

# Free-Roaming Cats: A Survey-Based Study Exploring Owners' Behavior

by

Lisa Macki

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Lisa Macki

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Gerardo Chin-Leo  
Member of the Faculty

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## ABSTRACT

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*Felis catus*, or the domestic cat, is both the most popular pet in the United States and a member of the International Union for the Conservation of Nature's 100 worst invasive species list. Cats can damage their surrounding environment through direct predation, competition, hybridization, and the spreading of disease. At the same time, they confer companionship, comfort, and a number of health benefits to their owners, such as lower blood pressure and rates of depression. Across the US the numbers of owned, stray, and feral cats are on the rise, and shelters are running at overcapacity. Given this increase and its societal consequences solutions are needed to manage cat populations. Managing free-roaming cats is also important due to their impact on the ecology of their surroundings, including direct predation of wildlife. Wildlife agencies and cat protection groups disagree on how to physically manage free-roaming cats, but both agree that the behavior of pet owners, who allow their cats to roam free, is the root of the problem. In order to address this issue, a better understanding of the rationale underlying cat owners' decisions to allow their pet to roam free is needed. The goal of this thesis is to contribute to this understanding. To this end, a survey was administered to residents of the Eastside Neighborhood in Olympia, WA. The results showed that free-roaming cat owners' actions are not related to their education level, knowledge of the impacts of free-roaming cats or dangers to their cats, or even to their agreement that free-roaming cats should be managed. These results reflect the complexities that make convincing cat owners to change their behavior difficult. Additional in-depth research is needed to provide a more thorough understanding of the factors associated with owners' decisions to let their cats roam free. Future research should include comprehensive interviews of cat owners who allow their cats to roam free, who have indoor cats, and who provide controlled outdoor access for their cats. Analyzing this information would be helpful in designing effective programs to educate owners and manage free-roaming cats

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# **Chapter 1: The Domestic Cat Past and Present: Environmental Impacts and Other Implications of Free-Roaming Cats.**

## **History of Domestication**

*Felis silvestris catus*, commonly known as the Domestic cat, is a subspecies of *silvestris*. This group also includes the European Wild Cat, African Wild Cat, and Indian Desert Cat. Genetic, morphological, and archeological evidence indicate that the African Wild Cat, or *F. s. lybica*, is the ancestor of modern domestic cats, but it is likely that other small wild cats made genetic contributions (Bradshaw, 1992; Serpell, 2000). Placing a date on the domestication of cats is difficult due to the transitional nature of the species, but Vigne, Guilaine, Debue, Haye, and Gérard (2004) reported that archeological evidence on the island of Cyprus show that some level of domestication occurred more than 9,500 years ago. Since fossil evidence indicates that cats are not native to the island humans must have intentionally transported them there. The domestication of cats likely began as a way to protect food stores from rodents. People taking notice of the benefit of having cats around started encouraging their presence; it is this relationship that caused Clutton-Brock (1999) to call the cat “an exploiting or exploited captive”. People were able to exploit cats’ hunting prowess by providing shelter and food, thus encouraging cats to form home ranges overlapping their own. Cats, in turn, were able to exploit food, shelter, and affection by acting on their natural survival instincts and preying on species considered by humans to be pests (Clutton-Brock, 1999). The keeping of wild animals as pets by hunter gathers provides an alternative theory of how and why cats were domesticated (Serpell, 2000). It is likely that both scenarios occurred in different areas at different points in time.

Most evidence into the historical relationship between humans and cats comes from Egypt, where many think the process of domestication began. According to Serpell (2000), early evidence of cat domestication in Egypt was found in tombs around 4000 BC, as representations

on amulets around 2300 BC, and pictorially in 1950 BC. Wild animals played important social and religious roles in the Egyptian culture, and cats, which thrived in the agrarian society, were eventually regarded as manifestations of the goddess Bastet. Cats became a protected species in Egypt and were mummified in great numbers as both offerings to the goddess and as treasured pets. The spreading of cats from Egypt was originally restricted because of their important status, but they eventually were transported worldwide.

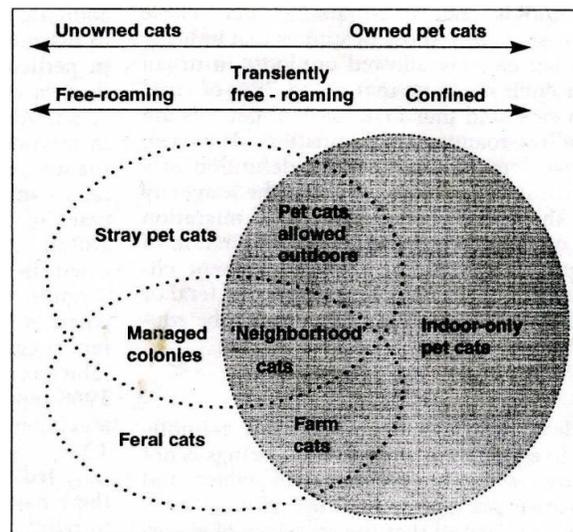
During the rise of Christianity and throughout the Middle Ages, cats' status was significantly altered. The same characteristics that made them sacred in Egypt turned them into symbols of the devil and tools of witchcraft under Christianity, which led to their persecution. To some degree, these historical attitudes towards cats can be seen in current attitudes where a dichotomy of cats being considered either good or bad persists.

### **Current Trends**

Cats are currently found throughout the world as a variety of populations ranging from cherished pets to disease riddled pests. While exact numbers of cats are impossible to calculate, the American Pet Products Manufactures Association (2009) recently reported that an estimated 93.6 million cats are owned in the United States (as cited on [http://www.humanesociety.org/issues/pet\\_overpopulation/facts/pet\\_ownership\\_statistics.html](http://www.humanesociety.org/issues/pet_overpopulation/facts/pet_ownership_statistics.html)). Numbers for feral cat populations are even more difficult to estimate, but Jessup (2004), estimates that there are 60-100 million throughout the United States. In 2001, Pimental estimated that of the 21 million cats in Australia, approximately 3 million are owned and 18 million are feral. A recent report by the Pet Food Manufactures Association (2009) reports that there are 8 million owned cats in England, and while there are few estimates of feral cat population, Hartwell (2002) states that there are approximately 1 million.

Like much of its history, the domestic cat has a complex relationship with humans. Cats' level of association with humans is as varied as humans' attitudes towards cats. In fact, the domestic cats' status is so multifarious that despite its standing as an invasive species, wildlife and park managers can be found working with nonprofit cat groups to improve the welfare of feral cats. Cats' lifestyles range from having all of their needs met by humans to living completely wild. Patronek's (1998) diagram (*Figure 1*) not only describes types of cat populations, but also helps to visualize the complexities that are innate when discussing or attempting to manage cat issues. It is important to specify that a free-roaming cat is any cat not confined when outdoors, regardless of its relationship with humans.

*Figure 1. Conceptual diagram of cat populations. This figure shows the level of human association and lifestyle status for different cat populations (Patronek, 1998).*



As human populations have grown, so have the population of free-roaming feral and owned cats. This growth has increased conflicts involving domestic cats, leading to questions about cat welfare, the environmental impacts of free-roaming cats, and the lifestyles of cats. In an attempt to better address these questions, research revolving around domestic cats has expanded. Franklin (1999) described the many health benefits of owning a pet, such as lower

stress levels, lower rates of depression, faster recoveries after surgeries and heart attacks, and extended life spans. While the health benefits of owning a pet are widely accepted, most negative outcomes of cat ownership are highly debated, especially in regards to free-roaming cats.

The transient nature of particular cats, along with location characteristics and differences, influence the impacts that cats have on their environment. This makes generalizations about the risk they pose to humans, other pets, or wildlife difficult. It also impedes management, especially when discussions about absolute numbers are emphasized. As a prolific non-native species, any free-roaming cat can have a negative impact on its surrounding environment including: spreading disease to humans, pets, and wildlife, hybridizing with native cats, out-competing native predators, and direct predation.

