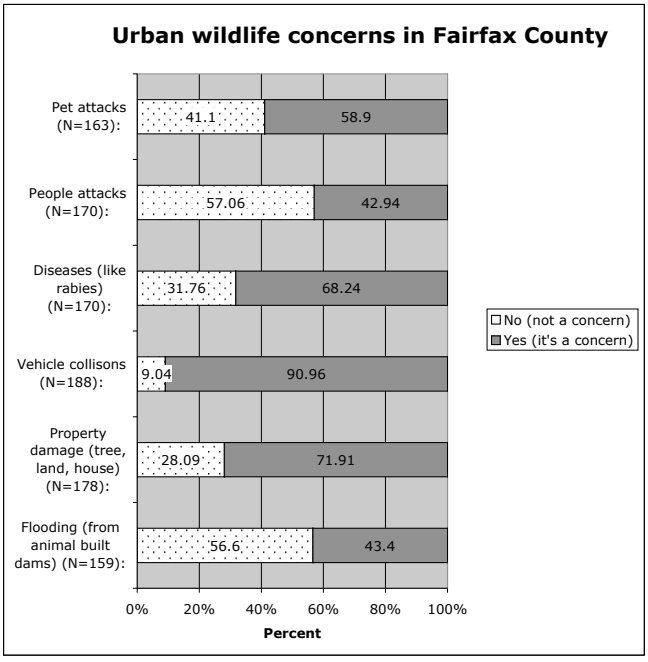

Figure 5. Urban wildlife concerns in Fairfax County.

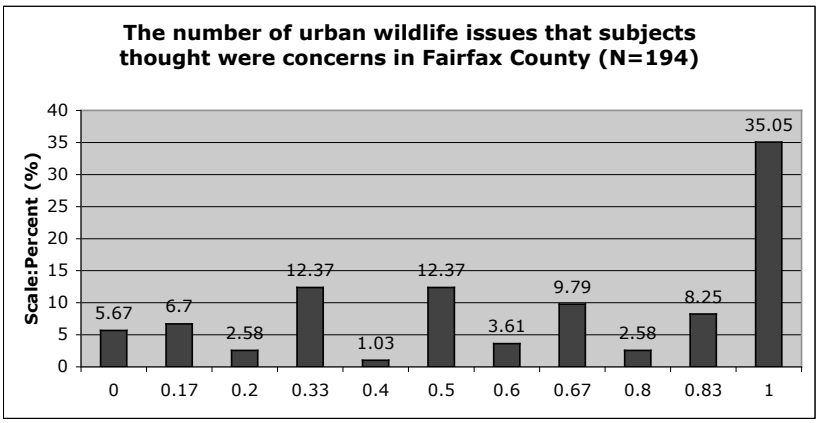

Figure 6. The number of urban wildlife issues that subjects thought were concerns in Fairfax County.

Table 22: Interpretation of the numbers on the concern index.

Number on the index	How many issues subjects thought were concerns
0	0 out of 6 is a concern
0.17	1 out of 6 is a concern
0.2	1 out of 5 is a concern
0.33	2 out of 6 are concerns
0.4	2 out of 5 are concerns
0.5	3 out of 6 are concerns
0.6	3 out of 5 are concerns
0.67	4 out of 6 are concerns
0.8	4 out of 5 are concerns
0.83	5 out of 6 are concerns
1	6 out of 6 are concerns

Table 23. Gender and the number of urban wildlife issues that subjects thought were concerns in Fairfax County.

Number of issues considered a concern/Number of issues	Female % (N)	Male % (N)
0/6	4.3 (4)	7.2 (7)
1/6	6.5 (6)	7.2 (7)
1/5	0 (0)	5.1 (5)
2/6	9.7 (9)	15.3 (15)
2/5	0 (0)	2 (2)
3/6	12.9 (12)	12.2 (12)
3/5	4.3 (4)	3.1 (3)
4/6	8.6 (8)	10.2 (10)
4/5	3.2 (3)	2 (2)
5/6	8.6 (8)	8.2 (8)
6/6	41.9 (39)	27.6 (27)
N=191	N=93	N=98

3.3.3. Participation In Wildlife Activities And Conservation Practices

Subjects seemed to enjoy a wide variety of wildlife activities and implemented many ecological practices occasionally or frequently in their daily lives (Question 14; see Figure 7 for a complete list of activities and results). The majority of people responded that they occasionally took nature walks (65%) or hiked (56.2%). More than half of subjects (54.3%) stated that they occasionally took public transportation. Most subjects said they occasionally (46.7%) or frequently (40.7%) purchased organic or environmentally friendly products. Most people (70%; n=142) stated that they frequently recycled. Over half of respondents (53.7%) replied that they frequently used energy saving light bulbs or devices.

However, there were several activities survey takers did not seem to participate much in. Many survey participants stated that they never go on wildlife-watching tours (62.4%), such as whale-watching tours, or amateur wildlife-watching (50%) like bird-watching. The majority of survey takers (80.3%) also have never sponsored a wildlife animal through an adoption program, such as whale or wolf adoptions.

When survey takers were asked if they participated in other (unlisted) wildlife activities or conservation practices, only fourteen individuals (6.8%) responded. Most replies were conservation-oriented, while others were animal or wildlife-related activities. Conservation activities included 'socially responsible investing' (0.5%), 'organize on behalf of environmental issues' (0.5%), 'soil conservation' (0.5%), and 'teaching about the importance of extinct species and the need to take care of species' (0.5%). Animal and wildlife-related activities included 'adopt abandoned animals'

(0.5%), ‘support programs to end or slow animal cruelty’ (0.5%), and several vague but animal-related responses: ‘dolphins and sea world’ (0.5%), ‘possums, squirrels, and deer’ (0.5%), ‘squirrels’ (0.5%), and ‘stray cats’ (0.5%). A few responses could be classified as both or either conservation or animal/wildlife-related, depending on the circumstances: ‘wildlife photography’ (1%), ‘vegetarianism’ (0.5%), and ‘frequently hunting’ (0.5%).

An index was composed out of the eighteen variables (refer to Table 24). Cronbach’s alpha for the index was 0.8311. Only one person (0.5%) never did any of the eighteen wildlife activities and conservation practices (i.e. had a score of 0). No one (0%) did all eighteen activities frequently (i.e. no one had a score of 2.0).

A regression was run on participation in conservation activities and age (see Table 25). Age has a positive, significant, and weak relationship with participation ($F(1, 198)=10.92$, $p=0.001$, $R^2=0.052$, adjusted $R^2=0.048$). The estimated predicted participation in wildlife activities and conservation practices formula was: 0.77+0.006(age), so that every extra unit of age increases participation in wildlife practices by 0.006 units. Therefore, as age increases, people did more wildlife and ecological activities more frequently.

An ANOVA revealed that occupation had an impact on involvement in environmental activities and practices ($F(4, 194)=4.81$, $p=0.001$, $\eta^2=0.09$; see Table 26 and 27). In general, subjects who were retired did the most activities. The Scheffe test indicated that there was a significant difference between the means of retired people and skilled and non-skilled laborers (0.022), and also retired people and non-workers (0.046).

Retired people participated in more activities and did them more often than non-workers, and skilled and non-skilled laborers.

An ANOVA indicates a significant relationship between education level and participation in wildlife activities and conservation practices ($F(3, 199)=6.62$, $p=0.0003$, $\eta^2=0.09$; see Table 28). A Scheffe test found that people with master's degrees differed from people with only high school degrees (0.000) in participation of conservation activities.

Subjects with formal ecological education ($M=1.03$, $SD=0.38$) significantly differed from subjects that did not have formal environmental education ($M=0.91$, $SD=0.32$) in relation to participation in wildlife and conservation activities ($t(200)=2.41$, $p=0.017$; see Table 29). People with formal environmental education tended to be involved in more activities and participated in them on average 'occasionally'. Survey takers without formal ecological education were also active in many activities and did them 'occasionally', however, they stated much more often that they 'never' did some of the practices.

Members of ecological groups ($M=1.16$, $SD=0.30$) and non-members ($M=0.89$, $SD=0.33$) differed in how often they participated in conservation activities and practices, ($t(201)=4.64$, $p=0.000$; refer to Table 30). Members of nature groups were slightly more active in environmental actions and did them more often than non-members. In general, members were involved in these practices mostly 'occasionally' and sometimes 'frequently' and non-members were active 'occasionally' as well as 'never'.

An ANOVA indicates that annual household income did not an impact on partaking in ecological activities, ($F(4, 151)=2.08$, $p=0.089$). T-tests were done on participation in wildlife activities and conservation practices and residency, and participation in wildlife activities and conservation practices and gender. Residency had no influence on participation ($t(201)=0.86$, $p=0.391$) and neither did gender ($t(198)=1.53$, $p=0.130$). In general, Fairfax County residents ($M=0.95$, $SD=0.34$) and non-residents ($M=0.91$, $SD=0.35$) did most activities 'occasionally', though some were 'never' participated in. Females ($M=0.97$, $SD=0.35$) and males ($M=0.90$, $SD=0.33$) had similar results.

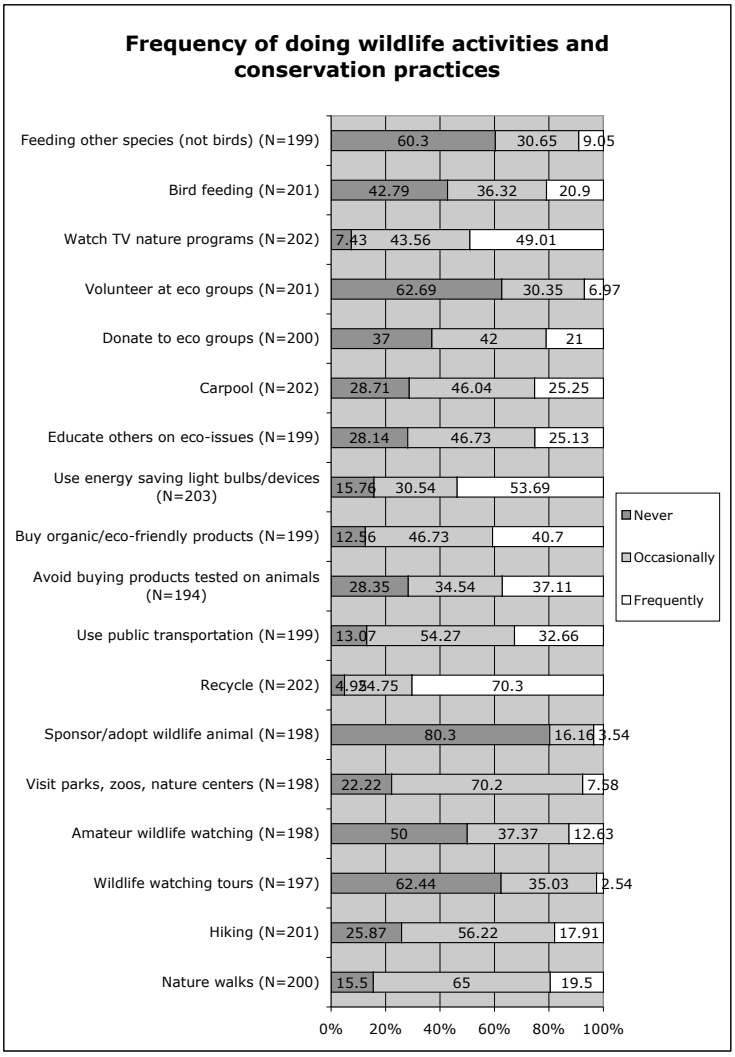

Figure 7. Frequency of doing wildlife activities and conservation practices.

