

WHO'S AFRAID OF THE BIG, BAD COYOTE? A SURVEY OF MESSAGING AND
EXISTING ATTITUDES IN THE NATIONAL CAPITAL REGION

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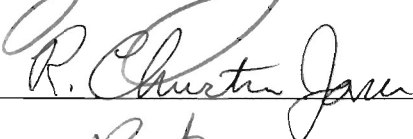
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DEDICATION

This thesis is dedicated to my husband, David, and to my parents. Thanks for all of your support.

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ABSTRACT

ATTITUDES TOWARDS COYOTES IN THE WASHINGTON, D.C. METROPOLITAN AREA AND THE EFFECTS OF MESSAGING ON ATTITUDES

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George Mason University, 2007

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Coyotes are relatively recent arrivals to the Washington, D.C. metropolitan area. In an effort to understand and obtain baseline data about existing attitudes, a survey was conducted in 2006. Most respondents had neutral attitudes towards coyotes, which might be in part due to low levels of awareness about their presence in the area. Of particular interest, pet owners seemed to have more extreme attitudes, either positively or negatively, towards coyotes, and women tended to have more negative attitudes towards coyotes. Wildlife managers and others interested in preventing and reducing human-coyote conflict should capitalize on the current situation and develop outreach programs that will teach people how to live near coyotes as well as engender positive attitudes towards them. The survey also looked at the effect that small pieces of information in various categories (coyote behavior and ecology, human-coyote interactions, and images of coyotes) had on attitudes. Statements about coyote behavior, especially those that

emphasized the social aspects of their lives, proved to be the most effective in increasing positive attitudes. Amongst other findings, statements about attempts to eradicate coyotes were viewed negatively and some traditional images associated with coyotes (especially a coyote howling) were also viewed negatively. This information will be useful to wildlife managers and others interested in designing outreach materials.

Introduction

The purpose of this research project is twofold. First, as coyotes are relatively recent additions to the fauna of the D.C. metropolitan area, understanding attitudes and beliefs of local residents towards coyotes and wildlife management techniques is important in order to plan for, reduce, and prevent coyote-human conflict. This project attempts to measure these attitudes and beliefs. Second, although in-depth programs have proven the most effective in changing attitudes towards wildlife species, many non-profit organizations and wildlife managers have only a short period of time in which to get their message across to large numbers of people, often in the form of a poster, flyer, brochure, or other outreach materials. Therefore understanding what sorts of messages best influences the public's attitudes towards and capacity for tolerance of coyotes is important. This project measures the impact that various types of information and specific statements have on respondents' attitudes towards coyotes. As many carnivore conservation programs lack stringent program evaluations that provide guidance as to what works and what does not (Draheim et al. 2006), this project attempts to provide some basic guidelines as to the effectiveness of outreach materials.

Since the establishment of conservation biology as a discipline in the 1980s, there has been a call to increase the human dimensions aspects of a field that many agree has

been dominated by natural scientists (Fox et al. 2006; Jacobson & McDuff 1998; Mascia et al. 2003). Some have argued that human interaction skills are as important as knowledge of the natural sciences in dealing with complex wildlife questions (Cannon et al. 1996; Madden 2004). After all, a large part of conservation work is changing human behavior (Mascia et al. 2003).

For carnivore conservation to be successful, the human dimensions of conservation must be thoroughly understood and utilized, including policy and social science issues (Primm & Clark 1996; Weber & Rabinowitz 1996). Referring to growing populations of predators in parts of Europe that have not seen large carnivores for centuries, John Linnell of the Norwegian Institute for Nature Research in Trondheim, Norway, stated: “I hate to admit it as an ecologist, but the most pressing issues are related to social science...Understanding the sociology of coexistence is really the key” (Enserink & Vogel 2006, 747).

Human Culture and Coyotes

Animals play a vital role in our society. Harold Herzog, an expert on human-animal relations, stated: “It would be difficult to overestimate the significance of animals in the social and psychological life of our species. Images of animals are everywhere: in our language, religion, dreams, television programs, and folklore. The feelings we exhibit toward our fellow creatures are intense, complex, and paradoxical” (Herzog & Burghardt 1988, 75). Some have claimed that we best understand animal species as human-constructs, with mythology, experiences, and folklore playing at least as important a role

as biology (Kellert et al. 1996; Lopez 1978). Canids and other large predators have been particularly important to human cultures, both positively and negatively (Lopez 1978).

Coyotes are relatively recent arrivals to the metro Washington, D.C. region. In fact, this is the last major metropolitan area to be colonized by coyotes in the United States, with the exception of Hawaii (Parker 1995). Although they have not yet become as ubiquitous here as in other parts of the country, there have been several human-coyote conflicts in the area, most notably in the Fallsgrove community of Rockville, Maryland. There, some residents were disturbed simply by the presence of coyotes—no incidents had actually occurred—and so hired a trapper to remove and kill the coyotes frequenting the area. This resulted in an acrimonious debate that ended up in court (Battiata 2006).

Stan Gehrt, a coyote researcher in Chicago, has explained the effect coyotes have on some people: “Coyotes are canids, and people have always had a love-hate relationship with canids. A lot of our wolf control was done more out of fear than any damage done. Wolves just made us uncomfortable...usually, for people to consider an animal to be a nuisance, that animal has to cause damage or inconvenience. But coyotes are the one species that can be considered a nuisance simply by being fleetingly seen” (Battiata 2006, 11).

In a recent study of attitudes in Cape Cod towards coyotes, part of the basis for this project, Jackman (2005) found that some residents considered “coyotes staring” and “coyotes that pass through yards or near children” a problem, illustrating the intolerance that many have for the presence of coyotes, and perhaps projecting their personal fears onto the behavior of coyotes. Echoing modern concerns, many early settlers in the

Western part of the country felt uncomfortable with wolves, a close relative of coyotes, staring at them from outside their campsites and settlements. Many wolves were killed for this transgression alone (Lopez 1978).

Coyotes hold a strong place in many indigenous cultures of the southwestern United States and Central America. They play various roles in these cultures, and are commonly portrayed as either tricksters or fools. Although in non-European cultures coyotes play an important, mostly positive role, the Europeans and Euro-Americans who settled in America treated them very differently.

In 1861, Mark Twain wrote a description of coyotes that aptly describes many Euro-Americans' opinions of coyotes:

The coyote is a long, slim, sick and sorry-looking skeleton, with a gray wolfskin stretched over it, a tolerably bushy tail that forever sags down with a despairing expression of forsakenness and misery, a furtive and evil eye, and a long sharp face, with slightly lifted lip and exposed teeth. He has a general slinking expression all over. The coyote is a living, breathing allegory of Want. He is *always* hungry. He is always poor, out of luck, and friendless. The meanest creatures despise him, and even the fleas would desert him for a velocipede. He is so spiritless and cowardly that even while his exposed teeth are pretending a threat, the rest of his face is apologizing for it. And he is *so* homely!—so scrawny, and ribby, and coarse-haired, and pitiful.

Twain continues:

He will eat anything in the world that his first cousins, the desert-frequenting tribes of Indians, will, and they will eat anything they can bite.... It is considered that the coyote, and the obscene bird [vulture], and the Indian of the desert, testify their blood kinship with each other in that they live together in the waste places of the earth on terms of perfect confidence and friendship, while hating all other creatures and yearning to assist at their funerals (Leydet 1977, 97-100).

When European settlers first arrived on the North American continent, they carried with them attitudes towards large carnivores from Europe--that carnivores were competitors and threats to human interests--as well as the belief that lethal predator control was a necessary component of converting the continent from a wild place to a properly civilized land (Messmer et al. 2001).

That predators should be wiped out from civilized lands was the predominant view—even within the conservation community—until after World War II, when new findings in ecology illuminated the importance of predators in a healthy ecosystem. Messmer and his co-authors (2001) feel that when the media followed suit and began to portray carnivores in a more positive light, public sentiment began to shift, until now the majority of people, even in parts of the west where wolf restoration projects are being considered, favor these projects (Meadow et al. 2005). Messmer et al. point out that this transformation was due both to new findings in science and their translation into the popular media. Stressing how important both of these steps are, they close: “...given the dynamic nature of the competing forces shaping the natural environment, the biggest impediment faced by wildlife managers seeking to incorporate science into public policy may be our own inability to ‘market’ science-based management information” (1258). Educational efforts to teach people about the need for predators in a healthy environment, and how to live successfully with these predators, are therefore vital strategies in preserving our nation’s ecosystems.

Today, predators often elicit strong emotions, either negative or positive. To some, predators are killers and to be feared; for others, predators are symbolic of the beauty and power of nature and are even used as totems in modern culture (sports teams and cars, for example) (Fascione et al. 2004). These two attitudes are often at odds with each other and often make predator conservation and coexistence programs controversial. Humans sometimes admire predators until they interfere with human aspirations. For example, in 2005 a bear entered Germany for the first time since 1835. He was welcomed and nicknamed Bruno—until he killed a few sheep, at which point he was killed (Stolzenburg 2006). However, there are cultures that have learned to coexist and admire—even learn from—predators (Lopez 1978). Therefore, an attitudinal shift towards coexistence is possible (Stolzenburg 2006).

Coyote Control Methods

A full description of the history of predator control in the United States is beyond the scope of this project, although it will explore parts of the history that are directly relevant to coyotes. Although all large predators (wolves, bears, mountain lions, etc.) in the United States have been under lethal pressure since the arrival of European settlers, the sheer numbers of coyotes killed is quite staggering. In 1934, the USDA (the government agency charged with federal predator control) stated that their goal was the “total extermination of the coyote in the United States” (in Fox & Papouchis 2005, 11). Between 1916 and 1999, almost six million coyotes were killed by the federal government, not including those killed by private citizens and state/local jurisdictions

(Fox & Papouchis 2005). In FY 2004, the federal government killed at least 75,674 coyotes (USDA-APHIS 2004); again, this number does not represent the coyotes killed by individuals and state/local governments.

Federally funded killing of coyotes is justified by its proponents mainly because of coyote predation of livestock, especially sheep (Berger 2006; Fox & Papouchis 2005). However, Berger demonstrated that the decrease of financial rewards for sheep ranchers in this country has happened for reasons other than predation. For example, she positively correlated sheep population fluctuations with the market price and production costs of sheep, including the cost of hay and competition with imported lamb. Predation rates accounted for only a small percentage of the change in the number of sheep produced in this country; therefore predation has little impact upon the financial well being of sheep ranchers.

In many places, the emphasis on predator control is shifting from widespread, non-targeted lethal control to an increase in the use of methods that are primarily non-lethal to both prevent conflict and target only the individuals who have participated in predation of livestock (Sillero-Zubiri & Switzer 2004). These non-lethal methods also focus on changing human behavior and increasing tolerance for the presence of predatory species (Sillero-Zubiri & Switzer 2004), and in most cases are preferred by the general public. For example, in Minnesota, while most respondents supported wolf control to decrease livestock predations, most preferred more humane techniques and targeted approaches, with the exception of farmers (Kellert 1985). Non-farmers seem to be more likely than farmers to prefer non-lethal methods of animal damage control for all species,

while farmers are more likely to prefer whichever methods work best, whether they are lethal or non-lethal—with the exception of coyote control, where farmers tend to prefer lethal methods (McIvor & Conover 1994). This is despite the fact that farmers believe that coyotes are responsible for less livestock predation than non-farmers (McIvor & Conover 1994).

Livestock producers more commonly use lethal control than non-lethal control, in part because of the belief that these methods are less expensive, take less man-power, and are more practical for large areas of land (Mitchell et al. 2004). These methods tend to target as many coyotes as possible instead of targeting specific animals that have preyed upon livestock. However, the public as a whole disapproves of “techniques that kill large numbers of innocent animals” (Mitchell et al. 2004, 1214). The use of the word “innocent” here implies that coyotes have knowledge of right and wrong in terms of what species coyotes can legally, so to speak, target. Western culture has a history of declaring certain animals guilty or innocent of crimes, even to the point of holding trials for accused animals during certain periods of history (Lopez 1978). Both Western Europeans and Euro-Americans have consistently placed symbolic guilt and innocence on predators and livestock, respectively (Coleman 2004). The pervasiveness of this use of language is clear even today, when even peer-reviewed journal articles continue to use words such as innocent in the context of predators preying on domestic animals, as seen in the aforementioned Mitchell et al. article.

People who grew up in urban areas have less support for predator control than those from rural areas (Martínez-Españeira 2006; Reiter et al. 1999). Throughout all of

the regions that the Reiter et al. study surveyed, there was support for predator control, but respondents had concerns about specific methods, with non-lethal and targeted methods seen as more humane and preferred in all cases except for rodent control (Reiter et al. 1999). Men were more likely to support the use of lethal coyote control than women (Martínez-Espiñeira 2006), which has often been the case (Koval & Mertig 2004).

Although those who had experienced problems with coyotes were more likely to approve of lethal control, those who had recently seen a coyote were less likely to support lethal methods (Martínez-Espiñeira 2006). Similarly, in Saguaro National Park, Arizona, people who had either visited the park or who had seen a mountain lion were less likely to agree with predator control than those who had neither seen a mountain lion nor visited the park (Casey et al. 2005).

Vancouver, British Columbia, had many human-coyote conflicts in the mid-1990s and early 2000s. In fact, in 2001 there were six reported attacks on small children. Whereas most jurisdictions in similar situations have turned to lethal control, Vancouver decided to take a different approach, one that has proven to be highly effective. City officials and wildlife professionals noted that in all of the attack incidents coyotes had been regularly fed by humans, either purposefully or accidentally through garbage and pet food left outside. Vancouver hired a full-time “Co-Existing with Coyotes” program director, who both teaches people how to live safely with coyotes as well as training “problem” coyotes who have lost their fear of humans by harassing them (throwing cans filled with pebbles in their direction, etc.). In a few cases, coyotes have had to be euthanized, but on the whole the program has been tremendously successful for both

humans and coyotes (Battiata 2006; Fox 2006). This demonstrates that the techniques preferred by the general public can be highly effective in controlling human-coyote conflict in urban areas.

Coyote Ecology

Stan Gehrt, of the comprehensive Cook County, Illinois, Coyote Project, has said the Chicagoland public most wants to understand how coyotes function—how they go about their daily business (Gehrt 2006). If this is the case, basic research into coyote ecology and providing the results to the public can provide desired information and perhaps lead people to the conclusion these animals can be good neighbors. Although messaging about coyote ecology might not sway those with highly negative attitudes towards this species, it might solidify the opinions of those who have strong positive feelings about coyotes and cause those who have neutral attitudes to feel more positively (Meadow et al. 2005).

Coyotes have been demonstrated to play an integral part in many ecosystems, especially if they are the largest predatory species present in an area (Crooks & Soulé 1999). The authors used coyotes to test the theory of mesopredator release, where local extinctions of larger mammalian carnivores leads to an increase in the density of smaller carnivores that subsist mainly on birds and other small vertebrates. Mesopredators in the study included the striped skunk, raccoon, grey fox, domestic cat and opossum. The authors concluded that the presence of coyotes was the best indicator for total mesopredator abundance in a patch of habitat, after the effects of fragment age, isolation,

and size were taken into account. The authors further concluded that coyotes, as the top predator in the area, had a positive, albeit indirect, effect on bird diversity, especially the scrub-specialist native birds that undergo frequent and rapid extinctions in the study area (Crooks & Soulé 1999). Perhaps by learning more about the key roles that coyotes play, we can build tolerance for their presence (Berger 2006; Estes 2004).