## **Spreading of Disease**

### **To Humans**

The main human health risk that free-roaming cats pose is the transmission of diseases or parasites. There is also the risk of injury or infection due to bites, which most often occur when people try to approach unfamiliar cats. Free-roaming cat interactions, with wildlife and other free-roaming cats, combined with low vaccination rates, increase the risk of spreading diseases to humans.

While only a few cases of human rabies have originated from cats, the risk of exposure and the high cost of postexposure prophylaxis (PEP), have led many public health authorities to stress the importance of vaccination for all cats and avoidance of contact with any free-roaming cat (Patronek, 1998). The Center for Disease Control (CDC) (2007) suggests that most infected cats contract rabies from wild raccoons, and the high rate of infection is likely due to “fewer cat vaccination laws, fewer leash laws, and the roaming habits of cats.”

In areas where plague can be found in rodent populations, mainly in the southwest, cats can be an exposure source for humans. The CDC (2005) listed domestic cats as a risk factor in spreading plague to humans by either direct contact with an infected cat (usually as a result from preying on infected rodents) or by bringing infected fleas into the vicinity of humans. For this reason, the CDC recommends treating cats for fleas and not allowing them to roam free as a way to prevent the spread of plague.

The parasite Toxoplasmosis can be spread by cats through their feces. Cats are the only animal that can shed live oocysts, a thick walled egg that allows for transfer to a new host. These parasites can then be transported to humans by direct contact with feces or contact with contaminated soil or water. Cats' tendency to defecate and bury their feces in exposed soil sites such as gardens, increase the risk of exposure to humans. Other animals, like pigs, can also be infected by contact with cat feces and then pass the parasite onto humans if meat is not properly cooked. The CDC (2008) lists toxoplasmosis as the third leading cause of death due to food-borne illnesses. Pregnant women are particularly at risk because exposure to the parasite can lead to miscarriages or birth defects.

Cats can transmit other zoonoses such as: encephalitis, salmonella, Lyme's disease, Giardiasis, and a number of parasitic worms. The transmission of disease from cats to humans varies by location and type, but all free-roaming cats potentially pose a threat. Population reduction of unowned cats, restricting owned cats outdoor access, ubiquitous vaccination, proper handling of cat litter, and protection of gardens and sandboxes from cat feces are all actions that reduce human exposure to diseases transmitted by cats.

### **To Pets**

Free-roaming cats pose a health risk to other pets by spreading disease and causing injuries during fights. Spaying or neutering cats has been shown to reduce aggression and

fighting behavior, and vaccination can prevent the spread of some diseases. However, as rates of vaccination and alteration differ between all levels and localities of cat populations, it is important to note a few of the diseases that cats spread. A number of diseases that can be spread to humans, like rabies or the plague, also affect other animals such as dogs. Some diseases that are unique to felines include: feline paleukopenia virus (FPV) or feline distemper, feline leukemia virus (FeLV), feline immunodeficiency virus (FIV), feline infectious peritonitis (FIP). Any of these infections typically result in the death of the feline. According to Barlough, Barr, Scott, and Richards (n.d.), while an effective vaccine exists for FPV, the only sure way to prevent infection by the others is by eliminating the risk of exposure. A reduction in the number of free-roaming cats will protect pets from disease and injury.

### **To Wildlife**

Wildlife can be exposed to certain diseases through direct contact with domestic cats and indirectly through cat waste. As human development spreads and the density and number of cats increase, so does the potential for disease to be spread to wildlife. Additionally, when feeding stations are established for free-roaming cats, wildlife is attracted to the food as well. This further increases cat and wildlife interactions, thus the risk of spreading disease.

Wild feline species can contract a number of diseases from domestic cats including feline leukemia, feline distemper, feline immunodeficiency virus, and rabies. According to Florida PantherNet (n.d.), a number of endangered Florida panthers, whose population is only about 100 individuals, have died of feline leukemia as a result of preying on domestic cats. Other feline species that can contract disease as a result of interactions with domestic cats include bobcats, mountain lions, and many of the *silvestris* subspecies.

Diseases impacting wildlife populations can also be spread by domestic cat waste. David Jessup (2004) cites reports that show the drastic impact that toxoplasmosis spread from cat waste has on both the endangered Hawaiian Alala and southern sea otters off the coast of California. Dickman (1996) describes the risks of toxoplasmosis on Australian wildlife, where infections are reducing the populations of small native marsupials like the bandicoot. The bandicoots become infected after eating insects and earthworms that acquired oocysts from cat waste. Dickman also emphasizes that toxoplasmosis is the most devastating disease that cats can spread to wildlife. In order to completely reduce the risk of toxoplasmosis and other diseases spread by cats to wildlife, owned cats need to be prevented from roaming free, their litter needs to be handled properly, and the unowned free-roaming cat populations needs to be reduced.

### **Hybridization**

According to Clutton-Brock (1999), the process of domestication results in genetic, physical, and behavioral differences, which over time result in the formation of a different species. While the domestic cat is recognized as a species unto itself, Bradshaw (1992) notes that domestic cats fluid relationship, along with a low level of breeding control by humans, have resulted in cats having fewer behavioral and morphological differences from their wild ancestors than other domesticated animals. As a result, free-roaming domestic cats can successfully breed with other species in the *silvestris* group including the European wildcat, African wildcat, and Asian wildcat. Increased numbers of domestic cats, along with expansion of human development, have led to a decrease of genetic purity. This decrease can result in the extinction of particular subspecies. Garman (2000) declared hybridization to be the greatest threat for most *silvestris* subspecies, of which a number have been declared endangered. He further specified

that research has shown that only one in eight Scottish wildcats (*Felis silvestris grampia*) remains genetically pure, which highlights the threat of hybridization on wild species.

### **Competition with Native Predators**

Domestic cats broad diet, high population density, and in many cases supplementary feeding provided by humans can allow them to out-compete native predators. George (1974) observed predation patterns of three cats in the farmland of southern Illinois. The cats preyed heavily on species such as the prairie vole, which is an important food source for wintering raptors. He further speculated that cats' ability to continue hunting once prey became scarce would force native predators to search for prey elsewhere or face starvation.

Dietary overlap has been shown to occur between domestic cats and native predators in numerous locations. Whereas, competitive interactions have been hypothesized, but are notoriously difficult to measure in natural systems. For example, on the Californian island San Clemente, Phillips, Winchell, and Schmidt (2007) compared the diets of island foxes and feral domestic cats. Being the only two mammalian predators on the island, the authors attempted to describe possible competitive interactions. They found that the diets of the foxes and cats completely overlap, but differed in terms of proportions of prey taken. Their study did not conclusively show an interspecies competitive effect, but did indicate that cats were likely to have a competitive advantage due to their slightly greater dietary breadth and higher population densities. For this reason competition with cats could not be ruled out as a factor in the observed population decrease of foxes.

In a review of possible impacts of domestic cats on native fauna in Australia, Dickman (1996) reported that competitive interactions might influence the populations of several native species including: quolls (predatory marsupials), skuas (a hawk like seabird), and a number of raptors. Despite these possible instances of competition between cats and native predators,

conclusive evidence has not been found. The sheer number of dietary overlaps that cats have with native predators around the world serves as a call for further research into possible competitive interactions. Currently, measuring interactions between cats and native predators remains daunting, but competition with high-density subsidized domestic cats cannot be ruled out as a possible factor in the decrease of certain predators.