Table 24. Summary of participation in wildlife activities and conservation practices.

Index	**% (N)**
0-0.5	5.9 (12)
0.5 to 1.5	86.7 (176)
1.5 to 2.0	7.4 (15)
Total:	100.00 (203)

Table 25. Summary of age and participation in wildlife activities and conservation practices.

Index	18-20 % (N)	21-30 % (N)	31-40 % (N)	41-50 % (N)	51-60 % (N)	61+ % (N)
0-0.5	10.2 (5)	4.6 (4)	0 (0)	7.7 (2)	0 (0)	0 (0)
0.5 to 1.5	89.8 (44)	87.5 (77)	87.5 (14)	80.8 (21)	88.2 (15)	75 (3)
1.5 to 2.0	0 (0)	8 (7)	12.5 (2)	11.5 (3)	11.8 (2)	25 (1)
Total (N=200**):**	100.0 (49)	100.0 (88)	100.0 (16)	100.0 (26)	100.0 (17)	100.0 (4)

Table 26. Summary of occupation and participation in wildlife activities and conservation practices.

Index	Professional % (N)	Semi Professional % (N)	Skilled and Non-skilled Labor % (N)	Retired % (N)	Non-worker % (N)
0-0.5	3.3 (3)	9.1 (1)	5.6 (1)	0 (0)	6.7 (5)
0.5 to 1.5	85.9 (79)	81.8 (9)	94.4 (17)	33.3 (1)	90.7 (68)
1.5 to 2.0	10.9 (10)	9.1 (1)	0 (0)	66.7 (2)	2.7 (2)
Total (N=199):	100.0 (92)	100.0 (11)	100.0 (18)	100.0 (3)	100.0 (75)

Table 27. Mean and Standard Deviation (SD) of ANOVA of occupation and participation in wildlife activities and conservation practices.

Occupation	Mean	SD
Professional	1.02	0.33
Semi Professional	0.96	0.37
Skilled and Non-skilled Labor	0.80	0.21
Retired	1.48	0.08
Non-worker	0.89	0.33
Total:	0.95	0.33

Table 28. Summary of education level and participation in wildlife activities and conservation practices.

	High School (%)	College/ Undergraduate (%)	Graduate: Master's (%)	Graduate: PhD (%)
0-0.5	83.3 (5)	5.8 (6)	3.5 (1)	0 (0)
0.5 to 1.5	91.7 (55)	85.4 (88)	75.9 (22)	100 (11)
1.5 to 2.0	0 (0)	8.7 (9)	20.7 (6)	0 (0)
N=203	N=60	N=103	N=29	N=11

Table 29. Summary of formal environmental education and participation in wildlife activities and conservation practices.

	Formal Environmental Education (%)	**No Formal Environmental Education (%)**
0-0.5	6.8 (4)	5.6 (8)
0.5 to 1.5	79.7 (47)	89.5 (128)
1.5 to 2.0	13.6 (8)	4.9 (7)
N=202	N=59	N=143

Table 30. Summary of environmental group membership and participation in wildlife activities and conservation practices.

	Member (%)	**Non-member (%)**
0-0.5	0 (0)	7.3 (12)
0.5 to 1.5	86.8 (33)	87.3 (144)
1.5 to 2.0	13.2 (5)	5.5 (9)
N=203	N=38	N=165

3.3.4. Threat Level Of Ecological Issues To Fairfax County Mammals

The majority of respondents (61.3%) thought that habitat degradation or damage was a serious threat to mammal species in Fairfax County (Question 15; see Figure 8 for a complete list of results). Most people (72.7%) stated that urban development was a serious threat. Many respondents (41.5%) answered that they thought global warming was a serious risk, while 36.2% of people gave it a moderate standing. More than half of survey takers (52.7%) believed that litter was a serious risk to Fairfax County's mammal species. Only 35.9% ranked farm runoff as 'serious' and 32.9% of participants answered that it was a moderate threat.

Nearly half of participants (51.2%) believed that wildlife-watching was not a threat to local mammals. Fewer people (44.7%) ranked air pollution as a serious danger to Fairfax County mammals. Slightly more than a third (35%) believed that military

activities were only a minor threat. About 41% replied that tourism is only a minor threat.

Only seventeen people replied when asked to list other issues they considered threats to mammal species in Fairfax County. Most participants (91.7%) did not list other mammal environmental concerns. The listed issues were 'housing and land development and displacement of animals' (1%), 'fences and pesticides' (0.5%), 'illegal hunting' (0.5%), 'lack of education' (2%), 'shops, stores, and overpopulation' (0.5%), 'fences and fear' (0.5%), 'hobby hunting and urban development' (0.5%), 'hunting' (0.5%), 'wildlife feeding and picking through litter' (0.5%), 'animals in captivity like zoos' (0.5%), 'animals eating a subject's plants' (0.5%), 'wildlife running in the streets and highways' (0.5%), and 'the greenhouse effect' (0.5%).

The listed individual issues were also put into an index. Cronbach's alpha (α) was 0.8913. Most people tended to think that the environment issues were overall a moderate threat to the area's mammals (see Table 31). A t-test showed that gender has a relationship with the level of ecological concern to local mammals ($t(195)=2.60$, $p=0.011$). Females ($M=3.09$, $SD=0.51$) tended to think that ecological issues were a greater threat to local mammals than males ($M=2.90$, $SD=0.53$; see Table 32).

The rest of the demographic factors tested had no influence on perception of threat level of environmental concerns on wildlife mammals. According to t-tests, residency, formal environmental education, and environmental organization membership had no impacts on opinion of level of threat of environmental issues. Residents ($M=2.97$, $SD=0.49$) and non-residents ($M=3.06$, $SD=0.62$) had comparable views ($t(195)=-1.07$,

p=0.288). Subjects with formal environmental education (M=2.98, SD=0.56) and people without (M=3.00, SD=0.52) did not differ in threat perception (t (194)=-0.24, P=0.810). Members (M=3.11, SD=0.51) and non-members (M=2.96, SD=0.53) of environmental or animal organizations had similar viewpoints on threat level of ecological issues to local mammals (t (195)=1.61, P=0.110). A one-way ANOVA indicated that occupation did not influence threat perception (F (4, 188)=0.78, p=0.541). ANOVAs also revealed that household annual income (F (4, 147)=1.15, p=0.333) and education level (F (3, 192)=2.10, p=0.102) had no impacts on views of the overall threat level of environmental issues to mammals. Regression analysis indicated that age also had no impact (F (1, 192)=0.00, p=0.998).

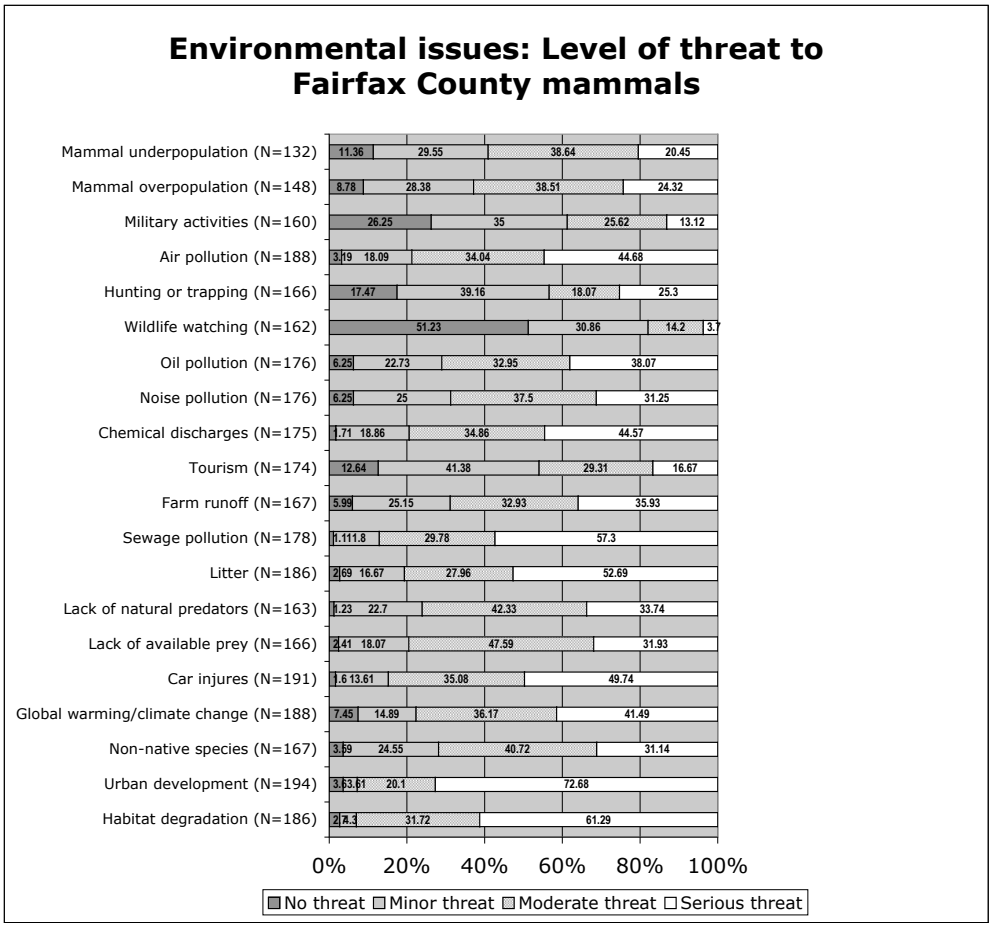

Figure 8. Environmental issues: Level of threat to Fairfax County mammals.

Table 31. Summary of threat level of environmental issues to Fairfax County mammals.

Index	% (N)
No Threat (1.0 to 1.5)	0.5 (1)
Minor Threat (1.5 to 2.5)	13.2 (26)
Moderate threat (2.5 to 3.5)	67.5 (133)
Serious Threat (3.5 to 4.0)	18.8 (37)
Total:	100.0 (197)

Table 32. Summary of gender and threat level of environmental issues to Fairfax County mammals.

Index	Female % (N)	Male % (N)	
No Threat (1.0 to 1.5)	0 (0)	1 (1)	
Minor Threat (1.5 to 2.5)	8.3 (8)	18.4 (18)	
Moderate threat (2.5 to 3.5)	67 (65)	67.4 (66)	
Serious Threat (3.5 to 4.0)	24.7 (24)	13.3 (13)	
N=195	N=97	N=98	

3.4. Support of Mammal Ecological Issues, Environmental Law, and Conservation Education

3.4.1. Importance Of Mammal Conservation

The majority of survey takers thought that mammal conservation was either 'very important' (59.3%) or 'important' (35.3%) (Question 11; refer to Table 33). A few people (3.4%) felt neutral about the subject and said that it was 'neither important nor unimportant'. Very few individuals replied it was 'unimportant' (0.5%) or 'very unimportant' (1.5%).