Although it appears that coyotes as a species have survived long-term and extensive lethal control, such programs should still cause concern for conservation biologists. It is almost impossible to fully understand the effect the removal of predators such as coyotes has on ecosystems, because North American predator control by European settlers and Euro-Americans started before the scientific evaluation of North American ecosystems had gotten underway (Berger 2006). However, lethal predator control causes the public to believe that predators kill a substantial number of livestock, engendering a generally negative feeling towards them. This can affect their attitudes towards recovery efforts for endangered and threatened predators (Berger 2006).

Western coyotes have long been residents in urban areas, and more recently coyotes on the east coast have had an urban presence (Parker 1995). In Chicago, coyotes have been found residing in areas where the human density is very high, pointing to the adaptability of coyotes (Gehrt 2004a, b). In addition, coyotes tend to avoid humans, either through spatial or temporal separation even in areas with high human density (Andelt & Mahan 1980; Crooks 2002; Odell & Knight 2001; Riley et al. 2003; Tigas et al. 2002).

Some (Timm et al. 2004) believe that coyotes in urban areas become less fearful of humans, resulting in increased attacks. However, it remains unclear whether or not increased negative encounters between humans and coyotes result from an increase in human density (and therefore an increase in the probability of an encounter), an increased association with humans and food (as a result of people feeding coyotes, intentionally or not), or instead a lowered fear of humans, as Timm et al. proposed. It is probable that modifying human interactions with coyotes would go far towards avoiding these situations (Fox 2006).

In Arizona, residents who fed coyotes were visited by only one coyote group, demonstrating that these houses were considered part of a group's exclusive territory. It is likely that even houses that did not purposefully feed coyotes were a source of easy food through garbage and food left out for other wildlife. In about 35% of scats found in this study area, human food items were found (McClure et al. 1996).

The story is different in Chicago, where coyotes rely on a large variety of food items, most of which (such as large numbers of rodents) are only indirectly associated with humans. In Chicago, 42% of the food items found in 1,429 scats were small rodents, 23% was fruit, deer (probably mostly fawns and road kill) was 22%, and rabbit accounted for 18% of the diet. Unlike in Arizona, human-related food such as pet food and garbage showed up in only 1.3% of the scats, and evidence of domestic cat (either scavenged or predated) was found in only 1.9% of the scats (Gehrt 2006).

General Attitudes Towards Animals

Science is not value free, although historically it has been presented as such (Clark et al. 2001; Primm & Clark 1996). Conservation biologists have run into problems with the success of their projects when their own values and attitudes remain unexplored (Clark et al. 2001). The values of locals have often been ignored in carnivore conservation programs—for example, in the wolf reintroduction program in Michigan’s Upper Peninsular in the 1970s (where all wolves were killed within eight months of their release) and the Mexican wolf project. Where local values were taken into account (such as the Yellowstone wolf and North Carolina red wolf projects), projects have been much more successful (Clark et al. 2001).

Attitudes, especially strong attitudes, might be formed mainly by early, formative experiences (Driscoll 1992). However, educational efforts can still play a vital role when targeting those who feel neutral or ambivalent about animals, especially when dealing with so-called “pest” species such as coyotes. There is some evidence to suggest that persuasive arguments can influence those with weakly held beliefs and attitudes (Meadow et al. 2005).

Stephen Kellert has explored in great depth the attitudes of Americans towards animals in general and wildlife in particular (Kellert 1988; Kellert & Berry 1980). His “positive” categories (those that indicate positive feelings and attitudes towards wildlife) were slightly better represented than the “negative” categories (those that indicate negative feelings and attitudes towards animals). Because this study occurred years ago, it is possible that recent scientific discoveries about animal cognition and media coverage

of animal issues have changed the percentage of the population represented in some of these categories.

Kellert also found that the American public tended to be under educated about animals. In fact, only 24% correctly answered the true/false statement “Timber wolves, bald eagles and coyotes are all endangered species of animals” (Kellert 1988). When asked about coyote predation of livestock, 23% were found to be knowledgeable, while 52% were not. Predators in general were one of the least understood categories tested. Coyotes were also included on the list of least liked species. However, coyotes had a high standard deviation, leading Kellert to state that there was much difference of opinion about this species (Kellert 1988; Kellert & Berry 1980).

Attitudes Towards Predators

It is possible to describe some of the root causes of both positive and negative attitudes towards large carnivores (although coyotes are generally considered medium-sized carnivores, they occupy the top-predator niche in the metropolitan Washington, D.C. area, so many of the same attitudes might apply) (Clark et al. 1996):

Antagonistic attitudes towards large carnivores continue to be based on historical and cultural fears; concerns for human safety; beliefs about real or perceived competition with humans for livestock, game, and habitat; concerns over the loss of property rights under conservation legislation; and negative symbolism associated with large carnivores, such as viciousness and ferociousness.

Supportive attitudes toward large carnivores are often based on perceptions of their attractiveness, an appreciation of their intelligence and strength, and affection for nature and animals; an understanding of the ecological role played by large

carnivores; moral and ethical beliefs; and positive symbolism associated with large carnivores, such as strength, courage, and endurance (945).

Although wolf restoration in the American West has been highly contentious, a recent study found that most people (with the notable exception of ranchers) in states involved in a proposed wolf restoration project supported wolf restoration—and yet, wolf restoration programs have proven quite controversial (Meadow et al. 2005). Relatively small groups—such as ranchers—with strong beliefs can dramatically influence policy decisions. At the same time, larger groups with moderate, but positive, feelings towards predators will have less influence policy decisions because they are less likely to participate in lobbying of any sort. By extension, it is as important to strengthen the attitudes of those who have moderately positive feelings towards coyotes to increase tolerance for the species (Meadow et al. 2005). The authors found that persuasive arguments did little to influence those who already held strong beliefs about wolves, whether positive or negative. However, those with weaker attitudes and beliefs about wolves were swayed by persuasive arguments, which demonstrates that predator coexistence programs might be most successful if aimed at those who hold more neutral attitudes and beliefs to begin with (Meadow et al. 2005).

Coyotes are relatively recent arrivals in the New England area, although they have been present there longer than in the mid-Atlantic region (Parker 1995). Although by 1994 only 20% of New England residents had ever seen a coyote, there was strong support for the existence of coyotes in the area. Only 5% of New England residents felt that coyotes should be completely eliminated. Thirty-nine percent agreed that coyotes

should be fully protected, while 40% disagreed. In addition, 70% disagreed with the statement: “Coyotes are a menace and should be killed or driven away whenever possible” (Stevens et al. 1994, 60).

Stevens also explored contingent valuation of coyotes in New England. Although contingent valuation is a rather controversial method (Sagoff 1988), the author felt that it was the only way for people to express the value they associate with coyotes (Stevens et al. 1994). Younger, urban residents were most likely to pay to protect coyotes. Those who would pay to protect coyotes allocated approximately 75% of their fictional payment to an existence value: “Because coyotes have a right to exist independent of any benefit or harm from humans” (Stevens et al. 1994).

It has been proposed that Americans value an animal species based on historical attitudes, what emotions are elicited by the species, and its usefulness to humans (Driscoll 1995). Coyotes would seem to fare poorly based on these criteria. For large, attractive mammals, however, subjects did not differentiate between the usefulness of a species and their intrinsic importance (Driscoll 1995). If people consider an animal to be attractive for other reasons, they were also rated as being useful. Therefore, if the popularity of animals such as coyotes is increased, the tolerance people hold for them could be increased. This could be important not only for coyotes but also for less common carnivores, as coyotes might act as a proxy for increasing support for the conservation of other large carnivores (Berger 2006).

Attitudes towards wildlife in urban areas

Although human-wildlife conflict (HWC) might be most commonly thought of in the context of rural areas, HWC also occurs in urban areas. A 1997 study found that urban homeowners spent considerable time and expense in attempting to resolve HWC with various urban wildlife species. In addition, they also spent considerable time and money trying to attract species that are viewed positively. Urban residents seem to have a strong interest in wildlife, either for pleasure (such as feeding and watching birds) or as an inconvenience (such as repairing damage caused by wildlife) (Conover 1997).

In the Chicago metropolitan area, coyotes are perceived by residents as being the greatest wildlife threat to human health and safety (Gehrt 2004c). Because of this, seeing or hearing a coyote, regardless of actual damage, can be enough to cause residents to want a coyote control program.

Where an animal population lives in relation to human populations probably plays a role in determining peoples' attitudes towards various species (Bjerke & Ost Dahl 2004). For example, while the authors found that most Norwegians favor the existence of large predators in rural, sparsely populated areas, most had a much lower tolerance when they lived closer to urban areas.

Personal experience can be very important in forming attitudes, both negatively and positively. There is evidence to suggest that attitudes towards species are directly related to whether or not that species causes an individual harm or inconvenience, as defined by the individual (Bjerke & Ost Dahl 2004). Another study found that a negative experience with an urban wildlife species increased negative feelings only towards

species that are known to come into conflict with humans in urban areas (in this study, the list included cats, dogs, rats, mice, gulls, crows, magpies and pigeons) (Bjerke et al. 2003). Because of this, it is likely that many urban residents have more positive attitudes towards large predators such as wolves and bears, which tend not to venture into urban areas on a regular basis, so the likelihood of conflict is low. This might change for species such as coyotes, however, as they become more established and common in urban areas. One study in Sweden, however, found that multigenerational city residents (whose parents and perhaps grandparents were also city residents) actually held more negative views of wolves and wildlife in general than those who lived in rural areas or city residents who had regular experience in rural areas (Heberlein & Ericsson 2005).

Looking at the preferences of individuals for various species of urban wildlife in a sample of large American metropolitan areas, it was found that birds were generally considered more desirable than mammals, although some mammals also had high ratings. Surprisingly, both Canada geese and deer, species generally considered nuisances in the Washington, D.C. metropolitan area, were rated favorably. Conover felt that species that were relatively uncommon in an area were rated more favorably than common species; therefore, deer and Canada geese might be uncommon in many of the areas surveyed, resulting in positive ratings (Conover 1997). It is possible that coyotes will become more negatively viewed in newly colonized urban areas as their populations stabilize; on the other hand, coyote populations are rather thinly dispersed across the area and so might be better tolerated as they would be rarely seen. For example, foxes were reported to have a neutral rating in an urban area in Norway (Bjerke & Ostdahl 2004).

In a study carried out in Minnesota, urban residents held strong protectionist feelings and affection for wolves, while rural residents held weaker protectionist views (Kellert 1985). In Michigan, people who grew up in rural areas, especially those with concerns over economic losses due to predation, had more negative attitudes towards predators in general (including coyotes) than others (Hook & Robinson 1982). In a quantitative summary of attitudinal studies of wolves across several decades (1972-2000), urban residents consistently had more positive attitudes towards wolves than most rural residents, with the exception of hunters and trappers (Williams et al. 2002).

Pet Ownership

Pet ownership can play a role in influencing attitudes towards other animals. Having a positive experience with a pet can increase positive attitudes towards animals; however, having a negative experience with a pet does not result in increased negative feelings towards animals (Fidler 2003). Pet ownership has been correlated with more favorable attitudes towards urban wildlife than non-pet owners, although it is unclear whether having a pet is merely an indicator of good feelings towards animals in general, or if pet ownership itself influences these feelings (Bjerke et al. 2003). Another study demonstrated that pet owners liked most urban wildlife species more than non-pet owners (with the exception of rats, mosquitoes, snails, and insects) (Bjerke et al. 2003). Conversely, yet another study found that while positive experiences with pets can increase positive feelings towards animals, negative experiences with pets could do the

opposite (Knight et al. 2004). More research needs to be done to conclusively determine the role of pet ownership in attitudes towards animals.

An attachment to animals has been linked to negative feelings towards large carnivores in rural Norway. There, sheep farmers who formed attachments to their sheep (i.e. felt sad when they went to slaughter, expressed fondness towards their sheep, etc.) felt more negatively about carnivores than did farmers who did not express attachment to their sheep. This makes sense, as large carnivores are sometimes a threat to domestic sheep (and perhaps more importantly are usually perceived as threats to sheep); if farmers feel close to their sheep, then they would naturally dislike non-human animals that might do them harm (Vitterso et al. 1998).

Environmental Education

A major goal of canine education programs should be to encourage coexistence (Taylor 2004). By understanding the attitudes of the population the educator is working with, he or she can target the educational program specifically to the audience in question, based in part on their worldview (Taylor 2004).

Worldviews are important to consider when dealing with a conflict situation, such as when a population is divided on how they feel about the arrival of a carnivorous species in their area. Worldview is defined as: “a *concept* that attempts to articulate the consequences of human activities that are individual as well as collective, psychological as well as social” (Docherty 2001, 50). Worldviews are dynamic and are a social construct, developed by a group of people instead of individuals (Docherty 2001). At

times, those attempting to resolve conflicts disregard those who demonstrate high emotions rather than reasoned arguments. However, this can marginalize certain groups, leaving them unhappy with whatever solution is proposed. If a group of stakeholders is unsatisfied with a management plan, they can work to undercut the effectiveness of the program (Docherty 2001). Human wildlife conflict practitioners need to learn to navigate between different worldviews. Understanding the basic attitudes of different stakeholder groups is key to beginning to understand their worldview.

Education attempts to affect human behavior (Hungerford & Volk 1990). In 1977, the Tbilisi Intergovernmental Conference on Environmental Education declared that the objectives of environmental education (EE) were awareness, sensitivity, attitudes, skills, and participation (Hungerford & Volk 1990). Reaching these objectives would create environmentally responsible citizens. Although most EE programs still focus mainly on increasing the knowledge of students, this has proven to have only a small influence on human behavior (Hungerford & Volk 1990). However, learning the facts is the initial step to a well-rounded EE program—students must have knowledge to make environmentally responsible decisions (Hungerford & Volk 1990). Part of this study is an attempt to define what type of knowledge is most effective in this initial step, recognizing that in most public outreach program situations, educators and conservationists only have a moment (for example, a glance at a flyer or brochure) to get their message across to the public. In these cases, knowing what type of information best informs and influences people is valuable as knowledge does comprise one aspect of attitude, especially for those that know little to begin with (Reading & Kellert 1993).

Perception is often a more potent force in establishing attitudes than knowledge (Kellert et al. 1996). Kellert et al. suggest four variables that affect people's perceptions of predators and predator conservation programs: 1) Basic, underlying values affect feelings towards specific species; 2) The specific characteristics of the species influence attitudes, i.e., their physical attributes, intelligence or perceived intelligence, historical/cultural associations, etc. (Also in Driscoll, 1995); 3) Basic knowledge of a species; and 4) The interactions that an individual has had with the species and whether these were positive or negative experiences (1978).

Conclusion

The goal of this project is to increase the understanding of Washington, D.C. area residents' attitudes towards and beliefs about coyotes. As coyotes are recent arrivals to the D.C. area, this study will also provide baseline attitudinal data that will be helpful to refer back to as awareness of coyotes grows over time. In addition, this project will provide guidance to those who are designing outreach materials, such as flyers and posters, for coyote coexistence programs by determining what sorts of short messages about the species are most effective in influencing attitudes towards coyotes.

Methodology

In 2005, a survey was conducted in Cape Cod, Massachusetts, examining attitudes towards coyotes in the area (Jackman 2005). The survey instrument used in this current study was modeled on that used in Cape Cod, although some sections were changed and expanded (notably the sections measuring the impact of messaging on respondents' attitudes towards coyotes). In addition, the author was in communication with Jackman before her survey and had some input on the questions asked in the initial 2005 project. After Jackman finished her project, she and the author of this study discussed questions that worked well or did not work as well, which provided guidance to the writing of this survey instrument (Appendix), similar to a pilot study. In addition, the survey instrument was given to 10 colleagues (fellow graduate students in the Environmental Science and Policy department at George Mason University). Their input was incorporated into the final draft of the survey.