### **Direct Predation**

The most visible and debated impact free-roaming cats have on their environment is that of predation. Cats' notoriety as effective hunters spans throughout their history with humans and remains an important reason for cats being kept, especially as pest killers on farms. Cats are generalist omnivores who have been documented preying on a variety of mammals, birds, reptiles, amphibians, invertebrates, and fish, along with eating human refuse and occasional carrion when available. Hunting is an important survival instinct in terms of providing sustenance for cats, but the urge to hunt and kill prey goes beyond the need to eat. Adamec (1976) and Leyhausen (1979) demonstrated that a cat's urge to hunt and the process of eating, while interactive, are not directly related. Leyhausen (1979) further stated that, "the prey-catching mood unconditionally overcame the eating mood". Their research disproved the myth that a well-fed cat will not hunt and kill, and has been further supported by numerous direct observations. It has been hypothesized that the uncoupling of hunting and eating evolved as a survival tactic where any opportunity to obtain additional prey is important. While the amount and kind of prey taken by individual cats is dependent on a number of variables, the spread and growth of the domestic cats' population, combined with decreasing wildlife populations, have resulted in concern over cats' impact on prey populations.

## **The Effect of Cat's Predatory Behavior on Islands**

The impact of introduced animals on island fauna is staggering. Ian Atkinson reports that since the 1600's, 90 percent of extinct reptiles, amphibians, and birds lived on islands (1989). Extinctions of endemic species on islands are mainly caused by introduced animals. Introduced predators often decimate populations of animals that evolved with few or no native predators. A singular cause for a species extinction is often impossible to identify, but on islands there is substantial evidence that predation by cats has resulted in the decline and extinction of birds, mammals, reptiles, and amphibians.

Perhaps the most infamous example of the destruction cats have wrought on islands is Stephens Island in New Zealand. Medway (2004) documented the demise of the land bird fauna on the island. Cats were brought to the island around 1894, by the lighthouse keepers. As they began to reproduce many became feral. Less than 10 years later, by 1903, most of the 25 original bird species had been extirpated from the island including: the extinct Stephens Island piopio, the extinct Stephens Island wren, and the now endangered South Island Saddleback (it survived on other islands). As quoted by Medway, Perrine Moncrieff referred to the introduction of cats onto Stephens Island as "the destruction of an avian paradise". The absence of any other predators and the limited human alteration of the habitat at that time, support the idea that cats were the sole cause of the avian fauna annihilation on Stephens Island.

Seabird populations have also been heavily impacted by cats. Small species that nest on the ground or in shallow borrows, or larger birds with burrows that have wide openings are especially at risk. Ascension Island, in the South Atlantic, is an example of cats' impact on sea bird populations. The Ascension Conservation Department (2010) reported that the island was home to over 20 million sea birds prior to the introduction of cats. After they became established,

seabird populations crashed by 98% to around 400,000. Any remaining birds could only be found in areas inaccessible to cats or on offshore stacks.

Cats have also been shown to impact reptile populations on islands. Varnham (2006) reported that cat predation impacted turtle and iguana populations on a number of British territorial islands. Specific examples include the extinct Turks and Caicos Islands iguana, and the Emoia skink, of the Fijian Islands, which is now only found on cat free islands (Fitzgerald, 1988). Fitzgerald also mentions the severe decline of the endemic Galapagos Island marine iguana, which is preyed on by a number of introduced mammals.

The impact of cats on island species is so widely accepted that urgent management efforts have been undertaken. On small uninhabited islands cats are being completely eradicated using a variety of techniques, such as hunting, trapping, poisoning, and disease introduction. Domm and Messersmith (1990) described the removal of cats from North West Island, which is a barrier reef island. Hunting, trapping, and poisoning were used to eliminate cats, in the hope of encouraging the buff-banded rail and other sea birds to return to the island. Cats on Baltra Island, in the Galapagos, were removed in order to reinforce attempts to reestablish a population of native land iguanas. According to the Hawaiian Ecosystems at Risk (HEAR) Project, iguana numbers and colony establishment have increased since the 2003 removal. This success has prompted the Galapagos National Parks Department to carry out cat control on at least two other islands. In a review of feral cat eradication on islands, Nogales et al. (2004) stated that in the last 30 years eradications have been carried out on at least 48 islands, a majority of which are small and uninhabited or sparsely habited islands.

On larger populated islands, where eradication is complicated by cats' relationship to humans, in addition to the effort, time, and money required, there has also been some cat control

success. In response to the severe decline of seabirds, the Ascension Island Conservation Department (2010) developed and carried out a seabird restoration project. The main focus of the project was removal of feral cats, and the last known cat was removed in 2004. The project also successfully worked with the inhabitants of the island to register, microchip, and sterilize pet cats in order to protect both pets and seabirds. The aspect of allowing islands inhabitants to keep pet cats, while removing feral cats, gained the project attention as the first of its kind. Additional steps in the project included establishing legislation preventing cat reintroduction and monitoring seabirds. Since the removal of cats, 5 species of seabirds have returned and are once again breeding on the main island. It is hoped that additional species will return with time.

While cat removal from islands is usually beneficial to native species, sometimes the elimination of cat's interactions with other invasive species can cause unintended negative consequences. This was the case on Macquarie Island. Bergstrom et al. (2009) reported on the population growth of an invasive rabbit and the subsequent vegetation destruction that occurred after cats were removed. Despite the unfortunate ecological costs of cat removal on Macquarie Island, managers have learned the importance of examining competitive interactions, the need for risk assessment and management planning for unforeseen outcomes during restoration activities.

Efforts to eradicate cats on islands have not only protected endemic and endangered species, but also served as valuable learning tools. Information about removal techniques, invasive species interactions, and the importance of education and outreach has been gleaned. This will help facilitate cat removal efforts on islands in the future, and might also be useful for conservation efforts on continents, especially in areas with endangered species.

## **The Effect of Cats' Predatory Behavior on Continents**

On continents there is no doubt cats prey on a variety of species. The debate is whether or not cat predation negatively impacts prey populations. Currently there is no conclusive evidence for one side or the other due to the difficulty of isolating factors that impact a population. Species that cats prey on can be impacted by other factors, such as: predation by other animals, habitat loss, disease, and climate changes. Variability and mobility of both cats and their prey further complicate determining the impact of cat predation. Also, as Fitzgerald (1988) points out, very few controlled experiments have been undertaken to compare with *in situ* observations, which means that most evidence of cats impact on prey populations is indirect. It is important to note, however, that the overwhelming evidence for the negative impact cats have on island fauna is a strong indicator that they can similarly impact prey population on continents.

Many attempts at determining predation rates by cats have been made, but ascertaining accurate numbers of prey killed by cats in a given time period and location is improbable at best. The main reason for this is lack of knowledge about cat populations and variability of the number and type of prey taken by each individual cat. In addition, the techniques that are used to gather information about cat predation are imperfect. Studies typically use scat/gut analysis, owner surveys, direct observation, or a combination of these techniques to gather predation information. Each of these methodologies has biases that could result in either over or under estimates of cat predation. These biases bring into question the validity of estimating or extrapolating cats' absolute impact on prey. Despite these weaknesses, and even taken conservatively, predation numbers produced by most studies indicate that the number of prey taken by cats is staggering. Churcher and Lawton (1987) studied cat predation on vertebrates in an English village using owner observation and collected prey items. They found that approximately 70 cats killed 1090 animals in a year, with an average of 14 prey per cat. Barratt

(1998) studied cats in suburban Canberra, Australia and estimated that between 380,000 and 630,000 animals were killed per year by cats. He found that cats killed an average of  $10.2 \pm 2.7$  prey per year. In 2000, Fiore studied bird predation by cats in urban Wichita, KS using kill collection, scat analysis, and radio telemetry. She found that an average of 4.2 birds is killed per cat per year. Lepczyk, Mertig, and Liu (2003) examined bird predation across rural-to-urban landscapes in Southeastern Michigan. According to their results, between 800 and 3100 cats killed between 16,000 and 47,000 birds during the breeding season alone. All of the authors warn that due to location, prey, and cat variation, extrapolating their results is likely to yield loose estimates only. They do indicate that millions of free-roaming pet cats kill millions of birds, mammals, and other animals a year. If predation by feral cats was included in overall estimates, it is likely that numbers would be significantly higher. It is agreed that high predation rates alone do not necessarily equate to an impact on prey populations in general. Although, predation studies indicate that a majority of cats prey is from common and non-native species, threatened and endangered are also preyed upon. These results signify that cat predation could be a possible factor in population decreases, and be especially important in the consideration of threatened and endangered species conservation.