Regression analysis indicated that there is a negative, significant but weak relationship between age and opinion of the importance of mammal conservation ($F_{(1,198)}=5.87$, $p=0.016$; see Table 34). About 2.8% of the variation of the importance of mammal conservation can be explained by its linear association with age ($R^2=0.029$, adjusted $R^2=0.024$). The predicted importance of mammal conservation equation was: 1.79 - 0.009(age); i.e. for each additional unit of age, there is a 0.009 unit decrease in importance of mammal conservation. In other words, as age increases, subjects were more likely to consider mammal conservation more important.

An ANOVA suggested that there is no association between education level and importance of mammal conservation ($F(3, 199)=1.51$, $p=0.213$). T-tests indicated that there is no association between importance of mammal conservation and variables such as residency, gender, formal environmental education, and ecological organization membership. There was no difference between Fairfax County residents ($M=1.45$, $SD=0.67$) and non-residents ($M=1.61$, $SD=0.84$; $t(202)= -1.46$, $p=0.15$). Females ($M=1.41$, $SD=0.67$) and males ($M=1.59$, $SD=0.78$) did not differ significantly ($t(199)=-1.80$, $p=0.073$). Respondents that had formal environmental education ($M=1.53$, $SD=1.01$) and subjects that had no ecological education ($M=1.49$, $SD=0.58$) answered nearly the same ($t(201)=0.35$, $p=0.727$). Members of environmental organizations ($M=1.35$, $SD=0.79$) did not differ from non-members ($M=1.53$, $SD=0.71$; $t(202)=-1.33$, $p=0.184$).

An ANOVA showed no significant difference between people with different occupations and their perception on the importance of mammal conservation ($F(4, 194)=1.67$, $p=0.158$). A one-way ANOVA revealed that household annual income did not influence people's perception on mammal conservation importance ($F(4, 152)=0.58$, $p=0.676$).

Table 33. Importance of mammal conservation. Percentages are listed for both valid data and total data.

	N	%
Very Important	121/121	59.3/59
Important	72/72	35.3/35.1
Neither Important Nor Unimportant	7/7	3.4/3.4
Unimportant	1/1	0.5/0.5
Very Unimportant	3/3	1.5/1.5
Don't Know	n/a /1	n/a /0.5
Total:	204/205	100.0/100.0

Table 34. Age and importance of mammal conservation.

	18-20 % (N)	**21-30 % (N)**	**31-40 % (N)**	**41-50 % (N)**	**51-60 % (N)**	**61+ % (N)**
Very Important	45.8 (22)	60.2 (53)	62.5 (10)	53.9 (14)	77.8 (14)	100 (4)
Important	47.9 (23)	30.7 (27)	37.5 (6)	46.2 (12)	22.2 (4)	0 (0)
Neither Important Nor Unimportant	4.2 (2)	5.7 (5)	0 (0)	0 (0)	0 (0)	0 (0)
Unimportant	0 (0)	1.1 (1)	0 (0)	0 (0)	0 (0)	0 (0)
Very Unimportant	2.1 (1)	2.3 (2)	0 (0)	0 (0)	0 (0)	0 (0)
N=200	N=48	N=88	N=16	N=26	N=18	N=4

3.4.2. Support Of More Mammal Conservation Education In Schools

Nearly every subject (95%) stated that they would support more mammal conservation education in schools (Question 12a). Only ten survey takers (5%) answered that they did not support more mammal conservation education (see Table 35 for results).

A chi square test suggested that there is a weak relationship between gender and support of more mammal conservation education in schools (χ^2 (1, N=198)=5.85, p=0.016, V=0.170). More males (8.16%) did not support additional mammal conservation education in schools than females (1%; refer to Table 36 for details).

Chi-square analyses revealed there were no significant associations between support of more mammal conservation education in schools and the rest of the demographics. Residency (χ^2 (1, N=201)=0.02, p=0.877), age (χ^2 (40, N=197)=35.51, p=0.672), occupation (χ^2 (4, N=196)=6.27, p=0.180), and annual household income (χ^2 (4, N=154)=3.50, p=0.477) did not affect people's viewpoints on additional mammal conservation education. Likewise, education level (χ^2 (3, N=200)=1.66, p=0.646), formal environmental education (χ^2 (1, N=200)=0.41, p=0.520), and environmental group membership (χ^2 (1, N=201)=2.37, p=0.123) also had no relationship with support of more ecological education.

Table 35. Support of more mammal conservation education in schools. Percentages are listed for both valid data and total data.

	N	%
Support	191/191	95/93.2
Don't Support	10/10	5/4.9
Don't Know	n/a /4	n/a /2
Total:	201/205	100.0/100.0

Table 36. Gender and support of more mammal conservation education in schools.

	Female % (N)	**Male % (N)**
Support	99 (99)	91.8 (90)
Don't Support	1 (1)	8.2 (8)
N=198	N=100	N=98

3.4.3. Importance Of Mammal Conservation Laws And Policies

The majority of survey takers thought that mammal conservation laws and policies were 'very important' (42.2%) or 'important' (51%; Question 16). Only a few

individuals thought that mammal conservation policies and laws were 'unimportant' (1%) or 'very unimportant' (1.6%). See Table 37 for the complete results.

An independent groups t-test revealed that there was a significant difference between females (M=1.58, SD=0.65) and males (M=1.79, SD=0.82), and how important each gender regarded mammal conservation laws and policies (t (189)=-1.99, p=0.048; see Table 38). More females (47.4%) thought that mammal conservation laws and policies were 'very important' than males (37.5%). More males (6.3%) felt neutral about the topic than females (2.1%).

Members of environmental, animal, mammal, nature, or conservation organizations (M=1.40, SD=0.50) and non-members (M=1.75, SD=0.77) significantly differed in beliefs of the importance of mammal conservation laws and policies (t (190)= -2.57, p=0.011; see Table 39). The majority of both members and non-members thought mammal legislation were 'very important' or 'important', however, more ecological group members (60%) considered mammal ecological laws and policies to be 'very important' than non-members (38.2%). None of the members of environmental or nature-based groups felt neutral on the subject or thought mammal conservation laws and policies were 'unimportant' or 'very unimportant'.

One-way ANOVAs revealed that there were no relationship between opinion on the importance of mammal conservation legislation and policies and the following variables: occupation (F (4,183)=1.04, p=0.389), household annual income (F (4, 146)=0.11, p=0.978), and education level (F (3, 187)=0.62, p=0.601). Regression

analysis indicated that there was no influence of age on the opinion of mammal conservation law and policy importance (F (1, 186)=2.66, p=0.105).

A t-test revealed that participants with formal environmental, conservation, mammal, nature, or animal education (M=1.72, SD=0.92) and those with no such formal education (M=1.67, SD=0.66) did not significantly differ in opinion (t (189)=0.40, p=0.687). Fairfax County residents (M=1.66, SD=0.70) and non-residents (M=1.76, SD=0.86) had similar views on the importance of mammal conservation law and policy (t (190)=-0.87, p=0.39).

Table 37. Importance of mammal conservation laws and policies. Percentages are listed for both valid data and total data.

	N	%
Very Important	81/81	42.2/39.5
Important	98/98	51/47.8
Neither Important Nor Unimportant	8/8	4.2/3.9
Unimportant	2/2	1/1
Very Unimportant	3/3	1.6/1.5
Don't Know	13/13	n/a /6.3
Total:	192/205	100.0/100.0

Table 38. Gender and importance of mammal conservation laws and policies.

	Female % (N)	Male % (N)
Very Important	47.4 (45)	37.5 (36)
Important	49.5 (47)	52.1 (50)
Neither Important Nor Unimportant	2.1 (2)	6.3 (6)
Unimportant	0 (0)	2.1 (2)
Very Unimportant	1.1 (1)	2.1 (2)
N=191	N=95	N=96

Table 39. Environmental group membership and opinion on the importance of mammal conservation laws and policies.

	Member % (N)	**Non-member % (N)**
Very Important	60 (21)	38.2 (60)
Important	40 (14)	53.5 (84)
Neither Important Nor Unimportant	0 (0)	5.1 (8)
Unimportant	0 (0)	1.3 (2)
Very Unimportant	0 (0)	1.9 (3)
N=192	N=35	N=157

3.4.4. Effectiveness Of Current Federal Mammal Conservation Legislation

Only a few respondents (3%) replied that they thought that the current federal legislation on mammal conservation was 'very effective' (Question 18; see Table 40). A quarter of people (26.7%) said that the present mammal conservation federal legislation was 'effective'. Nearly the same proportion of people (28.2%) believed that it was 'neither ineffective nor effective'. A third of participants (32.6%) responded that the existing mammal conservation national laws were 'ineffective'. A tenth (9.6%) said that they were 'very ineffective'.

None of the demographics, except for income, influenced effectiveness of environmental legislation (see Table 41 below). An ANOVA showed that income had an effect on perception of effectiveness of ecological laws ($F(4, 102)=2.86$, $p=0.027$, $\eta^2=0.101$).

T-tests indicated that residency and gender did not affect viewpoints on effectiveness of current federal mammal conservation legislation and policies. Fairfax County residents ($M=3.19$, $SD=1.07$) and non-residents ($M=3.21$, $SD=0.95$) did not

differ on their opinions on the effectiveness of current law (t (133)=-0.09, p=0.931). There was no significant difference between females (M=3.22, SD=1.03) and males (M=3.18, SD=1.04) on their opinions of the efficiency of the national mammal environmental policies now in place (t (132)=0.217, p=0.829).

The means of an ANOVA revealed that occupation had no influence on perception of the effectiveness of current federal mammal conservation legislation (F (4, 129)=0.26, p=0.903). An ANOVA showed that education level also did not have an impact (F (3, 131)=1.87, p=0.137). Regression analysis indicated that household annual age (F (1, 131)=0.33, p=0.565) did not have any significant associations with perception of the efficiency of present-day federal mammal environmental laws.

A t-test indicated that subjects with formal environmental education (M=3.29, SD=1.10) and without formal ecological education (M=3.13, SD=1.00) did not differ in their perception of the effectiveness of the existing federal mammal conservation legislation (t (132)=0.81, p=0.418). An independent t-test revealed that members of environmental organizations (M=3.41, SD=0.89) and non-members (M=3.12, SD=1.07) had similar views on efficiency of national mammal ecological laws (t (133)=1.44, p=0.153).

Table 40. Effectiveness of current federal mammal conservation legislation. Percentages are listed for both valid data and total data.

	N	%
Very Effective	4/4	3/2
Effective	36/36	26.7 /17.6
Neither Effective Nor Ineffective	38/38	28.2 /18.5
Ineffective	44/44	32.6 /21.5
Very Ineffective	13/13	9.6 /6.3
Don't Know	n/a /65	n/a / 31.7
Non-response	n/a /5	n/a / 2.4
Total:	135/205	100.0/100.0

Table 41. Household annual income and effectiveness of current federal mammal conservation legislation.

	Under $40,000 % (N)	**$40,000-$55,000 % (N)**	**$55,000-85,000 % (N)**	**$85,000-$100,000 % (N)**	**$100,000 and over % (N)**
Very Effective	0 (0)	0 (0)	7.4 (2)	14.3 (1)	2.6 (1)
Effective	12.5 (3)	45.5 (5)	22.2 (6)	14.3 (1)	31.6 (12)
Neither Effective Nor Ineffective	20.8 (5)	27.3 (3)	29.6 (8)	28.6 (2)	31.6 (12)
Ineffective	41.7 (10)	27.3 (3)	40.7 (11)	28.6 (2)	26.3 (10)
Very Ineffective	25 (6)	0 (0)	0 (0)	14.3 (1)	7.9 (3)
Total: N=107	N=24	N=11	N=27	N=7	N=38

3.4.5 Support of Current Federal Mammal Conservation Legislation (Endangered Species Act And Marine Mammal Protection Act)

About a quarter of participants (26.2%) stated that they 'strongly agreed' with the statement 'I support the current federal legislation on mammal conservation, such as Endangered Species Act and Marine Mammal Protection Act' (Question 19a; refer to Table 42). About half of subjects (47.2%) said that they 'agreed' with the statement.