The survey instrument was distributed to undergraduate students in introduction to biology (BIOL 103) and introduction to environmental science (EVPP 110) courses at George Mason University. These courses meet a general education science requirement at George Mason University; therefore, the classes are composed primarily of students who are seeking majors in non-science disciplines. George Mason University's Human

Subjects Review Board approved the surveys and the procedure used while administering the surveys.

The surveys were distributed to students in laboratory sections at the beginning of the semester, with a response rate of 94.7% (n = 769 surveys completed). 84.3% of the surveys were completed in introduction to biology lab sections, and 15.7% were completed in introduction to environmental science labs. As an incentive to participation, students were given a raffle ticket for a \$100.00 gift certificate to an electronics store upon turning in a completed survey. Collected surveys were assigned a number and were coded according to a system that was developed on an Excel spreadsheet. Three undergraduate students (two of whom were paid an hourly wage and one who earned credit for her work as an independent study) assisted with the coding. Coding errors were checked by selecting a random sample of 25 surveys, recoding them, and comparing them to the originals. In all instances, there were no errors in the original.

Once the survey data were coded on the Excel spreadsheet, it was transferred to SPSS 13 for Mac OS X. The new data file was again checked for errors by examining the scores for each variable to ensure that each answer fell within the expected range. All errors found were corrected by going back to the original survey and recoding incorrect scores. SPSS 13 for Mac OS X was used for all statistical analyses. References to specific questions in the survey will be accompanied by the question number (in form “Q#”) in the survey. The survey instrument can be found in the Appendix.

The gender (Q38) and age (Q39) of each respondent were recorded. For analysis purposes, age was collapsed into two categories: traditional students (19-25) and non-

traditional students (26-40), as the author was most interested in whether there might be differences in attitudes towards coyotes between these two groups as this might indicate whether or not college students had different attitudes than adults in the area. In addition, each respondent was asked whether or not they belonged to any environmental, wildlife, or animal protection organizations (Q42).

Respondents were asked whether they were aware that coyotes were present in the Washington, D.C. metropolitan area (Q3), whether or not they had seen or heard a media story about coyotes in the past year (Q5), how much they supported the existence of coyotes in the D.C. area (Q4), and how much they liked or disliked coyotes (Q6).

Attitudes Towards Wildlife Management Policies

Participants were asked a series of three questions to determine their general attitudes towards coyote management in the D.C. metropolitan area (Q27). The responses were scored on a five-point Likert scale.

Activities

Past studies tell us that those who spend the most time participating in any sort of outdoor activity tend to have the most positive feelings towards predators. Individuals who regularly participated in non-consumptive wildlife-related activities had somewhat more positive values towards predators than the general public, but there was not much difference between consumptive and non-consumptive participants (Hook & Robinson 1982). On the other hand, hunting and having hunting as a family tradition actually

increased positive attitudes towards wolves, although this study looked specifically at wolves and not at predators in general (Williams et al. 2002).

An ACTIVITIES index was created to show how much respondents participated in wildlife-related activities in order to explore whether or not participation in such activities influenced attitudes towards coyotes. The index was created by adding the total scores for each part of Q1 for each respondent. The minimum and maximum possible and actual scores were recorded, as well as the mean, median, and skewness score. Independent-samples t-tests were conducted to compare the ACTIVITIES scores with gender, age, and whether or not the respondents were members of an environmental, wildlife, or animal protection organization.

Belief in Animal Mind

“Belief in Animal Mind” (BAM) can be defined as “how we attribute to animals mental capacities such as intellect, the ability to reason, and feelings of emotion” (Knight et al. 2004, 44). Higher levels of BAM have been correlated with less support of animal use (i.e. in animal-model experiments). It is therefore possible that having higher levels of BAM would predispose an individual to preferring non-lethal coyote management techniques, as well as perhaps being more tolerant of their presence.

Although there is no standard way of measuring BAM, one was developed that has proven useful (Hills 1995). Her original scale was modified by Jackman (2005) to refer specifically to coyotes. That modified index (Q7) was used in this project as well

and was scored on a five-point Likert scale. The last item of Q7 was reverse-coded for ease of understanding the index.

The Chronbach's alpha for this index was 0.486; however, when the last question, that begins "Coyotes are more like computer programs," was removed from the index, the internal reliability increased (Chronbach's alpha = 0.583). In the 1995 Cape Cod study, the last question was also removed for purposes of analysis (Jackman 2005). The BAM index in Hills' original study was highly internally reliable (Chronbach's alpha = 0.900).

The BAM index was reverse coded for ease of interpretation. Independent-samples t-tests were then performed to compare BAM scores with respondents' gender, age, and whether or not they were members in an environmental, wildlife, or animal protection organization.

Knowledge

Although, as discussed earlier, efforts to change people's attitudes towards coyotes should not stop with providing facts about coyotes, increasing the knowledge that residents' have about coyotes is a necessary step in affecting attitudes (Reading & Kellert 1993). Therefore, exploring the level of knowledge that the sample population currently holds is important.

To do this, an attempt was made to create a knowledge index (the sum of the parts of Q2), but it proved internally unreliable (Chronbach's alpha = 0.204). A factor analysis

of the index was performed, but removing items did not noticeably increase the reliability of the index. However, individual items from Q9 proved interesting.

Fear

Concerns about living in close proximity to wild animals help shape people's attitudes towards these animals. In the Chicago metropolitan area, coyotes were perceived by residents as being the greatest wildlife threat to human health and safety (Gehrt 2004c). In another study, the factor that most contributed to negative feelings towards predators was fear (Hook & Robinson 1982).

This survey included a section on fears about coyotes, based on an elk study (Lee & Miller 2003). Jennifer Jackman modified her index to apply it specifically to coyotes (Jackman 2005). Jackman's items were used in this project to create a FEAR index using six items scored on a four-point scale (Q9). The index was created by adding the components of participants' responses to Q9. The index was found to be internally reliable (Chronbach's $\alpha = 0.868$). The minimum and maximum possible and actual scores were recorded, as well as the mean, median, and skewness score.

A factor analysis was attempted for the FEAR index; however, although it looked promising in the correlation matrix, only one factor (consisting of all of the questions) was extracted in the component matrix.

Independent-samples t-tests were performed to compare gender, age, and whether or not respondents were members of an environmental, wildlife, or animal protection organization with the FEAR index.

Support

A SUPPORT index was developed to measure the level of support respondents had for coyotes in the Washington, D.C. metropolitan area. The index was based on questions similar to those asked in Jackman's (2005) Cape Cod survey. The index was created by adding participants' responses to four questions scored on a four-point scale (the components of Q8). Two of the questions ("the current D.C. metro area coyote population is a problem" and "coyotes don't belong in the D.C. metro area") were reverse coded to make the creation of the index possible. In addition, the entire index, once created, was reverse coded to simplify interpretation. The SUPPORT index was found to be internally reliable (Chronbach's $\alpha = 0.643$), and the minimum, maximum, mean, median and skewness values for the index were recorded.

Independent-samples t-tests were conducted to compare the SUPPORT index with respondents' gender, age, and whether or not they were members of an environmental, wildlife, or animal protection organization.

Correlations

All possible combinations of the indices were tested for correlations using a bivariate correlation process to create a Pearson product-moment correlation coefficient.

Pets

As was discussed in the introduction, it is possible that pet ownership can influence attitudes towards other animals (Bjerke et al. 2003; Fidler 2003; Knight et al.

2004). Pet owners are important stakeholders in any discussion of coyote management plans, as coyotes have been known to prey upon cats and small dogs. Therefore, this project explored the role that pet ownership might have on attitudes towards coyotes.

Participants were asked whether they or their household has a dog (Q16) or cat (Q20) in the Washington, D.C. metropolitan area. The percentages of dog owners and cat owners were recorded, and a new variable, pet ownership, was created that included both cat and dog owners. In Q19 and Q23, respondents were asked to rate particular concerns that they might have about dog or cat safety on a four-point scale. Both pet owners and non-pet owners' responses were recorded.

Independent-samples t-tests were performed that compared whether or not a respondent owned a pet (defined as a dog or cat) with the BAM, SUPPORT, and FEAR indices. Chi-square tests for independence were run to compare pet ownership with support for the existence of coyotes in the D.C. metropolitan area (Q4) and how much the respondents liked or disliked coyotes (Q6).

Q26 addressed whether or not respondents felt that coyotes should be held responsible for pet predation when the pet was outside unsupervised at the time. This question was scored on a five-point scale. Responses were recorded for both the pet owners and non-pet owners. In addition, a Chi-square test for independence was run to compare pet ownership with Q26. Whether or not there was a correlation between Q26 and the FEAR, SUPPORT, and BAM indices were also explored, using Pearson product-moment correlation coefficient.

Media

The media can have a powerful influence on people's perceptions of problems. As Stanley Gehrt, the coyote researcher in Chicago, said, coexistence happens 99% of the time—it's just the 1% of the time that you hear about it, often through the media, where conflicts occur. This can present a skewed view of reality (Gehrt, personal communication, 2007). On the other hand, an incident where an infant was killed by a black bear in New York State that was widely covered in the media over a short period of time caused the percentage of people who felt the risk of being attacked by a bear was acceptably low to actually rise after the incident (81% pre-incident, 87% post-incident). This might be because the media widely reported how rare such attacks were and portrayed this as an isolated incident (Gore et al. 2005). Because of the impact the media can have, its influence on the sample population's attitudes was explored.

Respondents were asked whether they had seen or heard a media story about coyotes in the Washington, D.C. metropolitan area, and, if so, in what form (Q5). A Chi-square test for independence was then run to compare whether or not they had seen or heard a media story with their support for coyotes in the D.C. metropolitan area (Q4) and how much they liked or disliked coyotes (Q6). In addition, an independent-samples t-test was performed to compare the FEAR index with whether or not the respondents had seen or heard a media story.

Experiences with Coyotes

Respondents were asked whether or not they had seen (Q10) or heard (Q11) a coyote in the D.C. metropolitan area, defined as an experience with a coyote for the purposes of this study. Independent-samples t-tests were conducted to compare whether or not they had seen or heard a coyote with the FEAR and SUPPORT indices. In addition, a Chi-square test for independence was performed to look for relationships between whether or not the respondents had seen or heard a coyote and how much they liked or disliked coyotes.

Respondents were also asked to rate their experiences with coyotes (Q12). All analyses for this question were conducted by selecting only those respondents who had answered that they had seen or heard a coyote in Q10 and Q11. The relationship between their ratings of their experience with the FEAR, BAM, and SUPPORT indices was investigated using Pearson product-moment correlation coefficient.

Q14 and Q15 dealt with whether or not the respondents' households had changed their behavior in some way because of the presence of coyotes near their house. Specifically, Q14 dealt with changes in behavior towards pets, and Q15 dealt with changes to property. The responses were combined in a new variable that expressed whether or not a respondent had changed their behavior due to the presence of coyotes near their household. Independent-samples t-tests were performed to compare the FEAR and SUPPORT indices with whether any behavioral changes had taken place. In addition, a Chi-square test for independence was performed to explore whether there was any

relationship with respondents changing their behavior and how much they liked or disliked coyotes.

Respondents were also asked whether they had any knowledge of a dog or cat, either their own or someone else's, being attacked by a coyote (Q24). A new variable was created from this question that simply signified whether a respondent had knowledge of a coyote attacking a pet. Independent-samples t-tests were performed to compare having knowledge of such an attack and the SUPPORT and FEAR indices. In addition, a chi-square test for independence was performed to compare the relationship between having knowledge of such an attack and how much the respondent liked or disliked coyotes (Q6).

Gender

Gender can be an important influence on people's attitudes towards wildlife and wildlife management policies (Bjerke & Ostdahl 2004; Bjerke et al. 2003; Casey et al. 2005; Czech et al. 2001; Lauber et al. 2001). Gender was given consideration when discussing each index. In addition, Chi-square tests for independence were run to compare gender with how much support an individual had for the presence of coyotes in the D.C. metropolitan area (Q4) and how much the individual liked or disliked coyotes (Q6).

Messaging

To explore what types of specific information—given in short “sound bites” such as through outreach materials—might best influence peoples’ attitudes towards coyotes, participants were presented with short statements about or images of coyotes in one of four categories (behavioral, ecological, human-coyote relations, or images). In the behavioral, ecological, and human-coyote relations forms, ten statements were given. In the images form, nine images were presented to the respondents (Q29beh, Q29eco, Q29cul, and Q29ima). Respondents were asked to indicate whether the provided information made them feel more or less positively about coyotes on a five-point scale. Although in the Appendix, all of the categories are presented in one survey form, it should be noted that each respondent received only one of these sections. In all, 25.1% (N=193) completed surveys that included the human-coyote relations statements, 25.9% (N=199) included the behavioral statements, 24.4% (N=188) included the ecological statements, and 24.6% (N=189) included the images.

A series of questions that had been asked before the statements or images had been presented to the participants (pre-test) were asked again after the statements or images were given to the participants (post-test). The paired questions were Q4 and Q30, Q6 and Q31, Q27 and Q32, and the BAM index (Q7 and Q33). The second BAM index was created in the same way the first was, by removing the last item to increase the internal reliability of the index (Chronbach’s $\alpha = 0.714$) and then reverse coding the index to make the analysis more understandable.

Paired-samples t-tests were performed on all of the pre- and post-test matching questions for all of the surveys together, in order to measure the effect that providing any type of information might have on respondents' attitudes towards coyotes.

For each of the four forms, the frequencies of how each individual statement or image made the respondents feel more or less positively towards coyotes was recorded. In addition, paired-sample t-tests were performed on all of the pre- and post-test matched questions for each of the forms separately, in order to explore what specific category of information might best influence attitudes towards coyotes.

Results of Attitudinal Section

Females made up 63.2% of the subjects while males made up 36.8%. The ages of the students ranged from 18 to 47. Ages were collapsed into two categories: traditional students (19-25; n= 686, 89.2%) and non-traditional students (26-40; n=48, 6.2%), as differences in responses between these two categories might indicate whether traditional college students have greatly different attitudes towards coyotes than the general public. Overall, the median age was 20 and the mean was 24.

Only 36.7% (n = 764) of students were aware that coyotes are present in the Washington, D.C. metropolitan region. Similarly, few students (13.7%, n = 764) had seen a media report about coyotes in the past year. Tables 1 and 2 demonstrate that most respondents had rather neutral feelings towards coyotes, with 80% of respondents either “somewhat” or “not very much” supporting the existence of coyotes in the area, and nearly 70% feel neutral about coyotes when asked how much they liked or disliked the species.

Table 1. Responses to the question: “How much do you or don’t you support the coyote’s existence in the D.C. metro area?” Percentages are given in valid/actual format. N = 763.

	Very much	Somewhat	Not very much	Coyotes should be eliminated or driven out of the D.C. metro area
Percentage of respondents	12.2 / 12.1	41.4 / 41.1	40.9 / 40.6	5.5 / 5.5

Table 2. Responses to the question: “How much do you like or dislike coyotes?” Percentages are given in valid/actual format. N = 758

	Dislike very much	Dislike somewhat	Neutral	Like somewhat	Like very much
Percentage of respondents	4.6 / 4.6	7.5 / 7.4	67.7 / 66.7	13.3 / 13.1	6.9 / 6.8

Attitudes Towards Coyote Management

Respondents were asked three questions relating to their general attitudes towards coyote management. The responses are summarized in Table 3.

Table 3. Attitudes towards coyote management. Percentages are in valid/actual format.