Free-roaming pet cats' access to human support, especially food, may increase the impact that they have on a prey species. George (1974) showed that subsidized feeding by people allowed cats to continue hunting prey population past the point where native predators would have had to "leave for greener pastures or face...starvation". This constant and high predation pressure may mean that cats can hunt prey past the point where their populations can recover, especially at a local level. Feeding and other support by humans also allows cat populations to reach numbers higher than would be expected for native carnivores. Crooks and Soule (1999)

found that fragments of sage-scrub habitat in southern California could contain approximately 35 cats, but only a couple of pairs of native predators. The advantage that cats have over native predators, due to their relationship with humans, means that prey species are experiencing predation pressures that exceed historical rates.

It has been shown that cat predation negatively impacts biodiversity. Crooks and Soule's (1999) reported that in sage-scrub habitat fragments where coyotes suppressed cat activity, scrub-breeding bird diversity was higher. In their work on cat impacts on avian assemblages in urban areas, Sims, Evans, Newson, Tratalos, and Gaston (2008) found similar results in which cat density was negatively related to species richness. These studies are perhaps the strongest evidence that cat predation impacts prey populations. They also indicate that prey in continental fragments can be as negatively impacted as prey on islands. According to Crooks and Soule, cat predation along with habitat loss and fragmentation, "may quickly drive native prey species, especially rare ones, to extinction" (1999). This statement also shows that there are interactions between numerous factors that negatively impact prey populations such as cat predation and habitat loss. Failing to consider cat predation as a factor in prey population declines, because of the absence of absolute proof, will likely result in the extinction of some prey species.

### **Additional Free-roaming Cat Implications**

The issues surrounding free-roaming cats extend beyond cats impact on human and environmental health to include: questions about economical costs, questions about animal welfare, and possible social conflicts. All of these aspects are part of a complex mosaic and must be considered when attempting to comprehend the implications free-roaming cats.

There are a number of economic impacts resulting from free roaming cats. These include:

- The cost of animal control
- The cost of running animal shelters and adoption programs
- Expenditures by nonprofit groups concerned with cat issues
- Spending to inhibit cats from defecating and digging in yards and playgrounds
- Medical costs due to injuries caused by cats and diseases transmitted by them to humans
- Increased veterinary bills for other pets related to interactions with cats
- Loss of revenue based on decreased wild life which could impact tourism

Although these costs are difficult to quantify, their implications should be taken into account when discussing the lifestyles of cats.

Cats' welfare has been highly debated in regards to outdoor access. The Humane Society of the United States (2003) reports that cats are the pet most likely to die prematurely as a result of unsupervised outdoor access, and that owners' may grant this access in association with the myth that in order for a cat to be happy they must be free to roam. This myth possibly arose due to cats' independent nature and hunting prowess. In actuality, free-roaming cats are exposed to a number of dangers including: getting hit by cars, poisons, diseases, cruel humans, and injuries caused by fights with other cats, dogs, and wildlife. Additionally, The Humane Society (2003) estimates that free-roaming cats live approximately 3 years compared to 12-18 years for indoor cats. Rochlitz (2000) states that indoor cats who are provided with an enriched indoor environment and access to the outdoors through enclosures or walks on a leash can have all of their needs met. For these reasons cat welfare has become a major consideration amidst free-roaming cat issues.

The social implications of free-roaming cats are imbedded in many of the previously discussed issues. Economic costs can affect a multitude of social needs, and welfare debates can strain social relationships. The undesirable results of free-roaming owned cats can cause conflict on a number of social levels for example neighbor to neighbor. Ownership disputes can occur

for cats that have no identification, when two parties claim the same cat. Alternately, when questions of responsibility for the destructive actions of a free-roaming cat arise, the claim is often made that the cat is a stray/neighborhood animal. Social disputes have begun to take place between cat and other pet owners where expectations between pet populations are often inequitable. For example, dog owners are often reminded to “pick-up” their pets waste but no such admonishment exists for cats. All of these issues can negatively impact social relationships leading to conflicts and reductions in positive social interactions

In addition to the environmental impacts of free-roaming cats, these further implications serve to highlight the complexity and magnitude of this issue. Existing social perceptions of the impacts of cats and their roles may be rooted in individual beliefs rather than an ecological framework. Thus, research is needed to elucidate the difficulties in educating people about how to best manage free-roaming cats. This thesis will contribute to this research by determining if trends exist between a cat’s lifestyle and the demographics, issue knowledge, and perception of their owners. Obtaining a better understanding of how cat owners interpret their cat’s lifestyles will help develop better education and management plans.

## **Chapter 2: Free-roaming Cats in the Eastside Neighborhood of Olympia, Washington: Survey and Analysis of Owner Knowledge and Behavior**

### **Introduction**

In the continuing debate over free-roaming cat management and the overall effect that cats have on wildlife, a couple of things are clear. First, 80% of Americans live in an urban environment and as the human population continues to grow, so does the spread of that environment (Adams, Lindsey, and Ash, 2006). Second, cats are now the most popular and abundant pet, numbering over 93.6 million, with at least as many feral cats in the United States alone (APPMA, 2009; Jessup, 2004). These trends indicate why research into the impacts of free-roaming cats on wildlife and human health is increasing. Information is lacking, though, on the overall impact of these cats and on the rationale of the owners that allow them to roam free. Despite the negative impacts that cats can have and their listing as an invasive species, cats' status as a domestic pet complicate management. This is made especially difficult by cat owners' lack of awareness or apathy for these impacts, and most importantly by their resistance to changing the life style of a pet.

In Patronek's (1998) special report on free-roaming and feral cats he "suspect[s] there is widespread agreement among wildlife, animal protection, and TTVAR groups that it is in the best long-term interest of cats and wildlife for pet cats to be confined to their owner's home, or supervised when outdoors" and suggests there remain many social barriers to attaining this goal. Views of cats as requiring outdoor access, being independent, or being a natural part of the ecosystem are common. These views, along with a combination of societal acceptance and limited regulation of free-roaming pet cats, further complicate management efforts (Toukhasati, et al., 2007). Management plans typically focus on sterilization, vaccination, licensing, and

education with particular emphasis on developing responsible pet owners. In fact, increased efforts to educate owners about being responsible and protecting their cats, such as the ABC's (American Bird Conservancy) *Cats Indoors!* program, have been widely called for, but little effort to measure the effectiveness of such education has been made (Clarke and Pacin, 2002; Toukhsati, et al., 2007).

Until a greater understanding of peoples' motives for allowing cats to roam free develops, efforts to protect cats, humans, and wildlife are likely to be found wanting (Lepczyk et al., 2003). In an attempt to add to this understanding, a survey was developed and administered to residents of an urban neighborhood within the city of Olympia, WA. The goal of this research was to identify trends between owner demographics, issue knowledge, residence opinion's, and cat lifestyles. Another goal was to explore the relationship between the perceptions of a human health threat versus a negative impact to wildlife in terms of indicating support for controlling free-roaming cats. One of the specific hypotheses tested was that owner education level would not be related to allowing cats to have free-roaming outdoor access. Lepczyk et al. (2003) found this to be the case in southwestern Michigan, and it is apt to be true for other locations. Most likely, this is because a higher education level is not necessarily indicative of exposure to information pertaining to issues surrounding free-roaming cats. The second hypothesis tested was that owner's issue knowledge would not be related to their cats' outdoor access. In this case, owners' may grant their cats outdoor access despite knowledge that this access is detrimental to the health of the cat and the surrounding environment. The acceptance of these hypotheses has implications for current education and management efforts.