In a regression analysis, there was a negative, significant but weak relationship between age and support of the current federal mammal conservation legislation, such as

the Endangered Species Act and Marine Mammal Protection Act (F (1, 194)=4.74, p=0.031, R^2=0.0238, adjusted R^2=0.0188; see Table 43). The estimated support of current federal mammal conservation legislation followed the equation: 2.38-0.01(age), which means as age increases by a unit, there is a 0.01 unit decrease in the support of current federal mammal conservation legislation variable. Older participants tended to have stronger feelings of support of the present legislation than younger subjects.

A one-way ANOVA indicated that occupation affected the support of the present-day national mammal conservation legislation, such as Endangered Species Act and Marine Mammal Protection Act (F (4, 190)=3.04, p=0.019, η^2=0.060; see Tables 44 and 45 for more information). Though the ANOVA revealed significance, in the post-hoc comparison (using a Scheffe test), there appeared to be no statistical difference between the group means. Therefore another ANOVA and Scheffe test were run with the retired group dropped, and the skilled and non-skilled labor group combined with the semi-professional (F (2, 189)=4.45, p=0.013, η^2=0.045). Professionals differed from the skilled and non-skilled/semi-professional category (0.047).

A one-way ANOVA showed there is a significant relationship between education level and support of the Endangered Species Act and Marine Mammal Protection Act (F (3, 194)=3.38, p=0.019, η^2=0.050; see Table 46). The Scheffe test indicated a different between master's and high school students (0.05).

An independent t-test revealed that members of environmental groups (M=1.92, SD=0.83) and non-members (M=2.11, SD=0.91) did not differ on support of the current federal mammal conservation legislation, such as Endangered Species Act and Marine

Mammal Protection Act (t (197)=-1.22, p=0.225). People with formal environmental education (M=2.04, SD=0.96) and without formal environmental education (M=2.10, SD=0.87) also did not differ on support of the current laws (t (196)=-0.456, p=0.650). There was no difference between Fairfax County residents (M=2.03, SD=0.88) and non-residents (M=2.22, SD=0.92; t (197)=-1.34, p=0.180). A t-test indicated that females (M=2.1, SD=0.810) and males (M=2.07, SD=0.987) did not differ from each other either (t (194)=0.21, p=0.834). An ANOVA revealed household annual income does not have an association with support of current federal mammal conservation legislation (F (4, 148)=0.74, p=0.564).

Table 42. Support of current federal mammal conservation legislation (Endangered Species Act and Marine Mammal Protection Act). Percentages are listed for both valid data and total data.

	N	%
Strongly Agree	52/52	26.1/25.4
Agree	94/94	47.2/45.9
Neither Agree Nor Disagree	43/43	21.6/21
Disagree	5/5	2.5/2.4
Strongly Disagree	5/5	2.5/2.4
Don't Know	n/a /4	n/a /2
Non-response	n/a /2	n/a /1
Total:	199/205	100.0/100.0

Table 43. Age and support of current federal mammal conservation legislation (Endangered Species Act and Marine Mammal Protection Act).

	18-20 % (N)	**21-30 % (N)**	**31-40 % (N)**	**41-50 % (N)**	**51-60 % (N)**	**61+ % (N)**
Strongly Agree	19.2 (9)	29.4 (25)	18.8 (3)	30.8 (8)	22.2 (4)	75 (3)
Agree	38.3 (18)	47.1 (40)	62.5 (10)	50 (13)	55.6 (10)	25 (1)
Neither Agree Nor Disagree	36.2 (17)	17.7 (15)	18.8 (3)	15.4 (4)	22.2 (4)	0 (0)
Disagree	4.3 (2)	2.4 (2)	0 (0)	3.9 (1)	0 (0)	0 (0)
Strongly Disagree	2.1 (1)	3.5 (3)	0 (0)	0 (0)	0 (0)	0 (0)
N=196	N=47	N=85	N=16	N=26	N=18	N=4

Table 44. Occupation and support of current federal mammal conservation legislation (Endangered Species Act and Marine Mammal Protection Act).

	Professional % (N)	Semi Professional % (N)	Skilled and Non-skilled Labor % (N)	Retired % (N)	Non-worker % (N)
Strongly Agree	30.8 (28)	18.2 (2)	18.8 (3)	66.7 (2)	20.3 (15)
Agree	52.8 (48)	45.5 (5)	31.3 (5)	33.3 (1)	46 (34)
Neither Agree Nor Disagree	13.2 (12)	36.4 (4)	37.5 (6)	0 (0)	28.4 (21)
Disagree	2.2 (2)	0 (0)	6.3 (1)	0 (0)	2.7 (2)
Strongly Disagree	1.1 (1)	0 (0)	6.3 (1)	0 (0)	2.7 (2)
N=195	N=91	N=11	N=16	N=3	N=74

Table 45. Mean and Standard Deviation (SD) of ANOVA of occupation and support of current federal mammal conservation legislation (Endangered Species Act and Marine Mammal Protection Act).

Occupation	Mean	SD
Professional	1.90	0.79
Semi Professional	2.18	0.75
Skilled and Non-skilled Labor	2.50	1.10
Retired	1.33	0.58
Non-worker	2.22	0.90
Total:	2.08	0.87

Table 46. Education level and support of current federal mammal conservation legislation (Endangered Species Act and Marine Mammal Protection Act).

	High School % (N)	College/ Undergraduate % (N)	Graduate: Master's % (N)	Graduate: PhD % (N)
Strongly Agree	18.6 (11)	24 (24)	46.4 (13)	36.4 (4)
Agree	42.4 (25)	51 (51)	42.9 (12)	54.6 (6)
Neither Agree Nor Disagree	32.2 (19)	22 (22)	3.6 (1)	9.1 (1)
Disagree	3.4 (2)	2 (2)	3.6 (1)	0 (0)
Strongly Disagree	3.4 (2)	1.00 (1)	3.6 (1)	0 (0)
N=198	N=59	N=100	N=28	N=11

3.4.6. Support Of The Creation Of New Federal Mammal Conservation Legislation

Slightly less than a third (30.8%) answered that they 'strongly agreed' with the statement "I support the creation of new legislation for mammal conservation" (Question

20). More than a third of respondents (39.4%) stated they 'agreed' with the sentence. A quarter of survey takers (27.8%) said that they 'neither agreed nor disagreed' with the phrase. Only 1.5% replied that they 'disagreed' with the idea of new mammal legislation. Just one person (0.5%) expressed they 'strongly disagreed' with the concept (see Table 47).

Members of ecological and animal organizations (M=1.66, SD=0.77) and non-members (M=2.09, SD=0.83) had dissimilar opinions on the support of the creation of new federal mammal conservation legislation (t (196)=-2.85, p=0.005; see Table 48). In general, more members of ecological and animal groups (51.4%) 'strongly agreed' that new federal mammal conservation legislation should be created than non-members (26.4%). However, a greater number of non-members (41.1%) stated they 'agreed' with the issue than members (31.4%). More non-members (30.1%) were neutral about making new national legislation than members (17.1%). No members of environmental-related groups 'disagreed' or 'strongly disagreed' with the idea of new mammal conservation legislation.

Residents (M=1.98, SD=0.84) and non-residents (M=2.11, SD=0.82) had similar perceptions on the creation of new federal mammal conservation legislation (t (196)= -0.967, p=0.335). An independent groups t-test suggested that females (M=1.96, SD=0.82) and males (M=2.08, SD=0.86) also had similar views on the formation of new federal policies and laws (t (193)=-1.04, p=0.302). An independent groups t-test suggested that subjects with formal environmental education (M=1.97, SD=0.86) and

without formal environmental education (M=2.04, SD=0.83) also did not differ in their opinions (t (195)=-0.54, p=0.591).

A regression analysis showed that there was no association between age and support of the creation of new federal mammal conservation legislation (F (1, 193)=0.68, p=0.409). ANOVAs revealed that education level (F (3, 193)=1.09, p=0.355) and household annual income (F (4, 147)=0.93, p=0.446) did not affect support of support of the creation of new legislation. Finally, an ANOVA showed that occupation did not affect support of the creation of new federal mammal conservation legislation (F (4, 189)=0.89, p=0.469).

Table 47. Support of the creation of new federal mammal conservation legislation. Percentages are listed for both relevant data and total data.

	N	%
Strongly Agree	61/61	30.8/29.8
Agree	78/78	39.4/38.1
Neither Agree Nor Disagree	55/55	27.8/26.8
Disagree	3/3	1.5/1.5
Strongly Disagree	1/1	0.5/0.5
Don't know	n/a /4	n/a /2
Non-response	n/a /3	n/a /1.5
Total:	198/205	100.0/100.0

Table 48. Environmental group membership and support of the creation of new federal mammal conservation legislation.

	Member % (N)	Non-member % (N)
Strongly Agree	51.4 (18)	26.4 (43)
Agree	31.4 (11)	41.1 (67)
Neither Agree Nor Disagree	17.1 (6)	30.1 (49)
Disagree	0 (0)	1.8 (3)
Strongly Disagree	0 (0)	0.6 (1)
N=198	N=35	N=163

3.4.7. How Favorable Politicians And Political Parties Are Viewed If They Support Mammal Conservation Legislation

The majority of participants (67.6%) answered they would view a politician or political party 'more favorably' if the politician or party supported mammal conservation legislation (Question 21; refer to Table 49). More than a quarter of people (28.9%) said their opinions of the politician or party would not change and they would view the politician or party 'neither favorably nor less favorably'. Only a tiny minority (3.5%) stated they would actually view the political party or politician 'less favorably'.

An independent t-test showed that people with formal environmental education (M=1.24, SD=0.54) and subjects without formal ecological education (M=1.42, SD=0.54) had different opinions on how favorable they viewed politicians and political parties if they supported mammal conservation legislation (t (171)=-2.01, p=0.046). On the whole, subjects with formal ecological education (81.8%) tended to perceive politicians and political parties 'more favorably' if they supported mammal conservation legislation than subjects without conservation education (61%). Although the majority of both groups stated they would view a politician or party 'more favorably', survey takers with no animal or nature education (36.4%) appeared to feel more neutral about the topic than those with formal green education (12.7%). Only three people each with (5.5%) and without environmental education (2.5%) said they would regard politicians and political parties 'less favorably' (see Table 50).

Residents (M=1.38, SD=0.55) and non-residents (M=1.30, SD=0.55) did not differ in how favorably they viewed politicians and political parties who supported mammal conservation legislation (t (171)=0.78, p=0.437). A t-test revealed that females

(M=1.30, SD=0.51) and males (M=1.40, SD=0.58) also did not differ in their views (t (169)=-1.18, p=0.238). Interestingly, members of environmental organizations (M=1.21, SD=0.48) and non-members (M=1.40, SD=0.56) had similar opinions on how favorably they viewed politicians and political parties who support mammal conservation legislation (t (171)=-1.82, p=0.071).