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	N
The D.C. metro area coyote population should be protected and preserved	23.8 / 21.5	39.6 / 35.6	26.2 / 23.5	6.8 / 6.1	3.6 / 3.3	692
The D.C. metro area coyote population size should be controlled	20.2 / 18.2	45.7 / 41.2	24.1 / 21.7	5.5 / 4.9	4.5 / 4.0	693
The D.C. metro area coyote population should be completely eliminated	2.7 / 2.5	5.3 / 4.8	19.0 / 17.2	20.4 / 18.5	52.5 / 47.5	695

These data lend support to the idea that coyotes have a certain amount of support in the study population. Most notably, the majority of respondents disagreed with the statement: “The DC metro area coyote population should be completely eliminated.”

ACTIVITIES

The ACTIVITIES index (Chronbach’s alpha = 0.798) had a minimum possible score of nine and a maximum possible of 45, with lower scores indicating less participation in such activities. Actual scores covered the full possible range. The index had a mean of 17.71, a median of 17.00, and a skewness score of 1.02 (SE = 0.09). Figure

1 shows the range of ACTIVITIES scores, demonstrating that most respondents spent little or moderate time participating in wildlife-related activities.

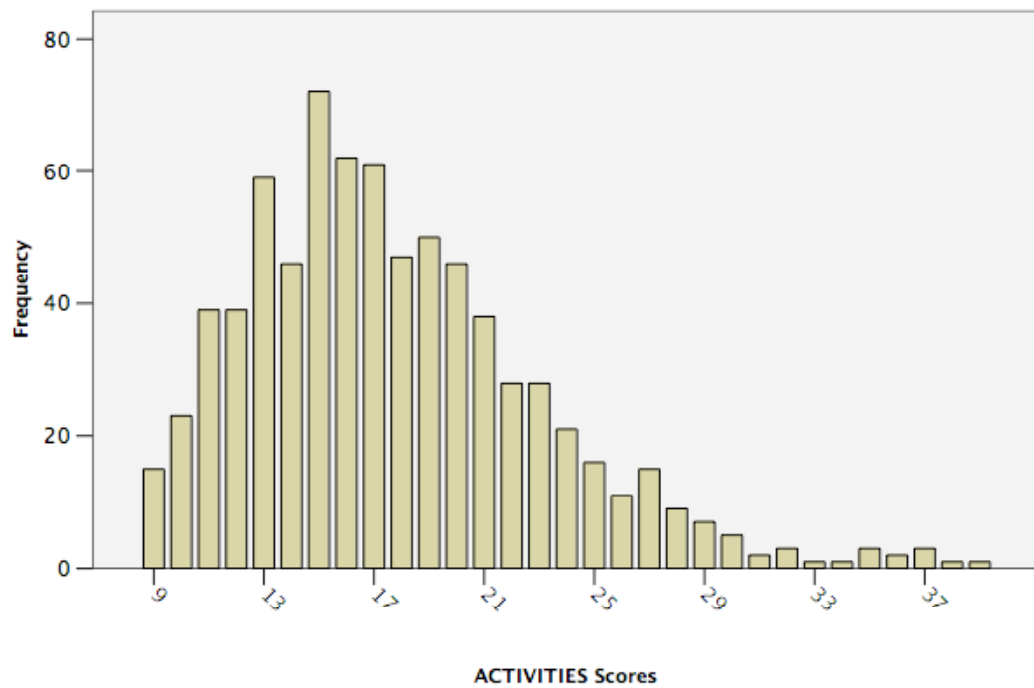


Figure 1. Range of respondents' ACTIVITIES Scores, showing how much time respondents spent participating in wildlife-related activities. Higher scores indicate higher rates of participation.

Table 4 presents the results of the independent-samples t-tests run with the ACTIVITIES index. Only the test that compared whether participants were members of an environmental, wildlife, or animal protection organization was significant ($p < 0.001$),

with members of such organizations participating at greater rates in wildlife related activities than non-members.

Table 4: Summary of results of independent-samples t-tests.

	ACTIVITIES	BAM	SUPPORT	FEAR
Gender				
Male	17.94 ± 5.71	14.15 ± 2.96	12.82 ± 3.00	13.11 ± 4.62
Female	17.54 ± 5.10	14.32 ± 2.62	11.85 ± 2.75	15.13 ± 5.05
t _(df)	t ₍₇₄₂₎ = -0.99	t ₍₅₇₅₎ = 0.74	t ₍₄₈₈₎ = -3.67*	t ₍₅₈₀₎ = 5.33*
Membership				
Member	21.49 ± 6.11	14.53 ± 2.82	13.70 ± 2.53	12.56 ± 4.41
Non-member	17.29 ± 5.10	14.24 ± 2.75	12.06 ± 2.90	14.55 ± 5.01
t _(df)	t ₍₇₃₀₎ = 6.42*	t ₍₅₆₄₎ = 0.76	t ₍₄₈₁₎ = 3.74*	t ₍₆₆₇₎ = -3.10*
Student status				
Traditional	17.64 ± 5.62	14.26 ± 2.73	12.22 ± 2.94	14.41 ± 4.98
Non-traditional	17.57 ± 5.28	14.38 ± 3.28	12.73 ± 2.30	13.49 ± 5.21
t _(df)	t ₍₇₁₈₎ = 0.09	t ₍₅₅₈₎ = -0.25	t ₍₄₇₂₎ = -0.93	t ₍₆₅₆₎ = 1.18

* equals p < 0.01

BAM

The BAM index (Chronbach's alpha = 0.583) had a minimum possible and actual score of 4 and a maximum possible and actual score of 20, with higher scores indicating a greater degree of BAM. The sample population had a BAM score mean of 14.25, a median of 14.00, and a skewness score of -0.32 (SE = 0.101). Figure 2 shows the range of BAM scores respondents had which indicates how much they believe that coyotes are thinking, feeling creatures.

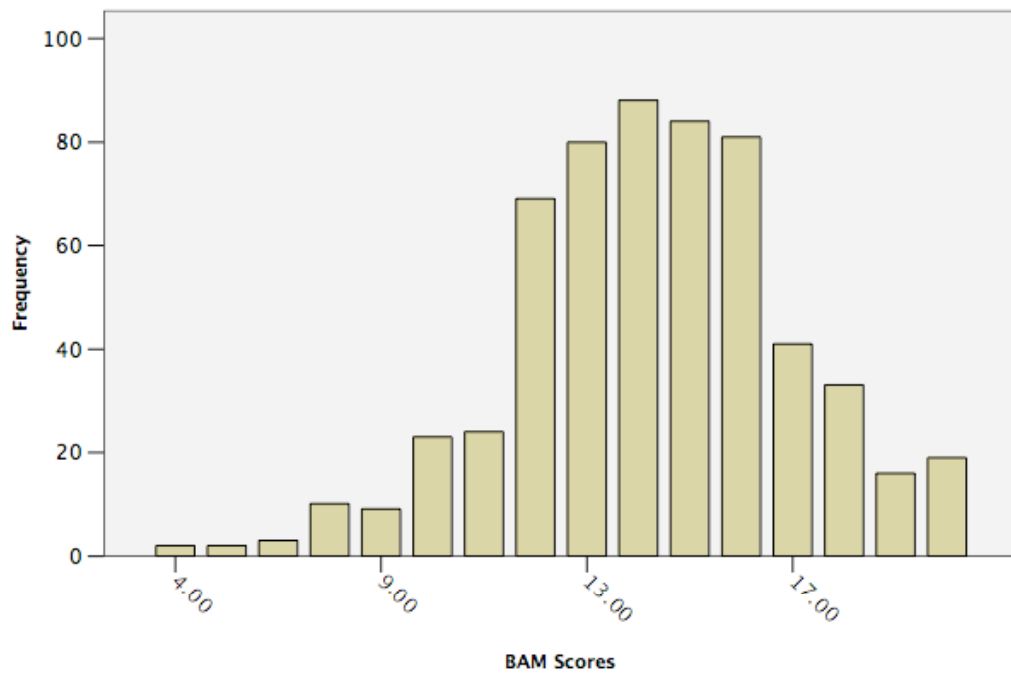


Figure 2. The range of respondents' BAM scores, indicating the strength of their belief in animal mind as it relates to coyotes. Higher scores indicate higher levels of BAM.

Table 4 shows the results of the BAM independent-samples t-tests. There were no significant results.

Knowledge

The results of the series of questions that were asked to assess respondents' knowledge about coyotes can be found in Table 5. Notably, most respondents correctly

agreed that coyote attacks on humans are not common, that coyotes will prey upon cats, and that if you encounter a coyote you should not run away from it. On the other hand, most respondents thought incorrectly that coyotes were endangered and that adult males weigh an average of 100 pounds.

Table 5. Responses to knowledge about coyotes questions. The correct response is in bold print for each question. Percents are in valid/actual format.

	Agree	Disagree	N
Coyotes are carnivores that eat only meat	59.4 / 58.6	40.6 / 40.1	769
Coyotes always travel in packs	44.5 / 44.1	55.5 / 55.0	762
Coyote attacks on humans are not common	81.2 / 80.1	18.8 / 18.6	759
Adult male coyotes weigh on average 100 lbs.	57.8 / 57.2	42.2 / 41.7	761
Coyotes are in danger of becoming extinct	70.2 / 69.6	29.8 / 29.5	762
Coyotes will kill cats on occasion	77.9 / 77.0	22.1 / 21.8	760
If you encounter a coyote, you should run away from it	28.8 / 28.5	71.2 / 70.5	761

Fear

The FEAR index (Chronbach's alpha = 0.868) had a minimum possible and actual score of 6 and a maximum possible and actual score of 24; the lower the score, the less fear the respondent had of coyotes. The index had a mean of 14.37, a median of 14.00, and a skewness score of 0.10 (SE = 0.09). Figure 3 shows the range of respondents' FEAR scores, indicating how much or how little they fear coyotes.

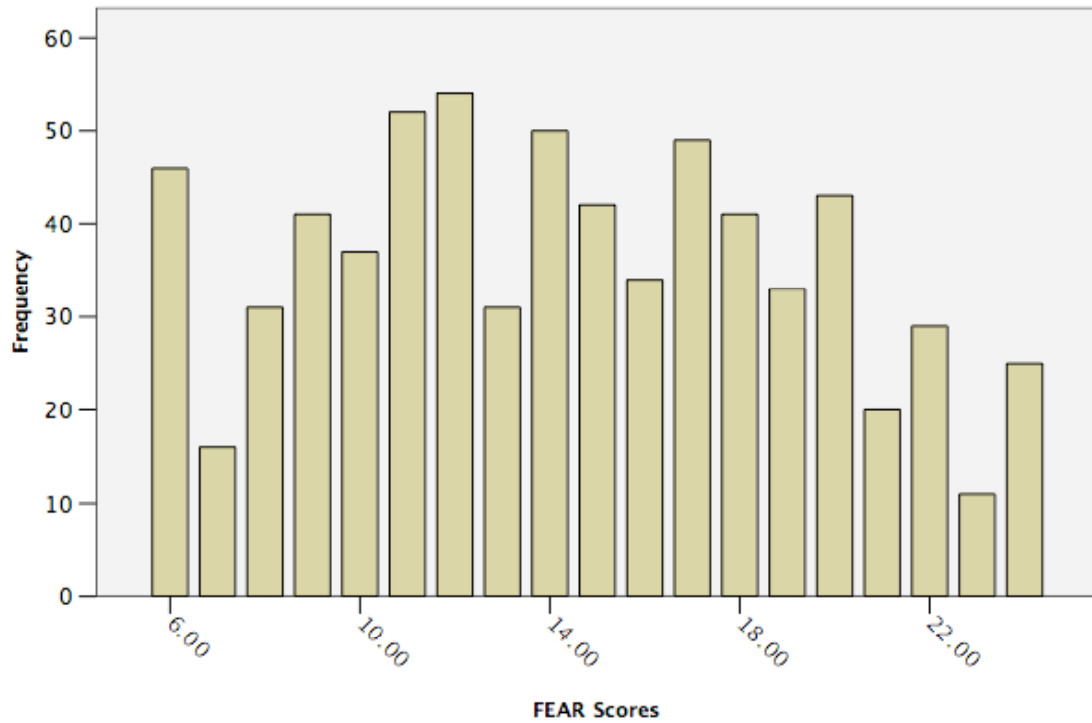


Figure 3. The range of respondents' FEAR scores, indicating how much or how little they fear coyotes. Higher scores indicate higher levels of fear.

The responses to individual components of the FEAR index provided valuable information by pinpointing the strongest concerns respondents had about coyotes. Table 6 summarizes these results.

Table 6. How concerned respondents are about specific fears related to coyotes. Percents are in valid / actual format.

	Not a concern	Minor concern	Moderate concern	Major concern	N
Potential risk to myself in a face-to-face encounter with a coyote	51.8 / 48.9	21.6 / 20.4	14.9 / 14.0	11.6 / 10.9	726
Coyotes attacking dogs	29.6 / 2 / 7.7	30.8 / 28.9	26.5 / 24.8	13.1 / 12.2	720
Coyotes attacking cats	36.1 / 34.1	27.1 / 25.6	24.4 / 23.0	12.4 / 11.7	726
Having coyotes near my home	31.8 / 30.6	26.7 / 25.6	20.1 / 19.2	21.4 / 20.5	738
Coyotes spreading rabies	11.3 / 10.8	19.7 / 18.7	26.8 / 25.5	42.2 / 40.2	732
Coyotes attacking children	16.1 / 15.3	16.3 / 15.6	22.1 / 21.1	45.5 / 43.4	734

Of particular interest is that half of respondents felt that a face-to-face encounter with a coyote was not a concern, while at the same time 43% of respondents felt that the potential for a coyote to attack a child was a major concern. This is despite the fact that most respondents knew that coyote attacks on humans were rare (see Knowledge section above). In addition, 40% of respondents felt that coyotes spreading rabies was a major concern even though coyotes are not a vector species for rabies in this area.

The results of independent-samples t-tests run with the FEAR index can be found in Table 4 on page 40. Women had more fear of coyotes than men ($p < 0.001$) and members of environmental, wildlife, or animal protection organizations had less fear than non-members ($p = 0.002$).

Support

The SUPPORT index (Cronbach's Alpha = 0.643) had a minimum possible and actual score of 4 and a maximum possible and actual score of 20, with lower scores indicating less support for coyotes. The index had a mean of 12.22, a median of 12.00, and a skewness value of 0.076 (SE = 0.110). See Figure 4 for respondents' SUPPORT scores, indicating how much or how little they support the existence of coyotes.