## **Methods**

The neighborhood chosen to be the study population was the Eastside Neighborhood in Olympia, WA. This approximately 268 acre neighborhood is within blocks of downtown Olympia, has boundaries defined by the neighborhood association, and is comprised of mixed use plots typically found within an urban setting. Thurston County auditor information regarding plot ownership and use was gathered, along with visual confirmation, to compile an accurate list of residences for the neighborhood. Using a random number generator, a random sample of 89 addresses, from among the 1119 possible, was chosen to participate in the survey, with the goal of obtaining the best confidence interval (10%) while adhering to both monetary and time constraints.

Survey questions were developed to ask residents about their present and past interaction with cats in the neighborhood, general question about cat characteristics, opinions related to free-roaming cats, and basic demographic information. The questions were crafted to be basic and straightforward, and require as little time as possible for completion, in an attempt to stimulate response rates while producing accurate viable data. A combination of multiple choice, true/false, and yes/no closed questions along with open ended fill in the blank questions were used (See Appendix A). An informal pretest of approximately twenty individuals was used to identify mistakes and any other problems with the survey prior to it being sent to neighborhood residents.

Survey methodology was developed following Dillman, Smyth, and Christian (2009). Survey implementation started in May of 2009 with mailing of an introductory cover letter, survey, and stamped return envelope. In an attempt to avoid response bias within households, the cover letter instructed the resident with the closest upcoming birthday, who was over 18, to complete the survey. Residents were also given the option to complete the survey online through

questionpro.com, using the exact same survey. Survey's that were returned by the post office as undeliverable were first checked for address validity through the United States Post Office website. Then the letter was re-sent with a correct address or to another randomly selected address. A week and a half later, a follow-up postcard was sent thanking those who had completed the survey and reminding others to please complete the survey as soon as possible. Finally, three weeks after the initial survey was sent, the surveyor visited the houses of residents who had not responded to follow-up on the survey sent by mail. Three visits were made to each house in an attempt to contact residents before they were indicated as non-respondents.

Once the final attempt to contact non responding residences occurred, the survey was considered complete and data analysis began. Descriptive statistics were used to summarize and identify possible trends. Conditional probabilities were used to describe the relationship between the perception of cats having a negative impact on human health and wildlife, and the support of controlling free-roaming cats. Respondent knowledge about cats was measured based on the proportion of knowledge questions answered correctly. Respondents that answered 6 or more (out of 8) correctly were considered to be knowledgeable about the issues related to free-roaming cats. Chi-squared tests of contingency tables were used to determine whether education, knowledge, and other factors were correlated to allowing cats to have free-roaming outdoor access.

## **Results**

Of the 89 surveys mailed, 53 were returned and one address turned out to be a religious site rather than a residential dwelling and was removed from the sample. The effective response rate for this survey was 60.23%, which resulted in a sampling error of  $\pm 13\%$ ,  $\alpha = .005$ . For this survey one can be statistically confident that 95 out of 100 times, the estimate obtained from the sample will be within  $\pm 13\%$  of the actual population value.

Forty five percent (24) of respondents indicated that they own at least one cat, with a total of 41 cats claimed, extrapolating this for the entire neighborhood results in a total estimate of 842 owned neighborhood cats with a density of 3.14 cats per acre. Of owners, 100% indicated that their cats had been both spayed/neutered and vaccinated. A majority of cat owners allowed their cat to have unsupervised access to the outdoors (54.2%), with 37.5% keeping their cats strictly inside, and 8.3% allowing their cats outdoor access with an enclosure, by being tethered, or by leashing them. The 12.5% of cat owners that considered changing their cats' indoor/outdoor status, indicated concern for their cats' safety, changes in living situations, and matters of personal safety as reasons for this consideration. Of the 66.7% of owners whose cats had brought home dead or injured animals, birds and small mammals were seen most often.

Out of all respondents, 18.9% indicated that within the past year they had provided food to a cat that was not considered their pet. An average of 1.4 non pet cats were being fed, which indicates that approximately 207 households feed 291 cats not owned by them in the neighborhood. Whether these cats are owned by another household in the neighborhood or are abandoned, stray, or feral was not explored by this survey. Residents who feed cats that are not their pets were equally represented by cat owners and non cat owners.

The percentage of respondents who had owned cats in the past in this neighborhood was 32 with 11.8% indicating their cats had indoor access only, 5.9% allowed only controlled outdoor access, and 82.3% owned free-roaming cats. When asked if owners had at some point changed the indoor/outdoor status of their cats, 25.5% indicated that they had. Of those, 75% had changed their cats' status to indoor only, citing safety concerns and changes in living situations. The remaining owners had changed their cats' status to indoor/free-roaming outdoor citing the cat's energy level.

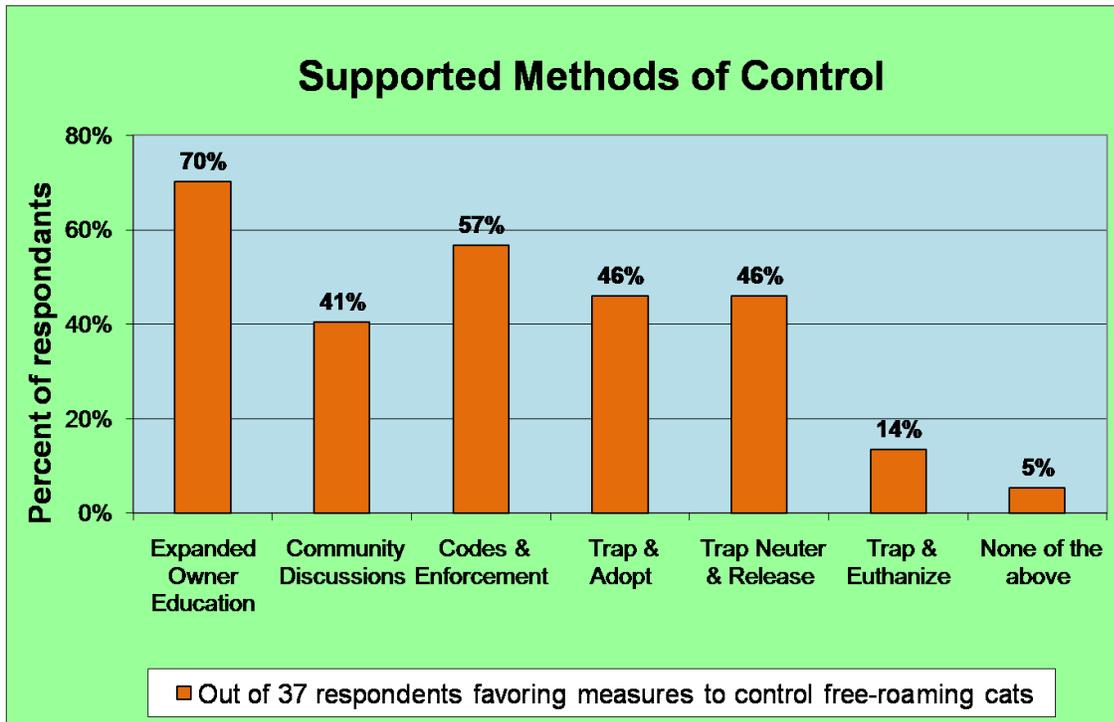
Based on overall responses to the knowledge questions (Part C), 44.7% of the respondents were found to be knowledgeable, and 55.3% were not. Overall, only 4 respondents (8.5%) answered all of the questions correctly. Response percentages for individual questions (Table 1) show a wide range of differences between the number of respondents who answered correctly and those that did not.