One-way ANOVAs showed there was no relationship between how favorable pro-mammal conservation legislation politicians and political parties are perceived, and the following demographics: occupation (F (4, 166)=2.19, p=0.072), education level (F (3, 169)=0.43, p=0.735), and household annual income (F (4, 134)=0.26, p=0.903). Regression analysis indicated that age did not influence opinion (F (1, 170)=0.01, p=0.928).

Table 49. How favorable politicians and political parties are viewed if they support mammal conservation legislation. Percentages are listed for both valid data and total data.

	N	%
More Favorably	117/117	67.6/57.1
Neither Favorably Or Less Favorably	50/50	28.9/24.4
Less Favorably	6/6	3.5/2.9
Don't Know	n/a /29	n/a /14.2
Non-response	n/a /3	n/a /1.5
Total:	173/205	100.0/100.0

Table 50. Formal environmental education and how favorable politicians and political parties are viewed if they support mammal conservation legislation.

	Formal Environmental Education % (N)	**No Formal Environmental Education % (N)**
More Favorably	81.8 (45)	61 (72)
Neither Favorably Nor Less Favorably	12.7 (7)	36.4 (43)
Less Favorably	5.5 (3)	2.5 (3)
N=173	N=55	N=118

4. Discussion

4.1. Demographics

4.1.1. Residency

The majority of the subjects (72.2%) were local residents. Most non-residents (14.6% of survey participants) came from other parts of the D.C. metropolitan area or other (non-D.C. region) areas of Virginia (4.9% of subjects). Only one person (0.5% of 205 people) stated she came from another (non-Washington D.C. metropolitan) part of Maryland. The high amount of non-residents in this study may be due to the choice of study sites. More subjects at George Mason University (37.7%) were non-residents than at Best Buy (17.2%).

4.1.2. Gender

Similar numbers of subjects were women (50.5%) and men (49.5%). The numbers of females and males sampled seemed to represent the population. In 2006, there were approximately 509,470 (50.4%) women and 500,973 (49.6%) men (with a margin of error of ±380; U.S. Census Bureau, 2006a).

4.1.3. Age

Overall, subjects were younger than the current Fairfax County population. The median age of the sample was 25 years, while the median age for Fairfax County's population in 2006 was 38.4 (± 0.3) years (U.S. Census Bureau, 2006a). The mean for the sample was also calculated (30.1 years old), but the mean age for the whole population was not available. The difference in age may be due to the choice of sample sites, since the majority of students at George Mason University are undergraduates (18,240 out of 30,714 students; George Mason University, 2008).

4.1.4. Occupation

Slightly more questionnaire takers had professional occupations than the true population: 46.5% compared to 40.9%. Less people in the sample (9%) had skilled or unskilled labor jobs than in the actual population (29.6%). The sample population also had more non-workers and retired people (39% versus 29.5%). These differences may have been caused by several factors. Many of the respondents, especially at the George Mason University study site, listed their occupation as 'student' and therefore were classified in the 'non-worker' group, perhaps causing an overrepresentation of non-workers. This survey also had an additional category (semi-professionals), which accounted for 5.5% of participants. Semi-professionals were not included when comparing the numbers above, which may have contributed to the differences. Lastly, in the survey, only adults 18 and over were surveyed, while people 16 and older were calculated in the U.S. Census's statistics (U.S. Census Bureau, 2006a).

4.1.5. Household Annual Income

Thirty-four people (21.7% of subjects) made under $40,000 a year, which is less than the 2006 national median household yearly income ($48,451; U.S. Census Bureau, 2006c). About 10.2% of people had incomes that were either slightly less, the same amount, or slightly greater ($40,000 to $55,000) than the national median income. Over 38% of participants had incomes around or more ($100,000 or greater) than the 2006 Fairfax County median household annual income ($100,318; U.S. Census Bureau, 2006a). However, almost a quarter of subjects (23.4% or 48 people) stated that they preferred not to answer the question, and also many people responded that they were students (and therefore non-workers), which may have affected the results.

4.1.6. Education Level

The sample population seemed to be more educated than the Fairfax County and national populations. According to the Fairfax County Government, in 2006 58.7% of people in Fairfax County had a bachelor's degree or higher (U.S. Census Bureau, 2006a), while only 25.5% of people nationally had a college degree or higher (U.S. Census, 2006b). Most of the people surveyed had a bachelor's degree (51.0%) or a graduate degree (19.6%). A little less than a third of participants (29.4%) stated they only had a high school diploma, however, many respondents (35.1% or 72 out of 205 people) were students at the time of the study and in the process of getting their undergraduate or graduate degrees. In addition, one of the study sites was a University so that may have influenced the outcome.

4.1.7. Formal Ecological Education

Most people did not have much formal environmental, conservation, mammal, nature, or animal education. The majority of subjects that had formal ecological education either took a few classes (43.9%) or majored in it or a related field in college or graduate school (49.1%). It was surprising that more people did not have formal environmental education since most of the participants were highly educated, one of the study sites was at a university, and many schools now are incorporating more environmental studies into their classes (Adams et al., 2006).

At George Mason University, all undergraduates are required to take two basic science classes in order to graduate (George Mason University, 2008c). A few years ago, the Biology department at George Mason University was dissolved, and the biology staff either became part of the Environmental Science and Policy department or the Department of Molecular and Microbiology (George Mason University, 2009). The Environmental Science and Policy department consists of faculty from several different sciences and also policy who teach a wide range of courses. There are also many faculty members from other departments who are considered associated faculty to the program. This may suggest that participants who were also students were either not taking environmental science classes as their required science courses or environmental issues are not being intergraded in regular classes. In the future it may be interesting to investigate what types of science classes students are taking (i.e. if they are taking classes that focus on environmental issues), whether environmental issues are being intergraded into regular science and policy classes, and which informal sources (such as media,

friends, or information from non-profits) people in this area are using to acquire their environmental knowledge.

4.1.8. Membership Of Environmental, Conservation, Mammal, Nature, Or Animal Organizations

Some of the largest and best-known organizations, like Sierra Club, People For the Ethical Treatment of Animals (PETA), and World Wildlife Fund (WWF), seemed to be the most popular to join. However, many popular non-profits are set at the national level, and tend to focus on only a few popular issues (Adams et. al., 2006), so they may not be educating their members about issues on a local, community scale. Conversely, several of these organizations mention general urban wildlife problems on their websites, and some like Sierra Club have local chapters, so hopefully more non-profits will begin focusing more on local urban wildlife issues in the future.

Though most people were not currently part of an organization, the majority of people expressed interest in joining one in the future (69.5% of 167 people). Overwhelmingly, many of their reasons for wanting to join in the future had to deal with appreciating and caring about wildlife, or that they wished to educate themselves about the issues. Interestingly enough, nearly all subjects who didn't want to become members did not state they were indifferent about ecological issues: only two individuals (3.9% of 51 people) said that they didn't care about environmental problems. Most disinterested participants mentioned that they couldn't participate because of lack of time, and a few even noted that they did care about ecological issues but that they were too busy to join. In addition, some individuals who responded they wanted to join later gave similar

answers: they stated they didn't have time and were busy now, but when they did, they would join.

4.2. Local Level of Knowledge

4.2.1. Knowledge Of The Number Of Wildlife Mammal Species In Fairfax County

Nearly all of the respondents were unaware of how many wildlife mammal species commonly occur in the county. Participants greatly misjudged the number of local mammals: they either believed that a lot fewer or a lot more species occurred locally. It was thought that most people would underestimate the number of species since most of the U.S. public usually believes only a few species reside in urban areas and urban residents are generally unaware of most local mammal species (Adams et al., 2006). In Scott and Parson's (2004) study, most participants underestimated the number of local whale species in their locale.

No one knew the exact number of species, but two individuals (1%) came very close in their estimates and stated that there were fifty species (there are 47 species in Fairfax County; Virginia Department of Game and Inland Fisheries, 2009). Overall, most people did not give a specific answer but most simply stated that they didn't know (70.2%) or gave vague answers. Some people gave a range of really high numbers, such as 'hundreds' or 'thousands'. One possible explanation for these extremely high numbers is that people may have been thinking of the number of individual mammals, and not the number of mammalian species.

None of the demographics used, except for one, appeared to influence knowledge

of the number of common local wildlife mammals. There was a strong relationship between age and knowledge of the number of mammal species. Since the analysis conducted was a chi square analysis, it is uncertain how exactly age affects knowledge, only that it does have an effect.

4.2.2. Mammal Photograph Identification

Surprising, the majority of people (62%) were able to identify the mammals in all four pictures. Only a few people (3.9%) either got them all incorrectly or chose not to answer. In another study, very few subjects were able to identify pictures of common whales species that inhabited local waters (Scott and Parsons, 2004). Only 30.2% of subjects (out of 250 people) were familiar with at least one out of the four species (Scott and Parsons, 2004). But in a suburb of Arizona, where support for mountain lions was very strong, most participants (74.6% of 493 people) were able to recognize a picture of mountain lion tracks.

'Rodent-looking' type mammals were chosen since many people usually get certain species confused with rodents (E.C.M. Parsons personal communication, 2006) probably because rodents are the largest mammalian group. Though most subjects were able to identify the pictures of the beaver (82%) and otter (70.2%), people who misidentified the mammals gave a diverse range of answers, ranging from land to water mammals such as muskrat or platypus. In addition, for the fox and otter, though most people identified them correctly as a 'fox' or 'otter' only a few people were able to identify them by their exact species common name (grey fox and river otter).

When all four questions were compiled into an index, only occupation seemed to have an impact on mammal identification. In general, professionals identified more mammals correctly than skilled and non-skilled laborers. In Scott and Parson's study (2004), occupation also had an association with mammal identification. In that study, educational professionals, as well as people employed in tourist, marine, or whale-related jobs were able to identify marine mammal species much better than people who were unemployed. However, surprisingly, they were not able to identify as many species as people who worked in other occupations.

4.2.3. Knowledge Of Wildlife Mammal Species In Fairfax County

For many wildlife mammal species, the majority of respondents were knowledgeable of which mammals are present in Fairfax County. But for several species, many people erroneously thought they inhabit the area when they did not or did not know that particular mammals were in the area. For some mammal species, like brown bears, wolves, and lynxes, about half of survey takers knew that the mammals were not in the area but the other half of the participants thought they were or simply did not know about the mammal's status.

Very few people knew that bobcats inhabited Fairfax County, most likely because sightings are very rare: only a few sightings have been cited in the area (Virginia Department of Game and Inland Fisheries, 2009). Most people thought that both species of mice occur here, when only the house mouse does. It is a bit surprising the majority of people were not aware coyotes were in the area especially since they have been media

stories about coyotes in the D.C. area in recent years. Though most respondents were aware that white-tailed deer (79.5%) inhabited the region and that elk (62.3%) did not, most people mistakenly thought that the mule deer were also in the region or stated that they did not know whether it occurred here or not (78.4%). Most people were aware that both grey (56.1%) and red foxes (68.3%) lived in the area, and also could identify a picture of a fox (see Section 4.2.2.).