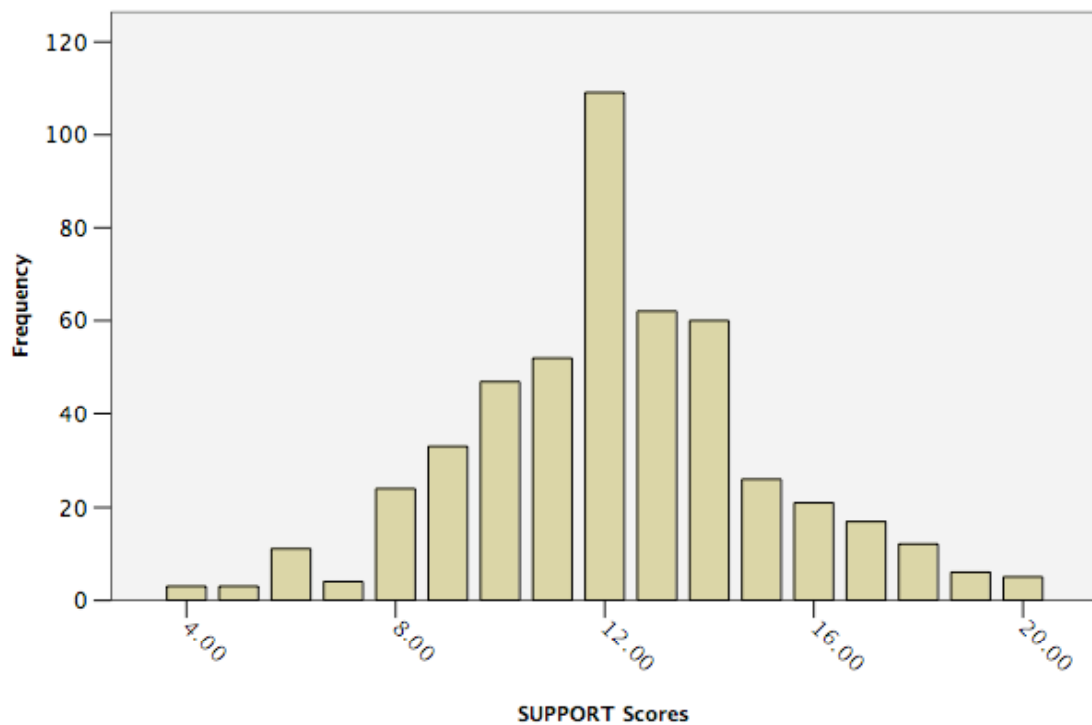


Figure 4: Range of respondents' SUPPORT scores, showing how much or how little respondents support the existence of coyotes. Higher scores indicate higher levels of support.

Table 4, on page 40, summarizes the results of a series of independent-samples t-tests comparing SUPPORT to demographic variables. Men tended to be more supportive of coyotes than women ($p < 0.001$) and members of environmental, wildlife, or animal protection organizations tended to be more supportive of coyotes than non-members ($p < 0.001$).

Correlations

Pearson product-moment correlation coefficients were created to explore possible relationships among the six possible combinations of indices (see Table 7).

Table 7. Results of correlation analysis of the four indices. Significant results are in bold print.

	ACTIVITIES & BAM	ACTIVITIES & SUPPORT	ACTIVITIES & FEAR	BAM & SUPPORT	BAM & FEAR	SUPPORT & FEAR
p-value	0.083	< 0.001	0.208	< 0.001	0.103	< 0.001
Pearson correlation coefficient	0.072	0.19	-0.49	0.17	-0.07	-0.33

The more an individual participated in wildlife-related activities, the more likely he or she was to support the existence of coyotes. Similarly, the higher the degree of BAM an individual held, the more likely he or she was to support the existence of coyotes. The SUPPORT and FEAR indices had a negative correlation, indicating that the

more an individual supported the existence of coyotes, the less likely they were to fear coyotes.

Pets

32.7% of respondents or their households owned dogs, while 19.7% of respondents or their households owned cats. In total, 56.9% (n=431) of respondents had no pets, while 43.1% (n=326) had one or more pets (pets here are defined as cats or dogs).

Most respondents (whether pet owners or non-pet owners) were either not concerned or had only minor concerns about dogs being attacked by coyotes. Even fewer respondents were concerned about coyotes attacking cats (see Tables 8-11).

Table 8. Pet owners responses to: “Please indicate how concerned you are that the following could happen to dogs that are outside unsupervised or are off-leash in the DC metro area”. Percents are in valid/actual format.

	Not a concern	Minor concern	Moderate concern	Major concern	N
Fighting with other dogs	15.9 / 15.3	33.0 / 31.9	33.3 / 32.2	17.8 / 17.2	315
Being hit by a car or truck	5.6 / 5.5	14.9 / 14.7	27.6 / 27.3	51.9 / 51.2	322
Being attacked by a coyote	38.9 / 37.4	38.5 / 37.1	13.1 / 12.6	9.6 / 9.2	314
Being stolen for dog fighting	44.2 / 42.3	28.2 / 27.0	14.4 / 13.8	13.1 / 12.6	312

Table 9. Non-pet owners responses to: “Please indicate how concerned you are that the following could happen to dogs that are outside unsupervised or are off-leash in the DC metro area.” Percents are in valid/actual format.

	Not a concern	Minor concern	Moderate concern	Major concern	N
Fighting with other dogs	22.9 / 21.3	29.9 / 27.8	34.6 / 32.3	12.7 / 11.8	402
Being hit by a car or truck	12.5 / 11.8	16.1 / 15.3	33.7 / 32.0	37.7 / 35.7	409
Being attacked by a coyote	34.5 / 31.8	27.2 / 25.1	19.6 / 18.1	18.6 / 17.2	397
Being stolen for dog fighting	37.8 / 34.1	21.1 / 19.0	20.6 / 18.6	20.6 / 18.6	389

Table 10. Pet owners’ responses to: “Please indicate how concerned you are that the following could happen to cats that are unsupervised and off-leash in the DC metro area.” Percents are in actual/valid format.

	Not a concern	Minor concern	Moderate concern	Major concern	N
Being attacked by dogs	28.1 / 26.7	37.1 / 35.3	19.7 / 18.7	15.2 / 14.4	310
Being hit by a car or truck	17.4 / 16.6	20.6 / 19.6	27.1 / 25.8	34.8 / 33.1	310
Being attacked by a coyote	45.7 / 42.6	31.9 / 29.8	12.2 / 11.3	10.2 / 9.5	304
Being attacked by great horned owls or hawks	51.7 / 47.9	28.1 / 26.1	10.6 / 9.8	9.6 / 8.9	302

Table 11. Non-pet owners' responses to: "Please indicate how concerned you are that the following could happen to cats that are unsupervised and off-leash in the DC metro area." Percentages are in valid/actual format.

	Not a concern	Minor concern	Moderate concern	Major concern	N
Being attacked by dogs	32.8 / 31.1	28.9 / 27.4	25.2 / 23.9	13.0 / 12.3	408
Being hit by a car or truck	20.7 / 19.7	21.9 / 20.9	29.9 / 28.5	27.5 / 26.2	411
Being attacked by a coyote	42.3 / 39.0	24.7 / 22.7	18.9 / 17.4	14.1 / 13.0	397
Being attacked by great horned owls or hawks	47.7 / 43.4	24.7 / 22.5	15.8 / 14.4	11.7 / 10.7	392

Pet owners and non-pet owners did not differ in their degree of BAM. Non-pet owners feared coyotes more than pet owners ($p = 0.003$), and there was no difference in levels of SUPPORT between pet owners and non-pet owners (see Table 12).

Table 12. Results of independent-samples t-tests comparing pet ownership status with BAM, FEAR, and SUPPORT indices.

	BAM	FEAR	SUPPORT
Pet owners	14.36 $\pm$ 2.78	13.71 $\pm$ 4.62	12.43 $\pm$ 2.95
Non-pet owners	14.17 $\pm$ 2.70	14.84 $\pm$ 5.21	12.04 $\pm$ 2.81
$t_{(df)}$	$t_{(578)} = -0.84$	$t_{(664)} = 3.00^*$	$t_{(490)} = -1.50$

* = $p < .01$

A chi-square test for independence was run to compare pet ownership with support for the existence of coyotes in the DC Metro area, opposed to overall support for the existence of coyotes as indicated by the SUPPORT index (see Table 13). There was a

significant relationship between pet owners and non-pet owners, with more pet owners very much or somewhat supporting the existence of local coyotes, while more non-pet owners did not have very much support, or believed that coyotes should be eliminated or driven out of the D.C. metro area.

Table 13. “How much do you or don’t you support the coyote’s existence in the DC metro area?”
Results of a chi-square test for independence ($p = 0.041$, Pearson-Chi-Square = 8.24, Cramer’s $V = 0.10$).

	Pet owners	Non-pet owners
Very much	15.4%	9.7%
Somewhat	43.1%	40.1%
Not very much	36.3%	44.3%
Coyotes should be eliminated or driven out of the DC metro area	5.2%	5.8%
Totals	100%	99.9%

A chi-square test for independence was also run to compare pet ownership with how much respondents liked or disliked coyotes (see Table 14). Again, there was a significant relationship. Pet owners seemed to have more extreme feelings about coyotes, either positively or negatively, than non-pet owners.

Table 14. “How much do you like or dislike coyotes?” Results of a Chi-square test for independence ($p = 0.018$, Pearson Chi-Square = 11.88, Cramer’s V = 0.13).

	Pet owners	Non-pet owners
Dislike very much	5.2%	4.2%
Dislike somewhat	5.2%	8.9%
Neutral	65.2%	69.6%
Like somewhat	14.5%	12.6%
Like very much	9.8%	4.7%
Total	99.9%	100.0%

When asked whether or not they agreed with the statement: “If people allow their pets outside unsupervised, they should not blame coyotes for pets that are attacked” (Q26), most either agreed or felt neutral about the statement (see Table 15). A chi-square test was run to look at the relationship between pet ownership with the above statement, but there was no significant relationship ($p = 0.550$). Both pet owners and non-pet owners seem to agree that pet owners have some responsibility towards keeping their pets safe from coyotes.

Table 15. Level of agreement with whether coyotes should be blamed for predations of unsupervised pets. Percents are in valid/actual format.

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	N
Q26. If people allow their pets outside unsupervised, they should not blame coyotes for pets that are attacked	19.7 / 18.5	34.3 / 32.1	19.2 / 17.9	16.0 / 15.0	10.8 / 10.1	720

Correlations were performed to explore potential relationships between individuals' responses to the statement above (Q26) and the FEAR, SUPPORT, and BAM indices. See Table 16 for details.

Table 16. Correlations between the BAM, SUPPORT, and FEAR indices and Q26. Significant results are in bold print.

	FEAR & Q26	SUPPORT & Q26	BAM & Q26
p-value	< 0.001	< 0.001	0.476
Pearson correlation coefficient	-0.20	0.25	0.03

The FEAR index and this statement's responses were negatively correlated, so that the less a person feared coyotes, the more he/she was likely to agree that people should not blame coyotes if pets are left outside unsupervised. The SUPPORT index and Q26 were positively correlated, so that the more a person agreed with the statement, the more support for the existence of coyotes he/she was likely to have. There was no significant relationship between BAM scores and agreement with Q26, however.

Media

Only 13.7% of respondents had seen or heard a media story about coyotes in the year prior to the administration of the survey. See Table 17 for the details on the type of media utilized.

Table 17. With what types of media respondents saw or heard stories about coyotes. Percentages are in valid/actual format.

	Percentage of respondents who saw/heard a story about coyotes	N
Newspaper	5.2 / 5.2	762
Television	8.5 / 8.5	761
Radio	1.6 / 1.6	761
Internet	1.6 / 1.6	761
Other	3.7 / 3.6	761

Having heard or seen a media report about coyotes did not seem to have a significant impact on respondents' attitudes towards coyotes. Chi-square tests found no relationship between whether respondents had seen or heard a media story and their level of support for coyotes in the D.C. metropolitan area ($p = 0.441$) or how much respondents liked or disliked coyotes ($p = 0.652$). Likewise, an independent-samples t-test found no significant difference between the FEAR scores for those who had seen or heard a media story versus those who had not ($p = 0.514$).

Experiences with coyotes

Most respondents had not seen or heard a coyote in the DC metro area at the time the survey was administered--only 21.2% had such an experience with local coyotes, while 78.8% had not.

Table 18. Summary of independent-samples t-tests for whether or not respondents have had an experience with coyotes and the FEAR and SUPPORT indices.

	FEAR	SUPPORT
Has seen/heard a coyote	15.02 ± 4.90	12.23 ± 2.78
Has not seen/heard a coyote	14.18 ± 5.00	12.22 ± 3.16
$t_{(df)}$	$t_{(681)} = -1.82$	$t_{(493)} = -0.02$

Independent-samples t-tests demonstrated that having seen or heard a coyote in the area did not seem to affect FEAR scores ($p = 0.070$) or SUPPORT scores ($p = 0.985$) (Table 18). A chi-square test for independence indicated that there was no relationship between whether an individual liked or disliked a coyote and whether they had seen or heard a coyote in the DC area ($p = 0.367$). Respondents who had seen or heard a coyote were asked to rate their experiences as positive or negative. The majority (57.4%) felt that their experience was neutral (see Table 19 for more details).

Table 19. How respondents who have seen or heard a coyote rate their experience. Percents are in valid/actual form. N = 756

	Respondents who have seen or heard a coyote
Very Positive	9.7/9.3
Positive	20.0/19.3
Neither positive nor negative	57.4/55.3
Negative	7.1/6.8
Very negative	5.8/5.6

The more a person supported the existence of coyotes in the D.C. area, the higher they were likely to rate the experience of having seen or heard a coyote; however, there were no correlations between ratings of experiences (either seeing or hearing coyotes) and the FEAR or BAM indices (see Table 20).

Table 20. Pearson product-moment correlations between ratings of experiences with coyotes and the BAM, FEAR, and SUPPORT indices. Significant findings are in bold print.

	FEAR	BAM	SUPPORT
p-value	0.11	0.971	< 0.001
Pearson correlation coefficient	-0.06	0.00	0.19

Most respondents (90.0%) had not changed their behavior due to the presence of coyotes near their homes (i.e. by feeding pets inside, securing garbage, building fences, etc.). The less an individual feared coyotes, the lower the chance that they would have

changed some aspect of their behavior. There was no relationship between whether or not an individual had changed their behavior and their SUPPORT scores (see Table 21).

Table 21. Independent-samples t-tests comparing whether or not participants had changed their behavior due to the presence of coyotes and the FEAR and SUPPORT indices.

	FEAR	SUPPORT
Had changed behavior	16.00 ± 4.42	11.70 ± 2.83
Had not changed behavior	14.20 ± 5.00	12.30 ± 2.83
$t_{(df)}$	$t_{(678)} = -2.81^*$	$t_{(492)} = 1.54$

* = $p < 0.01$

A chi-square test indicated that there was a weak relationship between how much an individual liked or disliked coyotes and whether or not they had changed their behavior due to the presence of coyotes (see Table 22). In general, more people who had not changed their behavior due to the presence of coyotes in their area felt neutral about coyotes, while people who had changed their behavior tended to have stronger feelings about them, either positively or negatively.

Table 22. How much those who did or did not change their behavior due to the presence of coyotes liked or disliked coyotes. Results of a chi-square test for independence (Pearson Chi-Square = 11.581, $p = 0.021$, Cramer's $V = 0.12$).

	Have changed behavior	Have not changed behavior
Dislike very much	9.2%	4.1%
Dislike somewhat	9.2%	7.4%
Neutral	53.9%	69.2%
Like somewhat	14.5%	13.2%
Like very much	13.2%	6.1%
Total	100.0%	100.0

Ninety-three percent of respondents had no experience of either a dog or cat being attacked by a coyote (either their own pet or the pet of someone they know). Of the remaining 7%, some attacks had been witnessed or there was other conclusive evidence that a coyote was responsible, but in other cases, respondents assumed that a coyote was the cause for the disappearance of a pet although there was no evidence. However, for the purposes of this study, the belief that a coyote was involved is more important than the actual facts of the case.

Independent-samples t-tests demonstrated that having knowledge of an attack on a pet did not seem to affect respondents' SUPPORT scores ($p = 0.997$) or FEAR scores ($p = 0.778$) (see Table 23 for details).

Table 23. Results of independent-samples t-tests comparing knowledge of coyote attacks on pets and the SUPPORT and FEAR indices.