*Table 1. Response percentages for issue knowledge questions.*

<b>Question</b>	The cat population of the US is estimated to be?
<b>Responses</b>	<b>4.1%</b> - Under 50 million
	<b>26.5%</b> - Between 50 and 100 million
	<b>24.5%</b> - Between 100 and 150 million
	<b>44.9%</b> - Over 150 million ( <b>correct answer</b> )
<b>Question</b>	There are ___ pet cats than feral cats in the US.
<b>Responses</b>	<b>30%</b> - Less ( <b>correct answer</b> )
	<b>28%</b> - An equal number
	<b>42%</b> - More
<b>Question</b>	Well fed cats will ___ wildlife.
<b>Responses</b>	<b>3.9%</b> - Ignore
	<b>36.5%</b> - Stalk, but not kill
	<b>59.6%</b> - Stalk and kill ( <b>correct answer</b> )
<b>Question</b>	Putting a bell on a cat _____.
<b>Responses</b>	<b>58.8%</b> - Protects wildlife
	<b>41.2%</b> - Does not protect wildlife ( <b>correct answer</b> )
<b>Question</b>	T/F: Cats have a low reproductive rate
<b>Responses</b>	<b>0%</b> - True
	<b>100%</b> - False ( <b>correct answer</b> )
<b>Question</b>	T/F: Domestic cats are native to the US
<b>Responses</b>	<b>8%</b> - True
	<b>92%</b> - False ( <b>correct answer</b> )
<b>Question</b>	An indoor cat's live expectancy is ___ a free-roaming cat's
<b>Responses</b>	<b>7.7%</b> - Less than
	<b>7.7%</b> - Equal to
	<b>84.6%</b> - Greater than ( <b>correct answer</b> )
<b>Question</b>	City and County laws controlling cat behavior are ___ compared to laws controlling dog behavior
<b>Responses</b>	<b>83%</b> - Less strict ( <b>correct answer</b> )
	<b>17%</b> - Equally strict
	<b>0%</b> - More strict

When residents were asked their opinion of free-roaming cats' impact on wildlife populations, 69.2% thought they have a negative impact, 19.2% thought they have no impact, and 11.5% thought they have a positive impact. A majority of respondents feel that free-roaming cats are a potential human health risk (69.8%) and that measures should be taken to control free-roaming cats (69.8%), but only 34% of respondents felt that cat waste is a problem in the neighborhood. The method of control that got the greatest support was expanded owner education (70%), followed by stricter codes and enforcement (57%) (Figure 1). Additionally, a number of respondents chose to include comments about cats in the neighborhood. Comments ranged from announcing that a stray cat had showed up on their doorstep to respondents being worried about raccoons. The concerns listed that dealt directly with free-roaming cats included: worrying about cat safety, neighbors feeding free-roaming cats, cats digging and defecating in gardens, cats killing song birds, and cats causing damage to cars/outdoor furniture.

Figure 2. Supported methods of controlling free-roaming cats.



The demographic breakdown for respondents can be seen in Table 2. The ratio of female to male respondents was 37 to 15 or 71.2% vs. 28.8%, which could indicate a response bias as the percent of females to males for the county is approximately fifty/fifty. In order to address this potential bias, I used chi-squared tests of contingency tables to test for differences between females and males for a number of survey questions: knowledge, human health threat, impact on wildlife, support of control, and support of euthanasia. All of the tests showed that there was no statistical significant difference between female and male responses. Also, the neighborhood has a higher percentage of residents with bachelors or postgraduate degrees, compared to overall county demographics (U.S. Census Bureau, n.d.).

*Table 2. Survey respondents' demographics.*

Gender:	71.2% Female	28.8% Male				
Age:	7.7% 18-25	26.9% 26-35	15.4% 36-45	26.9% 46-55	11.5% 56-65	11.5% 66 and above
Level of education	0% Some HS	5.8% HS diploma/GED	26.9% Some college	9.6% AA	44% Bachelor's	13.5% Postgraduate
Income level (thousands)	14.3% < \$20	46.9% - \$20-40	26.5% - \$40-80	12.2% > \$80		

The data showed that there was no relationship between a respondent's education level and the outdoor access of their cat(s) ( $\chi^2 = .906$ ;  $df = 1$ ;  $p\text{-value} = .341$ ;  $\chi^2$  critical = 3.842). Also, the data showed that there was no relationship between a respondent's knowledge level and the outdoor access of their cat(s) ( $\chi^2 = 2.386$ ;  $df = 1$ ;  $p\text{-value} = .122$ ;  $\chi^2$  critical = 3.842). A further test of the relationship between education level and knowledge level showed that there is no correlation between the two ( $\chi^2 = .932$ ;  $df = 1$ ;  $p\text{-value} = .334$ ;  $\chi^2$  critical = 3.842).

Table 3 shows the conditional probabilities of respondents' support of controlling free-roaming cats and the methods of control supported, given that they perceived a human health threat, a negative impact of wildlife, or both. The overall support for control was shown to be similar for each of the categories, as was the method of control supported. The perception of cats having a negative impact on wildlife or posing both a human health threat and having a negative impact on wildlife did result in a slightly higher support for control, especially for the methods of community discussion and stricter codes/enforcement.

*Table 3. Condition probabilities for respondent support of controlling free-roaming cats and methods supported given a perceived human health threat, negative impact on wildlife, or both.*

	<b>Human Health Threat</b>	<b>Negative Wildlife Impact</b>	<b>Both</b>
<b>% supporting control</b>	66.7%	75.0%	71.4%
<b>Of those:</b>			
<b>% supporting method 1</b>	66.7%	70.4%	70.0%
<b>method 2</b>	25.0%	40.7%	45.0%
<b>method 3</b>	41.7%	51.9%	55.0%
<b>method 4</b>	45.8%	44.4%	50.0%
<b>method 5</b>	33.3%	48.1%	40.0%
<b>method 6</b>	12.5%	14.8%	15.0%
<b>no method options</b>	4.2%	7.4%	5.0%

## **Discussion**

Overall, the results of the survey show that a majority of cat owners in the neighborhood allow their cats to have free-roaming access, and very few owners have considered changing that access. It was also seen that the majority of residents support control for free-roaming cats and while a majority thought that they pose a human health risk and have a negative impact on wildlife, the definitive reasons for supporting control seem to be varied and complex. This was

reflected in the wide range of open comments that were received and has been acknowledged as a barrier to finding solutions for free-roaming cats in general (Slater, 2004).

One of the most important goals of this survey was to identify possible variables that influence owners' decisions to allow their cats to roam free. Unfortunately, no relationship was found between a cat's outdoor access and the variables relating to owners: education level, knowledge level, perception of a health threat, perception of a negative impact on wildlife, support of control measures, and specific knowledge of cats' life expectancy. These findings further highlight the complexity of this issue.

The lack of relationship between education level and a cats' outdoor access mirrored the findings of Lepczyk et al. (2003). They hypothesized that this could indicate that despite widespread efforts to educate pet owners, the information is either not reaching its audience or owner indifference is prevalent (Lepczyk et al., 2003). The problem with this reasoning is that increased owner education level is not indicative of an increased exposure to information about free-roaming cats, which was shown to be the case in this neighborhood as there was found to be no relationship between owner education level and knowledge level about cats. Residents with higher education levels such as a bachelor's degree or postgraduate degree do not necessarily study wildlife or animal welfare issues. For these reasons, looking at the relationship between owners issue knowledge and their cats' outdoor access is likely to provide more insight into the factors influencing an owners decision and be more helpful in informing future management or educational programs.

Unfortunately, further results from this survey showed that in this neighborhood there was no relationship between an owners' knowledge level and a cats' outdoor access. This provides support for Lepczyk et al.'s (2003) observation that "action does not follow knowledge".