In the index, most people (61% of subjects) were able to correctly answer almost 2/3 of the questions right (61% of questions). As expected, residents knew more local mammals species than visitors. However, residents did only slightly better than non-residents on average. Locals were aware of just two more species than visitors. Occupation also affected knowledge levels. Professionals were slightly more aware of local species than non-workers (the majority of who were students). This again may indicate that people in this area are not learning about local mammal wildlife in schools. Gender also seemed to play a role in knowledge levels of mammal occurrence. Similar to Kellert's (1985) study, males were slightly more knowledgeable of wildlife than females. But in another study, gender had no influence in knowledge levels (Scott and Parsons, 2004).

Age also had an effect, but in a different manner than what was thought might occur. In another urban area, younger people were more knowledgeable of the occurrence of local mammal species (Scott and Parsons, 2004). However in this study, the opposite was found, older participants tended to be more aware of local species than younger people.

Education level did not influence knowledge levels. Formal ecological education and environmental group membership also did not appear to matter. This may be because global issues and not local issues are usually better known (Sheridan, 2005; Adams et al., 2006), or because people may not be learning about local mammals in an educational setting or from environmental organizations. Adams et al. (2006) mention that most U.S. urban inhabitants learn about animals and the natural world from television shows, so perhaps that is also the case in Fairfax County. More research into how people learn about mammals and local wildlife is needed in this area.

4.3. Perception Of And Participation In Conservation Activities And Issues

4.3.1. Willingness To Plant A Wildlife Garden Or Habitat To Attract Wildlife Species

Most demographics did not play a role in willingness to plant a wildlife garden or habitat to attract wildlife species. Residency, gender, age, income, and education level did not affect desire for a garden. It was curious to learn that both formal ecological education and environmental group membership also did not appear to have an impact on willingness. It was thought that members of environmental organizations or people with formal ecological education may want a garden, because a few popular nature and ecological organizations, such as the National Wildlife Federation have wildlife garden programs, and students may have learned about wildlife gardens or related plant conservation issues in school. However, most subjects in this study did not have formal environmental education and were not members of ecological groups, so they may have learned about wildlife gardens elsewhere. Occupation was the only variable that had an

influence on willingness to plant a wildlife garden. Though most professionals and skilled and non-skilled labor claimed they would like to plant one, most semi-professions (70%) did not seem to want one. In Palmer and Dann's (2004) assessment of the National Wildlife Federation's program, most people surveyed in their study were women, highly educated, and tended to have higher incomes. Occupation of their subjects was not stated in their study.

Many subjects who responded they wanted a backyard wildlife habitat stated they wanted to attract a wide range of animals: birds, butterflies, and small mammals were often cited as desirable species to attract. These results seem to coincide with Palmer and Dann's (2004) analysis: the most popular species people in National Wildlife Federation's wildlife habitat program wished to attract were songbirds and butterflies, and to a lesser extent small mammals. However, it was peculiar to note that several subjects (13.5% or 17 out of 126 respondents) in Fairfax County stated they wished to attract deer, as Fairfax County has an overpopulation of deer (Fairfax County Environmental Quality Advisory Council, 2008), and deer are responsible for much ornamental and garden damage in the area (Fairfax County Environmental Quality Advisory Council, 2008; Fairfax County Police Department Animal Services Division, 2009; North Virginia Soil and Water Conservation District, 2009). However one individual (0.8% out of 126 subjects) did state they wanted to attract 'anything but deer'.

4.3.2. Urban Wildlife Concerns In Fairfax County

In general, some concerns were considered local issues in Fairfax County, while others issues were not considered concerns at all. The Fairfax County Park Authority considers most of these topics human wildlife issues. Vehicle accidents involving deer are one of the main human-wildlife issues in the area (Fairfax County Environmental Quality Advisory Council, 2008) since over 4,000 collisions occur each year (Fairfax County Police Department Animal Services Division, 2009; Fairfax County Park Authority, 2009d; North Virginia Soil and Water Conservation District, 2009). Nearly all participants (91%) believed that mammal caused vehicle accidents were a local cause for concern.

In Fairfax County, many people are fearful of predators, such as coyotes, attacking people (Fairfax County Environmental Quality Advisory Council, 2008; Fairfax County Park Authority, 2009b). The Fairfax County Government and many wildlife experts do not think that mammals like coyotes attacking people are a problem (Fairfax County Environmental Quality Advisory Council, 2008), but they cite that many people in the area may be concerned with people attacks (Fairfax County Environmental Quality Advisory Council, 2008; Fairfax County Park Authority, 2009b). About 57% of people surveyed did not think that mammals attacking people was an issue.

The Fairfax County Government states that residents fear coyote pet attacks (Fairfax County Environmental Quality Advisory Council, 2008; Fairfax County Park Authority, 2009b). However, the Fairfax County Government and many wildlife biologists consider pet attacks from species like coyotes to be a slight concern in the area,

since they are rare and usually preventable (Fairfax County Environmental Quality Advisory Council, 2008; Fairfax County Park Authority, 2009b). Most survey participants (58.9%) considered pet attacks by mammals to be a concern in the area, even if the majority of participants did not know that carnivores like coyotes resided in the county. It would be interesting to research which mammal species the general local public thinks are attacking pets, and how often they think pet attacks are occurring.

Sometimes concern for an issue can be high even is incidence is low. For example, most people also considered diseases like rabies to be an issue in the area, even if rabies occurrence is relatively low in the county. There were only 59 known cases in the county in 2006 (Virginia Department of Health, 2006), and the area's population is over a million (Fairfax County Department of Systems Management for Human Services, 2006).

In the index, gender was the only demographic analyzed that influenced urban wildlife life concerns. Females were more slightly more concerned that the listed issues were problems than males were. More men (67.1%) than women (54.9%) did not consider mammal caused flooding to be an issue, and more women (78.4%) than men (64.4%) thought that mammal built dams were a concern.

4.3.3. Participation In Wildlife Activities And Conservation Practices

On the whole most respondents participated in at least a few conservation practices and activities from time to time (59.1%) and over a third (36.9%) did many activities much more often on a regular basis. Subjects tended to partake in more

common practices such as recycling (70.3% recycled frequently) rather than activities like sponsoring a wildlife animal (80.3% never have sponsored an animal). Most people in Sheridan's (2005) study in the D.C. area also stated they recycled (75% out of 240 subjects) and considered it 'very important'. Since very few participants were members of conservation organizations (many of which promote sponsoring a wildlife animal), it was not surprising that few people participated in this activity.

Most survey participants either occasionally (34.5%) or frequently (37.1%) avoided buying products tested on animals. This seemed to be supported by the data from Driscoll's 1995 study, in which most participants (66% out of 133 subjects) did not support animal testing in products. The majority of survey takers also took public transportation occasionally (54.3%) and almost a third (32.6%) took it frequently. In addition, many people said they frequently (25.3%) or occasionally (46%) carpooled. This seemed to differ from O'Connor et al.'s (1999) U.S. study, in which most respondents were less willing to take public transportation and car pool than other environmental activities, and from Sheridan's (2005) study in which few people (14%) said they would car pool.

In the index, age, occupation, and education level appeared to influence ecological actions. Older subjects tended to participate in more activities more often than younger subjects. This result seemed to be supported by the analysis done on occupation, since retired people (who are usually older) participated in the most ecological actions than skilled and non-skilled laborers and non-workers. However, very few respondents were retired. People with a master's degree tended to undertake more activities than

people with a high school degree, suggesting that more education may incite interest in participation. However, people with PhDs did not participate more often than people with other degrees. It would be interesting to explore these differences in the future.

Likewise, formal ecological education and nature group membership influenced how many and how often people participated in activities. People with an environmental education or who were members of an ecological organization were involved in slightly more activities more often than people without formal ecological education or non-members. This suggests that people with formal environment education or who have joined an environmental group may have been exposed to more eco-friendly ideas, and might be influenced to implement them more in their lives. Residency and gender did not seem to matter in how many and how often people did ecological practices.

4.3.4. Threat Level Of Ecological Threats To Fairfax County Mammals

The majority of people considered urban development (72.7%) and habitat degradation (61.3%) to be serious threats. This was similar to the results in Czech et al.'s (2001) U.S. study: subjects thought habitat loss was a main threat to wildlife species, and shows that that most participants realized economic factors were also a threat to mammals.

Global warming and climate change were seen as a much bigger threat to local mammals than what appeared in Sheridan's 2005 study. In her study in the D.C./northern VA area, the majority of people surveyed thought that climate change was a 'minor risk' to marine mammals. Although this study was conducted just shortly after Sheridan's

survey, most participants thought that climate change/global warming was either a 'moderate' or 'serious' threat. This may indicate that people's awareness of the issue is growing, however, it should be noted that Sheridan's (2005) study only focused on marine mammals, while this thesis concentrated on the effects of these threats on all types of local mammals, but primarily focused on land mammals. These results may indicate that people may hold risks to land mammals versus marine mammals to different standards.

Surprisingly, unlike some previous studies, exotic species were thought to be a 'moderate' or 'serious' risk. In Czech et al.'s (2001) investigation barely any subjects (3% out of 450 men and 1% out of 193 women) realized invasive species were threats to native species. However, in Sheridan's (2005) study, most respondents gave exotic species impacts on marine mammals a 'serious' ranking. This may indicate that people in the Fairfax County area are aware of the impacts of invasive species.

In the index, only gender had an effect on threat perception of environmental issues on local mammal species. Though both genders perceived that overall the listed ecological concerns were 'moderate' threats, women thought that environmental issues were even more of a threat than men thought. Slightly more women than men gave the issues a 'serious' rating, and a few men had more 'minor' or 'no' threat answers. These results are supported by the results of previous studies like O'Connor et al. (1999), in which women tended to change personal behaviors more often than men to alleviate environmental issues.

4.4. Support Of Conservation Law And Education

4.4.1. Importance Of Mammal Conservation

In general most survey participants considered mammal conservation 'very important' or 'important'. In another study conducted in the D.C. area, marine mammal conservation was also rated as 'very important' or 'important' (Sheridan, 2005).

Nearly all of the demographics did not affect people's perception on the importance of mammal conservation. Residency, gender, occupation, education level, and income had no impact. In other studies in highly urbanized areas, income influenced mammal conservation support (Parsons et al., 2003; Casey et al., 2005), and women supported mammal conservation more often than men (Czech et al., 2001; Casey et al., 2005). Education levels mattered greatly in other areas and in many cases helped change environmental perceptions (Casey et al., 2005).

Age affected opinion on mammal conservation importance but the association was weak. Though most people considered mammal conservation either 'very important' or 'important', the older the subject, the more important she or he considered mammal conservation. Age also played a role in another study, but it was younger, and not older, people that tended to support black bear conservation (Morzillo et al., 2007)

4.4.2. Support Of More Mammal Conservation Education In Schools

Environmental education may shift ecological perceptions and attitudes (Pooley and O'Connor, 2000; Goedeke, 2004; Casey et al., 2005; Rideout, 2005). There appears to be a strong interest in more ecological education in the area. However, all of the

demographics, except for one, did not influence support of more mammal conservation education. Only gender had an impact. Almost all women (99%) and men (91.8%) supported an increase in mammal conservation education, but slightly more women supported it than men did. The association between the two variables (gender and support of more mammal conservation education) was weak, indicating that other undetermined factors shaped the participants' viewpoints.