	SUPPORT	FEAR
Had knowledge of a pet attack	12.22 $\pm$ 3.42	14.20 $\pm$ 5.02
Did not have knowledge of a pet attack	12.22 $\pm$ 2.83	14.38 $\pm$ 5.00
$t_{(df)}$	$t_{(491)} = 0.00$	$t_{(680)} = 0.282$

A 2x5 chi-square test indicated that the relationship between having knowledge of a coyote attack on a pet and how much that person likes or dislikes coyotes was

significant ($p < 0.001$). Fewer respondents who knew of a pet attack felt neutrally towards coyotes, and more people who had knowledge of such an attack disliked coyotes than those who did not know of a pet attack (see Table 24).

Table 24. The relationship between knowledge of a pet attack by a coyote and how much the respondents liked or disliked coyotes. Results of a chi-square test for independence (Pearson Chi-Square = 21.235, $p < 0.001$, Cramer's $V = 0.20$).

	Have knowledge of a pet attack	Have no knowledge of a pet attack
Dislike very much	15.1%	3.9%
Dislike somewhat	5.7%	7.6%
Neutral	54.7%	68.6%
Like somewhat	9.4%	13.7%
Like very much	15.1%	6.3%
Total	100.0%	100.1%

Gender

Based on a chi-square test, there was a significant relationship between the gender of the respondent and how much they liked or disliked coyotes. In general, men tended to like coyotes more than women (see Table 25).

Table 25. The relationship between gender and how much the respondents liked or disliked coyotes. Results of a Chi-square test for independence (Pearson Chi-Square = 17.449, $p = 0.002$, Cramer's $V = 0.20$).

	Female	Male
Dislike very much	5.7%	2.9%
Dislike somewhat	9.3%	4.3%
Neutral	68.6%	66.3%
Like somewhat	10.9%	17.4%
Like very much	5.5%	9.1%
Total	100.0%	100.0%

Similarly, men tended to support the presence of coyotes in the area more than women, with a chi-square test demonstrating a significant relationship between these two variables (see Table 26).

Table 26. The relationship between gender and how much the respondents supported the presence of coyotes in the D.C. metro area. Results of a Chi-Square test for independence. (Pearson Chi-Square = 12.076, $p = 0.007$, Cramer's $V = 0.13$)

	Female	Male
Very much	9.6%	16.5%
Somewhat	39.6%	43.5%
Not very much	44.4%	35.6%
Coyotes should be eliminated from the DC metro area	6.3%	4.3%
Totals	99.9%	99.9%

Results of Messaging Section

The final section of the survey asked part participants to rate how certain pieces of information made them feel towards coyotes and explored the overall effect that different categories of facts (ecological, behavioral, human cultural, or images) had on attitudes towards coyotes in an attempt to find out categories could be used most effectively in programs promoting coexistence with coyotes.

Overall effect of messaging

After being presented with a sample of information about coyotes, respondents were asked to answer some of the same questions that they were asked in earlier sections of the survey to create a pre/post-test design. Paired-samples t-tests were conducted to determine the possible overall effect of all the categories of messages combined. For every post-test attitudinal question, there was a significant difference pre- and post-test, with support for coyotes increasing from pre-test to post-test (see Table 27).

Table 27: Summary of paired-samples t-tests for the overall effect of providing additional information to respondents.

	How much do you or don't you support the existence of coyotes in the D.C. metro area	How much do you like or dislike coyotes?	The D.C. metro area coyote population should be protected and preserved	The D.C. metro area coyote population should be controlled	The D.C. metro area coyote population should be completely eliminated	BAM
Pre-test	2.60 ± 0.77	3.11 ± 0.81	3.74 ± 1.00	3.72 ± 0.98	1.85 ± 1.07	14.35 ± 2.71
Post-test	2.78 ± 0.74	3.25 ± 0.91	2.85 ± 0.95	3.61 ± 1.00	1.69 ± 1.03	14.88 ± 2.67
t _(df)	t ₍₇₄₈₎ = -6.53*	t ₍₇₄₈₎ = -5.66*	t ₍₆₇₅₎ = -3.42*	t ₍₆₇₁₎ = 3.12*	t ₍₆₇₈₎ = 4.98*	t ₍₅₄₂₎ = -5.79*

* = p < 0.01

Respondents' BAM scores increased from pre-test to post-test ($p < 0.001$), more respondents agreed that the D.C. area coyote population should be protected and preserved ($p = 0.001$), and fewer people felt that the coyote population should be controlled ($p = 0.002$) or completely eliminated ($p < 0.001$). In addition, there was more support for the existence of coyotes in the D.C. metropolitan area ($p < 0.001$) and respondents tended to like coyotes more ($p < 0.001$).

Human-Coyote Interactions

The first category of messaging that was explored involved human-coyote interactions (N=193). This category encompasses both cultural understandings of coyotes

as well as how humans have behaved towards coyotes. The results of the paired-samples t-tests run for this form are summarized in Table 28.

Table 28. Summary of paired-samples t-tests for the human-coyote interactions form.

	How much do you or don't you support the existence of coyotes in the D.C. metro area	How much do you like or dislike coyotes?	The D.C. metro area coyote population should be protected and preserved	The D.C. metro area coyote population should be controlled	The D.C. metro area coyote population should be completely eliminated	BAM
Pre-test	2.67 ± 0.78	3.10 ± 0.79	3.78 ± 0.99	3.68 ± 0.98	1.85 ± 1.12	14.25 ± 2.88
Post-test	2.77 ± 0.75	3.21 ± 0.91	3.85 ± 0.91	3.59 ± 1.10	1.64 ± 0.98	14.89 ± 2.73
t(df)	t ₍₁₈₇₎ = -1.76	t ₍₁₈₆₎ = -2.14*	t ₍₁₇₁₎ = -0.97	t ₍₁₆₉₎ = 1.31	t ₍₁₆₉₎ = 3.12**	t ₍₁₃₇₎ = -3.43**

* = p < .05; ** = p < .01

Respondents tended to like coyotes more post-test (p = 0.034), had higher degrees of BAM (p = 0.001), and disagreed more that the D.C. coyote population should be eliminated (p = 0.002).

Table 29 describes how respondents felt about specific statements. Most statements seemed to elicit a neutral response from participants. Statements viewed positively included: “the Navajo word for coyote can be translated as ‘God’s Dog’”; “in the tradition of the Miwok peoples, coyote, along with the help of the silver fox, created the world”; and “coyotes were associated with the gods of dance and music in early Mesoamerican cultures.” On the other hand, many participants viewed the statements that described human attempts to kill coyotes negatively.

Table 29. Participants' responses to cultural statements. Percents are in valid / actual format.

	Very Positive	Somewhat Positive	Neutral	Somewhat Negative	Very Negative	N
One study stated that human and coyote coexistence occurred every day, but coyotes only make the news when a conflict occurs	12.1 / 11.9	27.4 / 26.9	38.4 / 37.8	15.8 / 15.5	6.3 / 6.2	190
The Navajo word for coyote can be translated as "God's Dog"	21.6 / 21.2	32.1 / 31.6	43.2 / 42.5	2.6 / 2.6	0.5 / 0.5	190
The word "coyote" comes from the Aztec <i>coyotyl</i> , meaning trickster	3.7 / 3.6	16.3 / 16.1	46.3 / 45.6	31.1 / 30.6	2.6 / 2.6	190
The scientific name for coyotes, <i>Canis latrans</i> , is Latin for "barking dog"	3.2 / 3.1	15.3 / 15.0	68.3 / 66.8	12.2 / 11.9	1.1 / 1.0	189
In the tradition of the Miwok peoples, coyote, with the help of the silver fox, created the world	10.1 / 9.8	25.4 / 24.9	57.1 / 56.0	4.2 / 4.1	3.2 / 3.1	189
The Federal government spends three times the amount of money that ranchers lose due to predation even though predation accounts for the fewest livestock losses). Most of the money goes towards lethal predator control programs	3.2 / 3.1	10.6 / 10.4	48.1 / 47.2	27.0 / 26.4	11.1 / 10.9	189
Coyotes were associated with the gods of dance and music in early Mesoamerican cultures	12.2 / 11.9	34.4 / 33.7	49.2 / 48.2	2.6 / 2.6	1.6 / 1.6	189
One anthropologist assigned the coyote the role of mediator in North American mythology	10.6 / 10.4	31.9 / 31.1	51.6 / 50.3	3.7 / 3.6	2.1 / 2.1	188
Between 1916 and 1999, the Federal government killed nearly 6 million coyotes, almost 2 million since 1976.	6.9 / 6.7	9.6 / 9.3	27.7 / 26.9	28.7 / 28.0	27.1 / 26.4	188
The Federal government's predator control program uses many inhumane methods of killing coyotes, including aerial gunning, traps, and poisons, amongst other methods	6.3 / 6.2	9.5 / 9.3	29.1 / 28.5	19.0 / 18.7	36.0 / 35.2	189

Behavior Statements

Behavioral statements about coyotes were also provided to a sample of the respondents (N=199). Table 30 summarizes the paired-samples t-tests that were run for this form.

Table 30. Summary of paired-samples t-tests for the Behavior form

	How much do you or don't you support the existence of coyotes in the D.C. metro area	How much do you like or dislike coyotes?	The D.C. metro area coyote population should be protected and preserved	The D.C. metro area coyote population should be controlled	The D.C. metro area coyote population should be completely eliminated	BAM
Pre-test	2.61 ± 0.78	3.14 ± 0.85	3.67 ± 1.02	3.62 ± 1.01	1.87 ± 0.99	14.31 ± 2.71
Post-test	2.86 ± 0.76	3.36 ± 0.93	3.85 ± 0.97	3.58 ± 0.98	1.66 ± 0.98	15.12 ± 2.55
t _(df)	t ₍₁₉₂₎ = -4.78*	t ₍₁₉₄₎ = -4.11*	t ₍₁₇₄₎ = -3.19*	t ₍₁₇₂₎ = 0.65	t ₍₁₇₃₎ = 3.51*	t ₍₁₄₄₎ = -3.70*

* = p < .01

There was a significant increase in support for the existence of coyotes in the D.C. region ($p < 0.001$), and respondents liked coyotes significantly more ($p < 0.001$) post-test. In addition, significantly more respondents felt that the coyote population should be protected and preserved ($p = 0.002$) and significantly fewer people felt that the population should be completely eliminated ($p = 0.001$). BAM scores also increased significantly post-test ($p < 0.001$).

See Table 31 for details on how these individual statements influenced the respondents' perception of coyotes. Most of these statements caused respondents to feel either positively or neutrally about coyotes. The three statements that provoked the most negative attitudes towards coyotes were the three that refer to coyote attacks on people. However, even in these cases, the majority of respondents answered either positively or neutrally. One of these statements ("coyotes have only caused one human death; on the other hand, domestic dogs killed 28 people in 2005 in the US") had the most respondents selecting "very positive."

Other statements that people viewed positively included statements about coyotes being monogamous, playful and social, including the fact that non-breeding members of packs will help care for pups.

Table 31. Participants' responses to behavioral statements. Percents are in valid / actual format.

	Very Positive	Somewhat Positive	Neutral	Somewhat Negative	Very Negative	N
Coyotes engage in pair-bonding, are monogamous, and both sexes share in the care of young	34.2 / 33.7	28.1 / 27.6	36.2 / 35.7	1.5 / 1.5	0.0 / 0.0	196
Coyotes use visual, sound, touch, and smell signals in order to communicate, including eleven types of vocalizations	27.6 / 27.1	38.3 / 37.7	32.1 / 31.7	1.0 / 1.0	1.0 / 1.0	196
Coyotes are playful. Social play among coyotes includes cooperation, communication, and learning	35.2 / 34.7	33.2 / 32.7	28.1 / 27.6	2.0 / 2.0	1.5 / 1.5	196
Coyotes establish and maintain territories, using scent-marking, howling, and chasing to preserve boundaries. Coyotes rarely kill each other over territory.	23.0 / 22.6	37.2 / 36.7	32.1 / 31.7	6.1 / 6.0	1.5 / 1.5	196
In one scientific report, a coyote who had previously played with a golden retriever dog approached the dog while being walked by its owner, presumably for another positive interaction.	27.0 / 26.6	39.3 / 38.7	27.6 / 27.1	5.1 / 5.0	1.0 / 1.0	196
Coyote attacks on humans are very rare; the cause of the attacks can usually be	26.0 / 25.6	34.2 / 33.7	29.1 / 28.6	7.1 / 7.0	3.6 / 3.5	196

traced back to disease, intentional or unintentional feeding, or other human behavior.						
The only known human fatality due to a coyote was caused by human behavior.	29.7 / 29.1	30.8 / 30.2	29.2 / 28.6	7.2 / 7.0	3.1 / 3.0	195
Coyotes can live alone, as bonded pairs, or in family groups.	25.0 / 24.6	30.6 / 30.2	39.3 / 38.7	4.1 / 4.0	1.0 / 1.0	196
In coyote packs, non-breeding adults often help in the care of the pack's pups; these pups are usually their younger siblings.	32.7 / 32.2	33.7 / 33.2	30.1 / 29.6	3.15 / 3.0	0.5 / 0.5	196
Coyotes have only caused one human death; on the other hand, domestic dogs killed 28 people in 2005, in the US.	37.8%	27.0%	26.0%	5.6%	3.6%	196

Images

Some respondents were provided with photographs of coyotes and asked how these images made them feel about coyotes. Table 32 summarizes the paired-samples t-tests for this form.

Table 32. Paired-samples t-tests for the images form.

	How much do you or don't you support the existence of coyotes in the D.C. metro area?	How much do you like or dislike coyotes?	The D.C. metro area coyote population should be protected and preserved	The D.C. metro area coyote population should be controlled	The D.C. metro area coyote population should be completely eliminated	BAM
Pre-test	2.55 ± 0.80	3.10 ± 0.86	3.71 ± 1.06	3.87 ± 1.00	1.79 ± 1.14	14.56 ± 2.68
Post-test	2.76 ± 0.76	3.32 ± 0.86	3.77 ± 1.01	3.69 ± 1.00	1.69 ± 1.10	14.73 ± 2.90
t _(df)	t ₍₁₈₅₎ = -4.10*	t ₍₁₈₃₎ = -4.42*	t ₍₁₆₁₎ = -0.92	t ₍₁₅₈₎ = 2.74*	t ₍₁₅₉₎ = 1.84	t ₍₁₂₉₎ = -1.13

* = p < 0.01

Respondents supported the existence of coyotes significantly more ($p < 0.001$) and significantly liked them more ($p < 0.001$) post-test. In addition, respondents disagreed more strongly with the idea that local coyote population sizes should be controlled post-test ($p = 0.007$).

Table 32 shows the responses participants had to various images of coyotes (N=189). Most respondents viewed most images either neutrally or positively. However, the image of a coyote howling was viewed negatively by many of the respondents. Images that were viewed positively included a picture of one coyote licking another one's face, one of a coyote curled up, presumably asleep, and one of a coyote laying on a human bed.