Although puzzling, this type of behavior was also seen by Toukhsati et al. (2007) where 32% of cat semi-owners believed they were creating a bigger problem by feeding a cat they did not own, but continued to do so. Haspel & Calhoun (1990) reported that only 40% of people feeding free-roaming cats in Brooklyn, NY expressed favorable sentiments toward stray cats, but “continued to feed them despite the disapproval of their neighbors, financial constraints, or social obligations”, which demonstrates a trend where actions do not follow personal or social values. Further evidence for seemingly contradictory behavior was revealed in the Eastside Neighborhood survey where 46.2% of free-roaming cat owners supported controlling free-roaming cats. In the case of this neighborhood, action did not follow belief or knowledge. This helps to clarify why management of free-roaming cats is virtually nonexistent. There are a couple of possible explanations for owners’ actions. One is that owners are indifferent to the impacts of their cats and another is that they are not overly concerned with their pets’ wellbeing. When considering all of the efforts made to educate “irresponsible” owners, indifference and negligence may seem like plausible reasons for cat owners’ behavior. Although, research showing “people in cities demonstrate high levels of attachment, caring, and intimacy toward their pets [and] view their pets as important members of their households,” (Albert & Bulcroft, 1988) contradicts this line of thinking. Taking into account that a majority of residents knew indoor cats have greater life spans, believed they negatively impact wildlife, posed a health threat to humans, and supported controlling free-roaming cats, there appears to be many inconsistencies with not only owners actions, but with overly simplified explanations of these actions. Likely, a more accurate account of owners’ actions includes beliefs that owners have about the welfare needs of cats, especially the idea that cats are “independent”, thus require free-roaming time in order to live content lives (Toukhsati, 2007). Another important factor to consider is an owner’s

decision based on their personal lifestyles and habits. For example, an owner may feel it is easier to allow their cat to defecate outside rather than deal with a litter box. The reasoning behind owners' decisions is bound to be complex and based on a combination of knowledge, experience, supposition, and personal or social values.

This survey successfully identified areas where greater education is needed; such as whether or not bells protect wildlife (84.6% of owners allowing their cats to roam free thought they did), and that a well fed "pet" cat will still kill wildlife (46.2% of owners allowing their cats to roam free thought that they will not). It also showed that residents supported controlling free-roaming cats, particularly with expanded education and stricter codes and enforcement. Despite these findings, the lack of understanding about owners' motivations continues to be daunting. Available resources need to focus on in-depth interviews with cat owners to shed light on the reasoning behind owners' actions, with an emphasis on probing apparent inconsistencies. For this purpose, I developed a preliminary survey, which appears as Appendix B. Examples of questions that can be used to refine our knowledge of the rationale of free-roaming cat owners are: what factors influence your decisions about your cat's lifestyle, how would you describe or define responsible cat ownership, and as a cat owner, what do you think your responsibilities are to your neighbors and the community as a whole? Until research like this is accomplished, truly effective education and management plans will remain out of reach, and "responsible" cat ownership will remain an idyllic concept only.

### **Chapter 3: Suggestions for the Management of Free-Roaming Cats and for Educating the Public: Developing an Integrated Community-Based Approach**

Increasing numbers of free-roaming cats are a matter of concern due to the risks they pose for both wildlife and human health. In addition, considerations regarding the role of pets in society and cats' welfare contribute to discussions of free-roaming cat issues. Given free-roaming cats obvious and devastating impacts on islands, it is surprising that little has been done to manage them on continents. This thesis provides information on the complexity associated with regulating free-roaming cats due to the challenge of determining the factors motivating owners' behavior. It was found that a cat's lifestyle is not related to the education and knowledge level of its owners or to an owner's belief that cats pose a risk to humans and wildlife. Thus, more information is needed to understand the intricate matrix of factors which determine pet owner actions. Further research into these factors should include examining owners' past experience with cats, perceptions of cats' needs, amount of time spent with the cat, or behavior of cat. Solving free-roaming cat issues, by changing owners behavior, will involve improving education efforts, and implementing policy changes. Given the need for immediate action, recommendations for a community-based approach to address this problem are stated below.

While owner education and increased management regarding cat ownership has been widely called for, and some programs exist, most efforts are scattered and inconsistent. Even in areas with animal control agencies there is a lack of regulation policies, and areas with regulations lack the resources to enforce them. Dealing with free-roaming cats and attempting to educate owners is often left up to individuals and non-profits who are interested in cat welfare and/or are concerned about the negative impacts of cats. The limited resources available to

address free-roaming cats are spread across a range of organizations that are not working together or do not necessarily agree on particular aspects of cat management and owner education. Other barriers toward developing plans for successfully dealing with free-roaming cats are the lack of information, the traditional view that cats should/need to roam free, a resistance to pet legislation, and variation in community cat populations and attitudes towards cats. As Mackenzie-Mohr (1999) stresses, in order for a program involving behavior changes to be successful it must reduce the barriers and increase the benefits of making the change, as well as, the opposite increasing barriers and decreasing benefits for the current behavior. According to Graryson, Calver, and Styles (1997) it is also important to avoid “draconian enforcement”, as it typically counterproductive. It is likely that a number of approaches including, forming collaborative partnerships, engaging the community, and using adaptive management will be needed to overcome the limitations of current efforts.

One possible way to improve education and management efforts would be to develop a integrated community-based approach. Where community engagement would be used to gather information, develop a plan, implement the plan, and share information. Using a community, similar to the Eastside Neighborhood in Olympia, WA, to further explore free-roaming cat issues, and create possible solutions could greatly improve efforts by pooling resources and ideas. It would be important to engage as much of the community as possible and to use adaptive management throughout the process in order for this approach to yield the most benefits, both for the community and for the overall goal of addressing free-roaming cat issues on a larger scale.

The first step in developing a community-based approach would be to research current cats issues in the community, including attitudes towards and perceptions of free-roaming cats. This could be achieved by conducting surveys, in-depth interviews, and by holding forums or

discussion groups. Once a good understanding of cat issues and the people involved is obtained, the next step would be to create partnerships in order to maximize resources. This step is vital because according to Grayson, Calver, and Styles (2002) the paucity of resources available for cat management is currently a limiting factor. By combining the resources and efforts of individuals, non-profits, community veterinarians, and local animal control agencies development and implementation of an education/management plan could be greatly strengthened. Once partnerships are developed and stakeholders are engaged the next step would be plan development. Information from existing plans combined with gathered information about the local community would enable the plan to be tailored to meet the needs of the community in a focused and hopefully effective manner. This type of planning would likely be supported by a majority of community members. While this approach has not been attempted for addressing free-roaming cats issues, it is being adopted in response to other issues. The Southwest Crown Collaborative is a group of individuals, non-profits, governmental agencies, and private businesses who came together to develop a plan and find funding for the implementation (which is scheduled to begin in 2011) of a Collaborative Forest Landscape Restoration Program (SW Crown Collaborative, 2010). This collaborative engaged multiple stakeholders, including the public, in a successful attempt to identify vital goals for the program, and take steps toward meeting those goals. This type of collaborative could be used as a model for communities trying to address free-roaming cat issues.

Aspects of an education and management plan for free-roaming cats might include using cat owners, who provide their cats alternative access to the outdoors, as a resource. Workshops and trainings teaching owners how to train their cats to walk on leashes, build an outdoor cat enclosure, provide a more enriched indoor environment, and manage behavior problems could be

valuable tools. Education, targeted towards specific audiences, could focus on improving the bond between cats and their owners, the benefits of controlling a cat's outdoor access, and overall pet welfare and responsibility. Community legislation and regulation could include licensing, vaccination, and spaying/neutering requirements, along with leash and waste laws. Incentives, like low cost mobile altering, and disincentives, like fees, could be used to ensure that residents comply. Another tool to help reduce the number of free-roaming cats would be the establishment of a community no kill shelter and adoption center, which would focus on taking in pets from owners no longer able or willing to keep them. This might help prevent new animals from being released and abandoned. The particular features of a plan would be based on the make-up and needs of each community.

Using adaptive management principles during the process would result in a cycle of plan implementation, follow-up evaluation, and adjustment. This would intrinsically allow flexibility as further information was gathered or community changes occurred. It would be essential that any information garnered during this process be shared to a wider audience, through media such as: publications, web postings, and presentations. In order for this approach to be successful a committed individual, organization, or collaborative would be needed to initiate and facilitate its development. While this requirement and the long timeframe needed to carry out this approach may be challenging, the potential benefits for education and management efforts are immense. Applying an integrated community-based approach would transcend the current piecemeal efforts for free-roaming cat management and education, and could lead to the development of effective strategies that would help protect cats and reduce the negative impact they have on their surrounding environment.