4.4.3. Importance Of Mammal Conservation Laws And Policies

Only two demographics, gender and environmental group membership, had an effect on importance of mammal conservation laws and policies. For the most part, women tended to give rate mammal conservation laws and policies higher than men did. More women (47.4%) gave mammal conservation regulations a 'very important' rating than men (37.5%). Though very few people responded that mammal conservation policies was 'unimportant' (1%) or 'very unimportant' (1.6%), no females considered them 'unimportant' while a couple men (2.1%) did. More men also said they were 'unimportant' and 'very unimportant' than women. This seems to be similar to what Czech et al. (2001) and Casey et al. (2005) found in their studies. In Czech et al.'s (2001) investigation of conservation in the U.S., women tended to support environmental laws like the Endangered Species Act more than men did. Women supported protection of mountain lions more than men did in Casey et al.'s research (2005). However, in another survey, men supported conservation legislation more than women did (O'Connor et al., 1999).

While formal ecological education did not have an effect on importance of mammal environmental regulations, environmental group membership did.
It was thought that subjects with formal ecological education might support environmental law more than people without ecological education since they may have been exposed to more environmental policy, but there was no significant different between the two groups. For environmental group membership, both members of nature groups and non-members believed that mammal legislation was 'very important' or 'important', but more members rated mammal protection laws as 'very important' (60%) than non-members (38.2%). Furthermore, no members were neutral about the topic or thought mammal ecological laws and polices were 'unimportant' or 'very unimportant'. Every member rated environmental policies as either 'important' (40%) or 'very important' (60%). Environmental group membership and support for conservation of species have been linked in other studies (Morzillo's et al., 2007).

4.4.4. Effectiveness Of Current Federal Mammal Conservation Legislation

Opinion on the effectiveness of mammal conservation legislation was only affected by income. High income levels may affect support of conservation legislation in some cases (Parsons et al., 2003; Casey et al., 2005). Overall, participants seemed almost evenly split on their views on the effectiveness of the current federal mammal conservation legislation, with a little more people perceiving the laws as inadequate than sufficient. The results were similar to another recent questionnaire conducted in the D.C. area: over a third of people in that study also did not know how effective they thought

marine mammal conservation laws were, and the rest of the participants were nearly evenly split between inefficiency and efficiency, with slightly more participants who believed marine mammals were overprotected (Sheridan, 2005). These results may indicate public discontent of the effectiveness of current mammal conservation laws.

4.4.5. Support Of Current Federal Mammal Conservation Legislation (Endangered Species Act And Marine Mammal Protection Act)

Though participants felt mixed about the effectiveness of the present mammal legislation (see Section 4.4.4.), there appeared to be great support for the current federal mammal conservation legislation, such as the Endangered Species Act and Marine Mammal Protection Act. Most people either 'strongly agreed' (26.1%) or 'agreed' (47.2%) with the statement "I support the current federal legislation on mammal conservation, such as Endangered Species Act and Marine Mammal Protection Act". Very few people said they 'disagreed' (2.5%) or 'strongly disagreed' (2.5%) with the sentence.

Only three demographics (age, occupation, and education level) had effects on people's viewpoints. Most subjects seemed to support the present legislation, but older subjects tended to have slightly stronger feelings of support than younger survey takers. Though formal environmental education (a specific kind of education) did not seem to affect support, education level did. This may suggest that people are perhaps learning about environmental issues from many informal sources and not from formal sources such as environmental classes and workshops. In other studies people who were older

(O'Connor et al., 1999) and who had more education (O'Connor et al., 1999, Casey et al., 2005) supported environmental legislation more often.

Occupation also showed significance, but the Scheffe test did not show a difference between group means until the retired category was dropped, and the skilled/non-skilled labor and semi-professional groups were combined. It is thought that the error may have occurred because sample size of the retired populations was very small, and the other groups were also small compared to the professional and non-worker categories. The combined skilled and non-skilled labor and semi-professional group differed significantly from professionals.

4.4.6. Support Of The Creation Of New Federal Mammal Conservation Legislation

For this question, subjects were asked to respond to the statement "I support the creation of new legislation for mammal conservation". Most survey participants 'agreed' (39.4%) or 'strongly agreed' (30.8%) with the statement. Only environmental group membership mattered in support of the creation of new policies and law. Overall, ecological organization members (51.4%) tended to 'strongly agree' more often than non-members (26.4%), though most non-members (41.1%) 'agreed' with the creation of new legislation. It was notable that zero members stated they 'strongly disagreed' or 'disagreed' that new legislation should be created. This appears to suggest that environmental group membership may instill stronger pro-environmental legislation attitudes in the local populace. However, most respondents in the area were not members of nature or wildlife organizations, though many people expressed interest in joining one

(see Section 4.1.8.). Many people can have mixed opinions on support of proposed conservation legislation (O'Connor et al., 1999), so more research is needed in the area to identify what other factors may influence support for the creation of new conservation legislation. The results seem to suggest that there is strong public support for the creation of new mammal conservation legislation, presumably connected to public discontentment of the effectiveness of present laws (see Section 4.4.4.).

4.4.7. How Favorable Politicians And Political Parties Were Viewed If They Support Mammal Conservation Legislation

Most people (67.6%) stated that if a politician or political party backed mammal related environmental policies, they would perceive the politician or political party more favorably. Most of the rest of the respondents (28.9%) said it would not affect how they felt about a politician or party either way. Very few people (3.5%) said they would perceive the politician or party negatively if they did support mammal ecological regulations. Clearly, these results indicate that since many subjects support mammal environmental laws and presumably other environmental laws, politicians and political parties may want to take note of this when running for election or reelection.

None of the variables except for formal environmental education had any impact on how favorable politicians and political parties were viewed if they support mammal conservation legislation. People with formal environmental education (81.8%) viewed politicians and political parties who supported conservation law even more favorably than subjects who did not have formal ecological education (61%). This is not

unexpected since people with formal education may have had more exposure to environmental laws than people without ecological education.

In this study, the majority of subjects supported the current laws (see Section 4.4.5) but felt mixed about their efficiency. Slightly more people thought they were ineffective (see Section 4.4.4.) but most people stated they would support the creation of new mammal conservation laws (refer to Section 4.4.6.). If new conservation legislation were developed in the future, policy makers may want to take note that voters in the Northern Virginia or D.C. metropolitan area would most likely support it. The lack of statistical difference between residents and non-residents may indicate that support of new ecological legislation and pro-environmental policy makers might be environmental attitudes that the general American public shares.

5. Conclusion

Urbanization and the resultant encroachment into wildlife areas have caused an increase in human-wildlife conflicts (Casey et al., 2005; Raik et al., 2005; Adams et al., 2006). In the past, social-political factors, such as public perception, have often been disregarded in wildlife management (Kellert, 1985; Raik et al., 2005; Adams et al., 2006; Talbot, 2008). Present day, wildlife managers are now taking public perception into account when solving urban wildlife issues (White et al., 2005). Public perceptions of mammals and local mammal conservation issues have not been studied extensively in Fairfax County, VA. In this thesis, an ecological social survey was conducted to study public viewpoints and attitudes of mammals and related conservation issues in the area. Topics investigated included local level of knowledge of mammal wildlife species, concern of human-wildlife issues in Fairfax County, involvement in ecological activities, environmental threat perception, and support of mammal conservation, mammal preservation education, and mammal conservation policies.

Overall, environmental knowledge seemed low in certain aspects (like knowledge of the number of species) and higher in other cases (like in mammal identification and knowledge of species occurrence), but even with low knowledge levels in many instances, subjects seemed to have strong pro-environmental attitudes, viewpoints, and behaviors. People perceived many environmental issues as concerns, participated in

several environmental activities, and strongly supported mammal conservation issues, education, and policies. Lack of knowledge could also be seen in perceptions of many issues. Some human-wildlife concerns, like pet attacks by mammals like coyotes, were not considered concerns by the local government or experts (Fairfax County Environmental Quality Advisory Council, 2008; Fairfax County Park Authority, 2009b), but were considered concerns by survey participants. In addition, some environmental risks like oil spills affecting local mammals were thought to be serious to moderate threats by the surveyed public, when there was actually little threat of them. Examples such as this may suggest that although people may or may not be aware of certain environmental and human-wildlife issues or understand these issues in depth, environmental concern and support for ecological initiatives appears to be very strong in the Fairfax County area.

These data also indicate that more mammal conservation education on local issues may be helpful in alleviating some of the known human-wildlife issues in the area, like deer-vehicle collisions or flooding from beaver-built dams. In general, people in this area seem interested in both conservation and mammals, greatly supported mammal conservation causes even if they didn't know much about them, and expressed interest in more mammal environmental education. Local organizations like the Fairfax County Park Authority and Fairfax County Police Department Animal Services Division already provide a lot of information on local concerns. However, formal environmental education seems to be low in the area. Providing accurate information on these topics could lead to an even greater understanding and eventual solutions to local issues.

Although the Fairfax County government offers some seminars and wildlife activities, they may want to offer more classes on local mammal species and conservation issues. Possible seminars and activities include courses on local human-wildlife conflicts and local environmental issues, eco living information sessions, local fauna and flora identification classes and related conservation concerns, and nature walks or hiking.

Since the public's interest in ecological issues appears to be strong in this area, more environmental education in general (not just focusing on mammals but all ecological issues) may promote even more participation in ecological activities and more changes in attitudes and behaviors, which could help alleviate local issues as well as global ones. In addition, it may be necessary to investigate how locals are learning about environmental issues and, in particular, to identify which informal sources of education they use to learn about ecological issues. Perhaps schools in the area could teach more about local human-wildlife conflicts and local wildlife species. At George Mason University local wildlife mammal species are currently not taught in the introductory level biology classes (Larry Rockwood personal communication, 2009). To strengthen local knowledge, local mammal species and mammal conservation issues could be included in the curriculum of basic biology courses. Environmental issues could also be incorporated in all types of science courses (not just biology), as well as in social science or policy classes. Though this study did not focus on children, it may be a good idea to educate children at the grade school level about ecological issues, and teach them about local issues and environmental responsibility.

Although environmental organization membership was low in the county, many people expressed interest in joining one at a later time. To increase local knowledge levels, ecological organizations might want to educate their members about local conservation issues. Many people (regardless of whether they wanted to join a green organization in the future) stated that they were currently not members because of a lack of time. Environmental organizations may want to educate people about simple eco living tips that do not take a lot of time to increase participation in green activities. Learning about local concerns and what actions they can take to help prevent them may give people a sense of connection to the issue, which may lead them to become more active in environmental issues (Lee Talbot personal communication, 2005).

People surveyed in the area had mixed feelings about current federal environmental regulations. However, they greatly supported environmental issues, the creation of new environmental policies, and stated they would look favorably on politicians who supported mammal conservation. The data from this study show possible strong support for the creation of future and even tougher environmental laws, nationally and perhaps locally.

This study on public perception gives insight onto the local attitudes and viewpoints of mammals and mammal conservation on a wide range of topics, which may be useful in the wildlife management decision-making process, and may provide the background to help alleviate local human-wildlife conflicts. These data also give insight into how different demographics may influence environmental behaviors, beliefs, and knowledge. Fairfax County is a highly urbanized suburban area, and this study could be

used as a basis for the creation of similar studies in other highly urbanized areas. Lastly, this thesis provides the groundwork for future ecological social surveys in the Fairfax County area, and the study of changes in public perception of mammals and related ecological issues in the county over time.

Appendix A: Survey Instrument

Please tick the boxes or fill in the blanks where appropriate. The survey should take no more than a few minutes to complete.