Table 33. Participants' responses to images

	Very positive	Somewhat positive	Neutral	Somewhat negative	Very negative	N
	8.6 / 8.5	16.0 / 15.9	32.6 / 32.3	31.6 / 31.2	11.2 / 11.1	187
	21.9 / 21.7	32.6 / 32.3	37.4 / 37.0	6.4 / 6.3	1.6 / 1.6	187
	18.2 / 18.0	26.7 / 26.5	24.1 / 23.8	21.9 / 21.7	9.1 / 9.0	187
	50.2.0 / 49.2	36.6 / 36.0	11.8 / 11.6	0.5 / 0.5	1.1 / 1.1	186
	48.4 / 47.6	32.8 / 32.3	11.8 / 11.6	5.9 / 5.8	1.1 / 1.1	186
	15.1 / 14.8	24.2 / 23.8	39.2 / 38.6	16.1 / 15.9	5.4 / 5.3	186
	39.8 / 39.2	37.6 / 37.0	17.7 / 17.5	3.8 / 3.7	1.1 / 1.1	186

	31.6 / 31.2	28.9 / 28.6	21.9 / 21.7	12.8 / 12.7	4.8 / 4.8	187
	20.9 / 20.6	32.1 / 31.7	34.8 / 34.4	10.2 / 10.1	2.1 / 2.1	187

Ecology statements

The final type of form consisted of statements about coyote ecology (N=188). A summary of the paired-samples t-tests run for the pre- and post-test questions can be found in Table 34. Only two items showed a significant difference from pre-test to post-test: respondents tended to show more support for coyotes post-test ($p = 0.014$) and BAM scores tended to increase ($p = 0.004$).

Table 34. Summary of paired-samples t-tests for the ecology form.

	How much do you or don't you support the existence of coyotes in the D.C. metro area?	How much do you like or dislike coyotes?	The D.C. metro area coyote population should be protected and preserved	The D.C. metro area coyote population should be controlled	The D.C. metro area coyote population should be completely eliminated	BAM
Pre-test	2.57 ± 0.72	3.08 ± 0.76	3.81 ± 0.96	3.70 ± 0.94	1.86 ± 1.06	14.28 ± 2.56
Post-test	2.71 ± 0.69	3.11 ± 0.93	3.92 ± 0.92	3.57 ± 0.94	1.78 ± 1.08	14.76 ± 2.50
t(df)	t ₍₁₈₁₎ = -2.49*	t ₍₁₈₂₎ = -0.56	t ₍₁₆₆₎ = -1.83	t ₍₁₆₉₎ = 1.71	t ₍₁₇₄₎ = 1.42	t ₍₁₂₉₎ = -2.96**

* = p < 0.05; ** = p < 0.01

See Table 35 for details about participants' responses to specific ecological statements. The most positively received statement seemed to be: "coyotes prey upon rodents, and may control rodent populations." The statement that appeared to be the second most positively received was: "one study showed that coyotes in the Chicago area rarely ate human-related food, preferring rodents, rabbits, and fruits." Other statements viewed positively included a statements about a study that showed that coyotes indirectly increased native bird populations, that coyote populations tend to limit their own population growth, and that rabies in coyotes is relatively rare.

The statement most negatively viewed described how removing coyotes from an area does not reduce the overall population level in the long-term, as other coyotes will move in and litter sizes will increase.

Table 35. Participants' responses to ecological statements. Percentages are in valid/actual format.

	Very positive	Somewhat positive	Neutral	Somewhat negative	Very negative	N
One study found that the presence of coyotes could indirectly increase local bird diversity, by decreasing the numbers of smaller predators that feed on birds.	13.0 / 12.8	38.6 / 37.8	44.0 / 43.1	3.3 / 3.2	1.1 / 1.1	184
Coyotes establish and maintain territories and therefore limit their own population growth.	16.8 / 16.5	42.7 / 42.0	36.2 / 35.6	3.8 / 3.7	0.5 / 0.5	185
Coyotes prey upon rodents, and may control rodent populations.	31.4 / 30.9	44.9 / 44.1	20.5 / 20.2	3.2 / 3.2	0.0 / 0.0	185
Removing coyotes will not reduce overall coyote populations in an area. If coyotes are removed, other coyotes will take over their territory and litter size and pup survival rates will increase to meet former population levels.	5.9 / 5.9	11.9 / 11.7	52.4 / 51.6	24.9 / 24.5	4.9 / 4.8	185
Humans, though land modification, make habitat that is very suitable for coyotes and one of their main prey items, rodents.	9.7 / 9.6	26.5 / 26.1	49.7 / 48.9	12.4 / 12.2	1.6 / 1.6	185
Coyotes are close relatives of wolves, belonging to the same genus, <i>Canis</i>	11.9 / 11.7	20.0 / 19.7	51.9 / 51.1	14.1 / 13.8	2.2 / 2.1	185
One study showed that coyotes in the Chicago area rarely ate human-related food, preferring rodents, rabbits, and fruits	25.9 / 25.5	43.2 / 42.6	27.6 / 27.1	2.2 / 2.1	1.1 / 1.1	185
Some studies have shown that coyotes might be able to control Canada geese populations	16.2 / 16.0	29.2 / 28.7	45.4 / 44.7	8.1 / 8.0	1.1 / 1.1	185
Outbreaks of rabies in coyotes are rare; coyotes can actually provide a buffer between humans and rabies, by reducing the local population of foxes.	25.9 / 25.5	42.7 / 42.0	27.0 / 26.6	3.8 / 3.7	0.5 / 0.5	185
Coyotes are close relatives of dogs, belonging to the same genus, <i>Canis</i> .	16.8 / 16.5	28.3 / 27.7	51.6 / 50.5	3.3 / 3.2	0.0 / 0.0	184

Discussion

Attitudes

This project uncovered findings that will be of use to wildlife managers and others concerned with reducing coyote-human conflicts. Awareness of coyotes tended to be low in the study sample population. Perhaps because of this, most respondents had neutral feelings towards and some level of support for the existence of coyotes in the D.C. metropolitan area. Very few participants wanted to eliminate coyotes from the area. Individuals who hold non-extreme attitudes about a species might be more open to persuasive arguments than those with either positive or negative extreme attitudes (Meadow et al. 2005). As negative feelings can be engendered through negative encounters with animals (Bjerke et al. 2003), it is critical to reach D.C. metropolitan area residents now with messages about the importance of coyotes in our ecosystem and proactive messages to teach them how to reduce human-coyote conflict, before conflicts increase.

Most of the sample population correctly answered some questions that indicated they had some understanding of what it means and takes to live in an area with a coyote population. They understood that attacks on humans were uncommon and that they should not run away from a coyote if one is encountered. They also understood that

coyotes will kill cats on occasion, which is important – if residents do not know that this could be a problem, they are unlikely to take steps (such as keeping unsupervised pets inside, keeping dogs on leashes, and feeding pets inside) to protect pets. Augmenting basic knowledge such as this can help prevent human-coyote conflicts and perhaps increase tolerance for coyotes by preparing people for direct and indirect encounters with coyotes.

On the other hand, most respondents had some basic misunderstandings about coyotes. For example, the majority believed that coyotes were in danger of becoming extinct. This might explain some of the support felt for coyotes by the respondents. It might also demonstrate a lack of basic understanding of what endangered means – because so few respondents had seen or heard a coyote, it is possible that some of them took this to mean that the animals were rare. More research might uncover the reason behind this misunderstanding. It bears mentioning that the findings in this project were similar to those in a 1980 report, where about 60% of respondents answered the question: “timber wolves, bald eagles and coyotes are all endangered species of animals” incorrectly (Kellert & Berry 1980).

In addition, most respondents felt that male coyotes weighed on average 100 pounds, although coyotes are much smaller than this. It is possible that larger animals engender more fear from respondents, and the author, personally, has at times decreased fear of coyotes by explaining their average size to D.C. area residents; if this is the case, this misunderstanding might be the cause for some of the fear noted in this study. It would be interesting to explore this question in the future, as a statement addressing the

true average size of coyotes was not included in the messaging section of the survey instrument.

Although most respondents understood that coyote attacks on people were rare, and most respondents were not concerned with the potential risk of a face-to-face encounter with a coyote, the potential for a coyote to attack a child was one of the strongest concerns that people had about living near coyotes (the other was the potential for coyotes to spread rabies). These findings might help those promoting coexistence with coyotes to tailor their messages to the public, such as by providing information on what children should do if they encounter a coyote (or even teaching children themselves what to do, such as has been done in the aforementioned Vancouver program), the likelihood of a coyote attacking a child, or more information about coyotes and rabies.

Most respondents, whether or not they owned pets, did not have much concern about the potential for either dogs or cats to be attacked by a coyote – both pet owners and non-pet owners seemed to agree that the risk was much greater for a dog or a cat to be hit by a moving vehicle. In addition, the majority of both pet owners and non-pet owners felt that coyotes should not be blamed for pet predations when the dog or cat was left outside unsupervised, an encouraging finding that could be built upon with outreach materials that stress the importance of pet owner responsibility. It should be noted that the less a respondent feared coyotes, the more likely they were to agree that coyotes should not be blamed in such situations, and the more a person disliked coyotes, the more likely they were to believe that coyotes should be blamed in such situations.

Although there were no differences in average SUPPORT scores for pet owners and non-pet owners, non-pet owners were more likely to have higher FEAR scores. Overall, pet owners seemed to have more extreme attitudes towards coyotes, either negatively or positively, than non-pet owners, perhaps because pet owners were in some cases more likely to like all animals and in other cases were more concerned about potential threats to their pets. Because of this, even though pet owners did not seem to have much fear of coyotes attacking their cats or dogs, it might be useful to target pet owners as a specific group in terms of outreach programs and materials, especially regarding the steps they need to take to keep their dogs and cats safe. Understanding the reasons why pet owners seemed to have more extreme feelings would be an important avenue for future research.

Although the media has been demonstrated to have an impact on the public's perception of wildlife (Gore et al. 2005), this was found to not be the case in the sample population. It might be that the sample population, university undergraduate students, does not listen to or read local media on a regular basis; the participants' level of media consumption was not determined. Further research into the impact of media stories on the larger public should be undertaken, with surveys targeting the mature, working adult population. Wildlife managers and others concerned with decreasing human-coyote conflict might also want to seek other outreach opportunities in addition to the media that might be more accessible to the public.

Having seen or heard a coyote in the D.C. metropolitan area did not seem to affect how much a person feared coyotes, supported their existence, or how much they liked or

disliked them. Most respondents who had seen or heard a coyote in the area rated their experiences as neutral. Conversely, in another study people who had seen a large predator (in this case a mountain lion) in the wild were less likely to agree with lethal predator control (Casey et al. 2005), perhaps demonstrating increased support for their existence. Not surprisingly, people who feared coyotes less and had higher SUPPORT scores were more likely to rate their experiences positively.

The vast majority of respondents' households had not changed their behavior due to the presence of coyotes near their home. Those who had changed their behavior, however, were more likely to have stronger feelings about coyotes, either positively or negatively, than those who had not changed their behavior. This suggests that people change their behavior due to the presence of coyotes either because they seek to reduce the potential for human-coyote conflict, perhaps out of support for the idea of coexisting with coyotes, or out of fear or dislike of coyotes (and, in fact, it was also found that the more a person feared coyotes the more likely it was that they had changed their behavior due to the presence of coyotes).

Few respondents had knowledge of a coyote attack on a dog or cat, and having knowledge of such an attack seemed to have no effect on respondents' FEAR and SUPPORT scores. On the other hand, those who had knowledge of such an attack appeared to have stronger feelings towards coyotes, either positively or negatively. Therefore, it might be harder to influence people who already have knowledge of pet predation. Exploring why knowledge of a pet attack prompts extreme feelings could make outreach efforts stronger. Again, since people with neutral attitudes are probably

most open to new information about coyotes, it is important to have proactive campaigns before rates of conflict increase.

Gender played an important role in predicting attitudes towards coyotes. Men were more likely to support the presence of coyotes in the area, and tended to like coyotes more than women. At the same time, women feared coyotes more than men. This somewhat contradicts findings in other studies. For example, in one study women were found to feel more positively about wolves than men (Williams et al. 2002). In another, women felt more strongly that mountain lions should be protected and disagreed more that they should be lethally controlled in areas dominated by humans than men (Casey et al. 2005). The differences might be explained by how respondents categorize species – wolves and mountain lions might be considered charismatic megafauna, while coyotes might be considered pests. This would be an interesting avenue for further study.

Although, as will be seen below, the BAM scale was useful in determining what types of messages most influenced attitudes towards coyotes, it provided little additional information regarding the attitudes of the sample population. This might be because the BAM index in this project was less internally reliable than it has been in other projects (most notably Hill's 1995 study, which had a Chronbach's alpha of 0.90), perhaps because other projects have focused on animals as a whole, and not specific species. There are other measurements of BAM that have been developed by various authors – perhaps one of these might have been more useful in this project, as BAM has been found to be a useful tool for uncovering people's attitudes towards animal use (animal use can

be broadly defined to include management techniques) in other studies (Driscoll 1992; Driscoll 1995; Eddy et al. 1993; Hills 1995; Knight et al. 2004).

Messaging

When additional information (regardless of the type) was given to participants, there was an increase in support for the existence of coyotes, in levels of BAM, and an increase in the degree to which people liked coyotes. There was also a corresponding decrease in the belief that coyotes should be eliminated from the D.C. metropolitan area. Therefore, providing information to people seemed to influence attitudes at least in the short term. It appears, then, that by carefully selecting text and images, those who are producing outreach materials might be able to positively influence attitudes.

Statements referring to human-coyote interactions and relations seemed to influence three out of six post-test measurements. Statements describing coyotes' roles in the mythologies of various cultures seemed to be positively viewed by respondents, especially the meaning of the Navajo word for coyotes, which can be translated as "God's dog." Inclusion of such information in outreach materials might prove useful, perhaps as a counter-point to the common view that coyotes are considered a pest species by demonstrating that other cultures hold or held them in high regard.

Although one might think that statements describing Euro-American cultures' attempts to eradicate coyotes would solicit sympathy or empathy from respondents towards coyotes, this did not prove to be the case as these statements were viewed negatively. It is possible that respondents misunderstood the instructions that they were

being asked how these statements made them feel about coyotes, not how they felt in general about the statement or about the government's actions. However, outreach materials might be more effective if they focus on positive aspects of coyotes and leave out the history that coyotes have had with Euro-American culture. Perhaps respondents believe that there must be a good reason for the government's attempts to eradicate coyotes, and therefore these actions are justified and coyotes have little value. Further investigation into this question would prove useful.

Statements about coyote behavior seemed to be the most effective in influencing attitudes out of the four categories, as five out of the six post-test measurements had different results that demonstrated more positive attitudes towards coyotes. Explaining the rarity of the coyote attacks on people was viewed positively by most of the sample population, and should be included in outreach materials in order to give a realistic impression of the risk of living near coyotes.

Statements that discussed coyote behavior that parallels ideal human behavior (i.e., that they're social, monogamous, playful and sometimes help raise pups that are not their own) were also very popular. Perhaps these statements tend to elicit empathy for coyotes. "Educating for empathy," in Hill's (1995, p. 140) words, can be an effective way to encourage positive attitudes and foster coexistence with wildlife. Educating for empathy does not mean anthropomorphizing animals, however. Rather, it means stressing aspects of ecology that focus on the mental experiences of animals – namely animal behavior and social structures (Hills 1995). In fact, the BAM scores of respondents tended to be higher post-test than pre-test.

In the form where images of coyotes were presented to participants, changes occurred in three out of six post-test measurements, with all changes demonstrating increased positive attitudes towards coyotes. Coyotes are often pictured howling, in both photographs and other visual art forms. However, this traditional representation, at least in photographs, proved to be unpopular with the sample population. Instead, images that showed coyotes in active, positive social behaviors (i.e., licking another coyote's face as opposed to three coyotes walking together) and that showed coyotes in passive positions (such as being asleep) were viewed positively by most respondents.

One image showed a coyote that had been raised as a pet and is now living in a coyote rescue facility. This particular image showed a coyote lying on a human bed, and was viewed positively by most respondents. This might demonstrate the necessity for wildlife professionals to educate the public that coyotes are not domestic animals and that they should not be treated as such, either by attempting to tame pups to keep as pets or by simply providing them with food, which can lead to human-coyote conflict.