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Appendix A: Eastside Neighborhood Survey

**Part A: Below are questions that relate to your present interaction with cats in the Eastside neighborhood.**

1) Do you presently own a cat? YES  NO  If **NO**, skip to #8.

If **YES**, how many? \_\_\_\_\_

2) Have the cat(s) you own been spayed/neutered? YES  NO

3) Have the cat(s) you own been vaccinated? YES  NO

4) On average, how much do you spend a year per cat on veterinary costs?

LESS THAN \$100

\$100-200

\$201-300

MORE THAN \$300

5) Which of the following describes your cat(s) access to the outdoors?

INDOOR ONLY

INDOOR/OUTDOOR IN AN ENCLOSURE, TETHERED, OR LEASHED

INDOOR/ FREE-ROAMING OUTDOOR

FREE-ROAMING OUTDOOR ONLY

6) Have you ever considered modifying your cat's indoor/outdoor status? YES  NO  If **YES**, why? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

7) If your cat(s) spends free-roaming time outdoors have they ever brought dead/injured animals home? YES  NO  If **YES**, what kinds of animals, and on average how many per month?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

8) Do you currently or in the past year, have you provided food to a cat(s) that you do not consider “yours” or to be owned by you? YES  NO  If YES, approximately how many cats have or do you feed? \_\_\_\_\_

**Part B: Below are questions that relate to your past interactions with cats.**

9) Have you owned cat(s) in this neighborhood in the past? YES  NO  If NO, skip to part C.

10) What was the average lifespan of your past cat(s)? \_\_\_\_\_

11) Which of the following describe your past cat(s) access to the outdoors?

- INDOOR ONLY
- INDOOR/OUTDOOR IN AN ENCLOSURE, TETHERED, OR ON A LEASH
- INDOOR/ FREE-ROAMING OUTDOOR
- FREE-ROAMING OUTDOOR ONLY

12) Have you changed the indoor/outdoor status of your cat(s)? YES  NO

If YES, why? \_\_\_\_\_  
\_\_\_\_\_

**Part C: Below are some statements about cats, please answer to the best of your knowledge without using outside resources by checking the 1 most appropriate**

13) The cat population of the United States is estimated to be:

- UNDER 50 MILLION
- BETWEEN 50 AND 100 MILLION
- BETWEEN 100 AND 150 MILLION
- OVER 150 MILLION

14) There are \_\_\_\_\_ pet cats then feral cats in the United States.

- LESS
- AN EQUAL NUMBER
- MORE

15) *Well* fed cats will \_\_\_\_\_ wildlife.

- IGNORE

STALK, BUT NOT KILL

STALK AND KILL

16) Putting a bell on a cat.

PROTECTS WILDLIFE

DOES NOT PROTECT WILDLIFE

17) Cats have a low reproductive rate (ability to produce offspring).

TRUE

FALSE

18) Domestic cats are native to or originate from the United States.

TRUE

FALSE

19) An indoor cats life expectancy is \_\_\_\_\_ a free-roaming (outdoor) cat.

LESS THAN

EQUAL TO

GREATER THAN

20) City and County laws controlling cats' behavior are \_\_\_\_\_ compared to laws controlling dogs' behavior.

LESS STRICT

EQUALLY STRICT

MORE STRICT

**Part D: Below are questions about your opinions related to free-roaming cats.**

21) How you think free-roaming cats impact wildlife populations?

THEY HAVE A NEGATIVE IMPACT

THEY HAVE A NEUTRAL IMPACT

THEY HAVE A POSITIVE IMPACT

22) Do you think free-roaming cats are a potential health risk to humans? YES  NO

23) Do you think measures should be taken to control free-roaming cats? YES  NO

If **YES**, which of the following methods would you support? (check all that apply)

- EXPANDED OWNER EDUCATION
- COMMUNITY AND NEIGHBOR DISCUSSIONS
- STRICTER CODES/ENFORCEMENT OF LICENSING, VACCINATING, STERILIZATION, AND LEASH-LAWS
- TRAP AND ADOPT-OUT
- TRAP, NEUTER, AND RELEASE (TNR)
- TRAP AND EUTHANIZE

24) Do you have any additional comments about cats in the neighborhood? \_\_\_\_\_

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**Part E: Please fill out information about yourself.**

24) Gender:  Female  Male

25) Age:  18-25  26-35  36-45  46-55  56-65  66 and above

26) Level of education:  Some high school  HS graduate/GED  Some college  Associate's degree  
 Bachelor's degree  Postgraduate degree

27) Income:  below \$20,000  \$20,001 - \$40,000  \$40,001 - \$80,000  above \$80,001

**Thank You For Your Participation!**

## Appendix B: Follow-up Interview Suggestions

The results gathered in the Eastside Neighborhood survey indicate that in-depth interviews of cat owners are needed to collect information about owner decision making and inform future conversations about managing free-roaming cats. Pet owner education has been continually called for, with many programs being implemented based solely on perceptions of what pet owners need to know in order to become “responsible”. This is problematic because the definition of being a responsible pet owner may be different for each person. Additionally, it is not known how much, if any, owners use the concept of being a responsible pet owner when making decisions about their pet’s lifestyles and care.

Cat owner interviews need to be developed to be responsive and flexible to different answers. By using open-ended questions along with explanatory, probe, and elaboration follow-up questions the contradictions that were revealed in the Eastside survey can be explored. The surveys should also include detailed questions about owner demographics and the characteristics of their cats. Possible questions for this survey are listed below, and are categorized by specific populations of cat owners. It is especially important to collect information from the small number of residents that allow their cat outdoor access in nontraditional ways, as this will help inform other owners that are willing to control their cat’s outdoor access, but have reservations. It would also be valuable to interview a number of non cat owners to ask them questions about their perceptions of a responsible cat ownership, and opinion about cat control.

### **Questions for all cat owners:**

How would you describe/define responsible pet ownership?

Where did you learn about what it means to be a responsible pet owner?

Why did you choose a cat to have as a pet?

What factors influence your decisions about your cats lifestyle?

What do you think the positives of owning a cat are? The negatives?

What do you think a cat needs in order to be healthy?

Where do you learn about how to best care for your pet?

What do you see as your responsibilities to your cat?

As a cat owner, what do you think your responsibilities are to your neighbors, and the community as a whole?

How would you react to someone else's pet defecating or digging in your yard?

Do you think that cats negatively impact wildlife and/or the environment?

Do you think wildlife should be protected from pet animals? If yes, how do you think that can be achieved?

Do you think that pet cats should be controlled within their owner's property? Why?

Do you think that stray and feral cats should be controlled? Why? If yes, how do you think this could be accomplished?

**Questions for indoor cat owners:**

Why do you keep your cat indoors?

Would you consider allowing your cat or future cats to roam free outdoors? Why?

Do you think providing your cat controlled outdoor access would be beneficial for it?

Does your cat have behavioral problems that you associate with being an indoor only cat?

**Questions for cat owners that provide controlled outdoor access:**

Why do you choose to control your cat's outdoor access?

How did you decide on what type of outdoor access your cat would have?

Did you research options on providing your cat outdoor access? If yes where?

**Questions for cat owners that have free-roaming cat(s):**

Why do you let your cat roam free?

Do you worry about your cat's safety when it is outside?

Has your cat ever been injured?

If a neighbor came to you and complained about your cat defecating and/or digging in their yard/garden how would you react?

What, if anything, would make you consider controlling your cat's outdoor access?

Have you considered controlling your cat's outdoor access? What has prevented you from actually doing it?

Would you be willing to take steps to protect wildlife from your cat?

**Questions for non cat owners (some of which should be non pet owners):**

How would you describe/define responsible pet ownership?

How would you react to someone else's pet defecating or digging in your yard?

Do you think that pet cats should be controlled within their owner's property? Why?

Do you think that stray and feral cats should be controlled? Why? If yes, how do you think this could be accomplished?