1. Are you a resident of Fairfax County? Yes □ No □

b. If no, where is your permanent residence? _____

2. Do you have any formal environmental, conservation, mammal, nature, or animal education? Yes □ No □

b. If yes, please elaborate: _____

3. Are you a member of an environmental, conservation, mammal, nature, or animal organization? Yes □ No □

b. If yes, which environmental, conservation, mammal, nature, or animal organizations are you a member of? _____

c. If no, would you consider joining an environmental, conservation, mammal, nature, or animal organization in the future? Yes □ No □
Why or why not?_____

4. Are you a hunter or a trapper? Yes □ No □

b. If yes, which species do you hunt or trap? _____

c. If no, do you support hunting or trapping? Yes □ No □
Why or why not? _____

5. Are you are a fisher? Yes □ No □

a. If yes, please state why you fish: _____

6. Would you plant a wildlife habitat/garden in your yard to attract wildlife?
Yes □ No □ Already have one □

b. If yes, what wildlife species would you hope to attract? _____
_____

7. Are you a vegetarian? Yes □ No □

b. If yes, please state why: _____

8. How many wildlife mammal species do you think there are in Fairfax County? If you are not sure, please write 'don't know'. _____

9. In this section, please identify the mammal species in the photographs provided. If you are not familiar with the animal in the picture, write 'don't know' in the blank.

a. What mammal is pictured in photograph A? _____

b. What mammal is pictured in photograph B? _____

c. What mammal is pictured in photograph C? _____

d. What mammal is pictured in photograph D? _____

10. In this section, please answer whether the following mammal species are commonly found in the wild in Fairfax County.

a. Bobcat (*Lynx rufus rufus*)	Yes □	No □	Don't know □
b. Lynx (*Lynx pardinus*)	Yes □	No □	Don't know □
c. Coyote (*Canis latrans*)	Yes □	No □	Don't know □
d. Wolf (*Canis lupus)*	Yes □	No □	Don't know □
e. Little brown bat (*Myotis lucifugus lucifugus*)	Yes □	No □	Don't know □
f. Vampire bat (*Desmodus rotundus*)	Yes □	No □	Don't know □
g. House mouse (*Mus musculus musculus*)	Yes □	No □	Don't know □
h. Cotton mouse (*Peromyscus gossypinus*)	Yes □	No □	Don't know □
i. Mule deer (*Odocoileus hemionus*)	Yes □	No □	Don't know □
j. White-tailed deer (*Odocoileus virginianus*)	Yes □	No □	Don't know □
k. Elk (*Cervus elaphus)*	Yes □	No □	Don't know □
l. River otter (*Lontra canadensis lataxina*)	Yes □	No □	Don't know □
m. Sea otter (*Enhydra lutris*)	Yes □	No □	Don't know □
n. Manatee *(Trichechus manatus)*	Yes □	No □	Don't know □
o. Raccoon (*Procyon lotor lotor*)	Yes □	No □	Don't know □
p. Beaver (*Castor canadensis*)	Yes □	No □	Don't know □
q. Grey fox (*Urocyon cinereoargenteus*)	Yes □	No □	Don't know □
r. Red fox (*Vulpes vulpes fulva*)	Yes □	No □	Don't know □
s. Brown bear (*Ursus arctos*)	Yes □	No □	Don't know □
t. Black bear (*Ursus americanus*)	Yes □	No □	Don't know □

11. How important do you think mammal conservation is?

Very important □ Important □ Neither important or unimportant □
Unimportant □ Very unimportant □ Don't know □

12. Would you support more mammal conservation education in schools?

Yes □ No □

b. Why or why not?_____

13. Do you personally think the following urban and wildlife issues are concerns in Fairfax County?

a. Flooding (from animal built dams): Yes □ No □ Don't know □
b. Property damage (tree, land, house): Yes □ No □ Don't know □
c. Vehicle collisions: Yes □ No □ Don't know □
d. Diseases (like rabies): Yes □ No □ Don't know □
e. People attacks: Yes □ No □ Don't know □
f. Pet attacks: Yes □ No □ Don't know □

14. In this section, please answer whether you participate in the following wildlife activities or conservation practices.

Activity:	Frequently	Occasionally	Never
Nature walks			
Hiking			
Wildlife-watching tours (like whale-watching tours)			
Amateur wildlife-watching (like bird-watching)			
Visit parks, zoos, nature centers			
Sponsor a wildlife animal through an adoption program (such as whale or wolf adoptions)			
Recycle			
Use public transportation			
Avoid buying products tested on animals			
Purchase organic or environmentally friendly products			
Use energy saving light bulbs or devices			
Educate others on environmental issues			
Carpool			
Donate to environmental, nature, or animal organizations			
Volunteer at environmental, nature, or animal organizations			
Watch nature programs on TV (like Animal Planet)			
Bird feeding			
Feeding other wildlife species besides birds			

b. Other: _____

15. In this section, please rank how serious a threat you think the following issues are to mammal species in Fairfax County.

Issue:	Serious Threat	Moderate Threat	Minor Threat	No Threat	Don't know
Habitat degradation/damage					
Urban development					
Non-native/exotic species					
Global warming/ climate change					
Car injuries					
Lack of available prey					
Lack of natural predators					
Litter					
Sewage pollution					
Farm runoff					
Tourism					
Chemical discharges					
Noise pollution					
Oil pollution					
Wildlife-watching					
Hunting or trapping					
Air pollution					
Military activities					
Mammal overpopulation					
Mammal underpopulation					

b. Please list any other issues you consider threats to mammal species in Fairfax County:_____

_____

16. How important do you think mammal conservation laws and policies are?

Very important □ Important □ Neither important or unimportant □
Unimportant □ Very unimportant □ Don't know □

17. What is your political ideology?

Very liberal □ Liberal□ Moderate□ Conservative□ Very conservative □

18. How effective do you think the current federal legislation on mammal conservation is?? (for example, Endangered Species Act and Marine Mammal Protection Act)

Very effective □ Effective □ Neither effective or ineffective □
Ineffective □ Very ineffective □ Don't know □

19. I support the current federal legislation on mammal conservation (such as Endangered Species Act and Marine Mammal Protection Act)**.**

Strongly agree □ Agree □ Neither agree nor disagree □
Disagree □ Strongly disagree □

b. Why or why not?_____

20. I support the creation of new legislation for mammal conservation.

Strongly agree □ Agree □ Neither agree nor disagree □
Disagree □ Strongly disagree □

b. Why or why not?_____

21. If a politician or a political party supported mammal conservation legislation, would you view the politician or political party:
More favorably □ Neither favorably or less favorably □ Less favorably □
Don't know □

22. Are you? Female □ Male □

23. What is your year of birth? _____

24. What is your ethnicity or ancestry?
African American/Black □ Asian American/Asian/Pacific Islander □ White □
Latino American/Latino/Spanish □ Native American/Alaska Native □
Other: _____

25. What is your place of birth? _____

26. What is your occupation? _____

27. What is your household's combined annual income?
Under $25,000 □ $25,000-$39,999 □ $40,000-$54,999 □ $55,000-$69,999 □
$70,000-$84,999 □ $85,000-$99,999 □ $100,000-$114,999 □
$115,000-149,999 □ $150,000 or more □ Prefer not to answer □

28. What is the highest education level you've completed?
Jr. high □ High school □ College/undergraduate □
Master's □ PhD □ Other: _____
b. If college or higher, what was your major or focus of study? _____

Thank you for taking the time to fill out this survey! ☺

Appendix B: Photographs for Question 8 of Survey

Photograph A

Photograph B

Photograph C

Photograph D

Appendix C: Extra Demographics Not Used

Table 51. Ethnicity and ancestry. Percentages are listed for both relevant data and total data.

Ethnicity And Ancestry	Total (All Respondents) (%)
African American/Black	5.58/5.37
Asian American/Asian/Pacific Islander	15.74/15.12
White	65.99/63.41
Latino American/Latino/Spanish	4.06/3.90
Native American/Alaskan Native	0.51/0.49
Middle Eastern	1.52/1.46
Mixed Ancestry and Ethnicity	6.60/6.34
Non-response	n/a /3.90
	N=197/205

Table 52. Place of birth. Percentages are listed for both relevant data and total data.

Place of Birth	Total (All Respondents) (%)
U.S.A.	82.74/79.51
Canada	0.51/0.49
Caribbean	0.51/0.49
Central America	1.52 /1.46
South America	0.51/0.49
Asia	6.09/5.85
Middle East	2.03/1.95
Africa	2.54/2.44
Europe	3.55/3.41
Non-response	n/a /3.90
	N=197/205

Table 53. Hunters and trappers.

	Total (All Respondents) (%)
Hunters and Trappers	5.85
Non-hunters and Non-trappers	94.15
	N=205

Table 54. Types of wildlife species hunted or trapped.

	Total (All Respondents) (%)
Deer	50.00
Deer, Boar	8.33
Deer, Elk	16.67
Deer, Rabbit, Squirrel	8.33
Deer, Muskrat, Rabbit, Raccoon Squirrel	8.33
Deer, Game Birds/ Duck	8.33
	N=12

Table 55. Support of hunting or trapping by non-hunters and non-trappers.

	Total (All Respondents) (%)
Yes	47.62/36.27
No	51.02/38.86
Yes/no	1.36/1.04
Non-response	n/a /23.83
	N=147/193

Table 56. Fishers. Percentages are listed for both relevant data and total data.

	Total (All Respondents) (%)
Fishers	24.51/24.39
Non-fishers	75.49 /75.12
Non-response	n/a /0.49
	N=204/205

Table 57. Motives for fishing.

	Total (All Respondents) (%)
Bass Sunfish	2.00
Boating, Enjoy	2.00
Bonding	2.00
Bonding, Enjoy	2.00
Bonding, Food	4.00
Catch/release, Enjoy	16.00
Enjoy	24.00
Enjoy, Food	14.00
Enjoy, Sport	6.00
Enjoy, Work	2.00
Food	14.00
Nature	6.00
Nature, Skill	2.00
Sport	4.00
	N=50

Table 58. Vegetarians.

	Total (All Respondents) (%)
Vegetarians	13.66
Omnivores	86.34
	N=205

Table 59. Reasons why subjects are vegetarians.

	Total (All Respondents) (%)
Animal Rights/Cruelty	10.71
Animal Rights/Cruelty, Health	3.57
Animal Rights/Cruelty, Health, Morals/Ethics	3.57
Animal Rights/Cruelty, Health, Responsibility for Environment	3.57
Animal Rights/Cruelty, Health, Taste	3.57
Aesthetically Pleasing, Health	3.57
Brought Up As One, Eat Without Killing	3.57
Don't Like Meat	10.71
Don't Like Meat, Health, Morals/Ethics	3.57
Eat Without Killing	3.57
Health	3.57
Humane	3.57
Humane, Responsibility For Environment	3.57
Likes Veggies	3.57
Morals/Ethics	10.71
Morals/Ethics, Religion	3.57
Not Necessary	3.57
Overpopulation, Responsibility for Environment	3.57
Religion	3.57
Responsibility for Environment	7.14
Non-response	3.57
	N=28

Table 60. Political ideology.

	Total (All Respondents) (%)
Very Liberal	13.11/11.71
Liberal	24.59/21.95
Moderate	44.81/40.00
Conservative	15.85/14.15
Very Conservative	1.64/1.46
Other	n/a /6.34
Non-response	n/a /4.39
	N=183/205

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