Statements about coyote ecology seemed to have the least impact on attitudes, with changes in only two out of six post-test measurements. Statements that demonstrated that coyotes had a certain amount of utility for people (i.e., coyotes eat rodents and coyotes might indirectly increase native bird populations in some areas) proved to be viewed positively by respondents. The rodent statement proved especially popular, perhaps demonstrating humans' negative feelings towards rodents. In addition, a statement that described a coyote population that did not directly rely on humans for food

was viewed positively, perhaps because it showed coyotes as self-supporting wild animals, instead of “pests” that rely on human property.

Conclusion

The Washington, D.C. metropolitan area is in a rather unique situation at the moment. The level of awareness of coyotes appears to be rather low, and although there have been some conflicts reported in the media, the rate of conflict also appears to be low. As such, it is likely that most residents in the area hold neutral attitudes towards coyotes. This provides an opportunity for wildlife managers and others concerned with reducing human-coyote conflict (such as non-profit environmental, wildlife, or animal protection organizations) to reach the public before strong negative attitudes are formed about coyotes. Increasing positive attitudes about coyotes and teaching people how to live with coyotes at this early stage could prove highly successful in reducing the possibility of human-wildlife conflict, decreasing the demand for lethal control methods, and increasing awareness that changing human behavior is the most effective means of reducing human-coyote conflict.

Although in-depth, comprehensive education programs provide the best chance of influencing attitudes towards coyotes (Clark et al. 2001; Hungerford & Volk 1990; Meadow et al. 2005; Taylor 2004), such programs are not practical in many situations. Often, non-profit organizations and wildlife managers must rely heavily on outreach materials, only occasionally supplemented by more in-depth programs. This project has

demonstrated that by carefully choosing what to include in such materials, organizations and wildlife managers can engender positive attitudes towards coyotes, and therefore perhaps increase tolerance for their presence and a willingness to change human behavior.

Appendix Survey Instrument

Survey of Attitudes Towards Coyotes in the DC Metro Area

Q1. Please indicate how often you participate in the following wildlife-related activities on a scale from 1 to 5, where 1 is never and 5 is very often.

Reading books and articles about nature....	1	2	3	4	5
Watching birds outside my home..	1	2	3	4	5
Watching nature programs on TV...	1	2	3	4	5
Going hunting.....	1	2	3	4	5
Going fishing.....	1	2	3	4	5
Leaving home to watch birds or other wildlife....	1	2	3	4	5
Feeding birds.....	1	2	3	4	5
Feeding wildlife other than birds...	1	2	3	4	5
Going to a zoo or aquarium.....	1	2	3	4	5

Knowledge about Coyotes

Q2. We now would like to ask you some questions about coyotes. Please indicate whether you believe the following statements about coyotes are correct or incorrect.

	Correct	Incorrect
Coyotes are carnivores that eat only meat.....	0	1
Coyotes always travel in packs.....	0	1

Coyote attacks on humans are not common.....	0	1
Adult male coyotes weigh on average 100 lbs.....	0	1
Coyotes are in danger of becoming extinct.....	0	1
Coyotes will kill cats on occasion.....	0	1
If you encounter a coyote, you should run away from it...	0	1

Attitudes Towards Coyotes

Q3. Are you aware that there are coyotes in the DC metro area?

☐ yes ☐ no

Q4. How much do you or don't you support the coyote's existence in the DC metro area?

☐ very much

☐ somewhat

☐ not very much

☐ coyotes should be eliminated or driven out of the DC metro area

Q5. In the past year, have you seen or heard a media story about coyotes in the DC metro area?

☐ yes (Continue)

☐ no (Go to Q6)

If yes, where did you see the stories (check all that apply)?

☐ newspaper

☐ TV news

☐ radio

☐ internet

☐ other

Q6. How much do you like or dislike coyotes?

☐ dislike very much

☐ dislike somewhat

☐ neutral

☐ like somewhat

☐ like very much

Q7. Please indicate the extent to which you believe coyotes have the following characteristics on a scale from 0 to 5, where 0 is "strongly agree" and 5 is "strongly disagree."

Coyotes are aware of what is happening to them.....	1	2	3	4	5	DK
---	---	---	---	---	---	----

Coyotes are capable of experiencing a range of feelings and emotions (e.g. pain, fear, contentment, maternal affection).....	1	2	3	4	5	DK
--	---	---	---	---	---	----

Coyotes are able to think, to some extent, to solve problems and to make decisions about what to do.....	1	2	3	4	5	DK
--	---	---	---	---	---	----

Coyotes are more like computer programs, i.e. mechanically responding to instinctive urges without awareness of what they are doing.....	1	2	3	4	5	DK
--	---	---	---	---	---	----

Q8. Please indicate the extent to which you agree or disagree with each of the following statements on a scale where 1 is strongly agree and 5 is strongly disagree.

To me, coyotes symbolize the beauty and wonder of nature in the DC metro area..	1	2	3	4	5	DK
---	---	---	---	---	---	----

The current DC metro area coyote population is a problem..	1	2	3	4	5	DK
--	---	---	---	---	---	----

Coyotes are a positive addition to our community...	1	2	3	4	5	DK
---	---	---	---	---	---	----

Coyotes don't belong in the DC metro area...	1	2	3	4	5	DK
--	---	---	---	---	---	----

Q9. Please indicate how concerned you are about the following.

Potential risk to myself in a face-to-face encounter with a coyote.....	1	2	3	4	DK
---	---	---	---	---	----

Coyotes attacking dogs.....	1	2	3	4	DK
-----------------------------	---	---	---	---	----

Coyotes attacking cats.....	1	2	3	4	DK
-----------------------------	---	---	---	---	----

Having coyotes near my home.....	1	2	3	4	DK
----------------------------------	---	---	---	---	----

Coyotes spreading rabies.....	1	2	3	4	DK
Coyotes attacking children.....	1	2	3	4	DK

Experiences with Coyotes

Q10. How often have you seen a coyote in the DC metro area?

- ☐ never
- ☐ a few times
- ☐ about once a month
- ☐ two or three times a month
- ☐ about once a week
- ☐ more than once a week

Q11. Have you ever heard a coyote howl in the DC metro area?

- ☐ never
- ☐ a few times
- ☐ about once a month
- ☐ two or three times a month
- ☐ about once a week
- ☐ more than once a week

Q12. Overall, would you rate your experiences seeing and/or hearing coyotes as positive or negative?

- ☐ very positive
- ☐ positive
- ☐ neither positive nor negative
- ☐ negative
- ☐ very negative
- ☐ no experiences with coyote

Q13. How often have you had problems with coyotes in your residential area (either permanent home or school housing)?

- ☐ never
- ☐ seldom
- ☐ often
- ☐ very often
- ☐ don't know

Q14. Have you started to feed or otherwise keep pets inside in order to protect them from coyotes?

- ☐ yes
- ☐ no

Q15. Have you done anything to keep coyotes off of your property such as securing garbage, building fences, or installing lights?

- ☐ yes
- ☐ no

Q16. Do you or your household have a dog in the DC metro area?

- ☐ yes (Continue)
☐ no (Please continue to Q19)

Q17. How often is your dog outside without supervision?

- ☐ never
☐ seldom
☐ often
☐ very often

Q18. How often do you feed your dog its main meal(s) outside?

- ☐ never
☐ seldom
☐ often
☐ very often

Q19. Please indicate how concerned you are that the following could happen to dogs that are outside unsupervised or are off-leash in the DC metro area.

	Not A Concern	Minor Concern	Moderate Concern	Major Concern	Don't Know
Fighting with other dogs.....	1	2	3	4	DK
Being hit by a car or truck.....	1	2	3	4	DK
Being attacked by a coyote..	1	2	3	4	DK
Being stolen for dog fighting...	1	2	3	4	DK

Q20. Do you or your household have a cat in the DC metro area?

- ☐ yes (Continue)
☐ no (Go to Question 23).

Q21. How often is your cat outside without supervision?

- ☐ never
☐ seldom
☐ often
☐ very often

Q22. How often do you feed your cat its main meal(s) outside?

- ☐ never
☐ seldom
☐ often
☐ very often

Q23. Please indicate how concerned you are that the following could happen to cats that are unsupervised and off-leash in the DC metro area.

	Not A Concern	Minor Concern	Moderate Concern	Major Concern	Don't Know
Being attacked by dogs.....	1	2	3	4	DK
Being hit by a car or truck.....	1	2	3	4	DK
Being attacked by a coyote..	1	2	3	4	DK
Being attacked by great horned owls or hawks.....	1	2	3	4	DK

Q24. Have you or anyone you know ever had a dog or cat attacked by a coyote (check as many as apply.)

- ☐ I have had a dog attacked by a coyote (Continue)
- ☐ I have had a cat attacked by a coyote (Continue)
- ☐ Someone I know has had a dog attacked by a coyote (Continue)
- ☐ Someone I know has had a cat attacked by a coyote (Continue)
- ☐ Neither I nor anyone I know has had a cat or dog attacked by a coyote (Go To Q26)

Q25. If you or someone you know had a dog or cat attacked by a coyote, please tell us about the most recent attack.

a. What kind of pet was attacked?

- ☐ cat
- ☐ dog

b. Whose dog or cat was it?

- ☐ mine or my household's
- ☐ someone else whom I know

c. Why do you believe a coyote was responsible for the attack?

- ☐ witness to attack
- ☐ marks on body indicated coyote attack
- ☐ couldn't tell from body, assumed coyote
- ☐ body never found, assumed coyote
- ☐ other _____

d. When was this attack?

- ☐ 2006
- ☐ 2005
- ☐ 2004
- ☐ 2003
- ☐ 2002 or earlier

Q26. Please tell us whether you strongly agree, somewhat agree, somewhat disagree, or strongly disagree with the following statement on a five-point scale where 1 is strongly agree and five is strongly disagree.

If people allow their pets outside unsupervised, they should not blame coyotes for pets that are attacked..	1	2	3	4	5	DK
--	---	---	---	---	---	----

Attitudes Towards Wildlife Management

Q27. Please tell us whether you strongly agree, somewhat agree, somewhat disagree, or strongly disagree with the following statements.

The DC metro area coyote population should be protected and preserved....	1	2	3	4	5	DK
--	---	---	---	---	---	----

The DC metro area coyote population size should be controlled...	1	2	3	4	5	DK
--	---	---	---	---	---	----

The DC metro area coyote population should be completely eliminated.	1	2	3	4	5	DK
--	---	---	---	---	---	----

Q28. Please tell us the extent to which you agree or disagree with the following specific policies and programs to prevent conflict between humans and coyotes on a five point scale where one is strongly agree and five is strongly disagree.

Preserve natural areas to serve as a buffer between humans and coyotes..	1	2	3	4	5	DK
--	---	---	---	---	---	----

Warn residents to keep cats inside and dogs on leash with supervision...	1	2	3	4	5	DK
--	---	---	---	---	---	----

Warn residents to remove food sources from outside..	1	2	3	4	5	DK
---	---	---	---	---	---	----

Kill as many coyotes as possible...	1	2	3	4	5	DK
--	---	---	---	---	---	----

Kill specific coyotes that attack humans...	1	2	3	4	5	DK
--	---	---	---	---	---	----

Kill specific coyotes that attack pets...	1	2	3	4	5	DK
Implement birth control or sterilization measures to keep coyote population in check..	1	2	3	4	5	DK
Capture and relocate coyotes...	1	2	3	4	5	DK
Leave coyotes alone...	1	2	3	4	5	DK
Penalize residents who leave cats or dogs outside unattended...	1	2	3	4	5	DK
Prohibit the intentional feeding of coyotes...	1	2	3	4	5	DK

Information on Coyotes

IMAQ29. The following are images of coyotes. Please indicate the extent to which these images make you feel more positively or negatively towards coyotes on a five point scale where one is very positive and five is very negative.



© Jon Way

1 2 3 4 5



© Dick Randall

1

2

3

4

5



© Jon Way

1

2

3

4

5



© Ed McGuirk

1

2

3

4

5



© CeannLambert

1

2

3

4

5



© Dick Randall

1

2

3

4

5



© Ed McGuirk

1

2

3

4

5



© Jon Way

1

2

3

4

5



© Jon Way

1

2

3

4

5

ECOQ29.

One study found that the presence of coyotes can indirectly increase local bird diversity, by decreasing the numbers of smaller predators that feed on birds.....

1 2 3 4 5

Coyotes establish and maintain territories and therefore limit their own population growth.....

1 2 3 4 5

Coyotes prey upon rodents and may control rodent populations.....

1 2 3 4 5

Removing coyotes will not reduce overall coyote populations in an area. If coyotes are removed, other coyotes will take over their territory and litter size and pup survival rates will increase to meet former population levels.....

1 2 3 4 5

Humans, through land modification, make habitat that is very suitable for coyotes and one of their main prey items, rodents.....

1 2 3 4 5

Coyotes are close

relatives of wolves, belonging to the same genus, <i>Canis</i> ..	1	2	3	4	5
---	---	---	---	---	---

One study showed that coyotes in the Chicago area rarely ate human-related food, preferring rodents, rabbits and fruit.....	1	2	3	4	5
--	---	---	---	---	---

Some studies have shown that coyotes might be able to control Canadian geese populations...	1	2	3	4	5
---	---	---	---	---	---

Outbreaks of rabies in coyotes are rare; coyotes can actually provide a buffer between humans and rabies, by reducing the local population of foxes...	1	2	3	4	5
--	---	---	---	---	---

Coyotes are close relatives of dogs, belonging to the same genus, <i>Canis</i> ..	1	2	3	4	5
--	---	---	---	---	---

CULQ29.

One study stated that human and coyote coexistence occurred every day, but coyotes only make the news when a conflict occurs.....	1	2	3	4	5
---	---	---	---	---	---

The Navajo word for coyote can be translated as “God’s Dog”.....	1	2	3	4	5
---	---	---	---	---	---

The word “coyote”

comes from the
Aztec *coyotl*,
meaning trickster.... 1 2 3 4 5

The scientific name
for coyotes, *Canis*
latrans, is Latin for
“barking dog”..... 1 2 3 4 5

In the tradition of the
Miwok peoples,
coyote, with the help
of the silver fox,
created the world.... 1 2 3 4 5

The Federal government
spends three times the
amount of money that
ranchers lose due to
predation (even though
predation accounts for
the fewest livestock losses).
Most of the money goes
towards lethal predator
control programs 1 2 3 4 5

Coyotes were
associated with the
gods of dance and
music in early
Mesoamerican
cultures..... 1 2 3 4 5

One anthropologist
assigned the coyote
the role of Mediator
in North American
mythology..... 1 2 3 4 5

Between 1916 and
1999, the Federal
government killed
nearly 6 million
coyotes, almost
2 million since 1976... 1 2 3 4 5

The Federal
government’s predator
control programs
use many inhumane
methods of killing

coyotes, including aerial gunning, traps, and poisons, amongst other methods.....	1	2	3	4	5
--	---	---	---	---	---

BEHQ29.

Coyotes engage in pair-bonding, are monogamous, and both sexes share in the care of young...	1	2	3	4	5
--	---	---	---	---	---

Coyotes use visual, sound, touch, and smell signals in order to communicate, including eleven types of vocalizations.....	1	2	3	4	5
--	---	---	---	---	---

Coyotes are playful. Social play among coyotes includes cooperation, communication, and learning.....	1	2	3	4	5
--	---	---	---	---	---

Coyotes establish and maintain territories, using scent-marking, howling, and chasing to preserve boundaries. Coyotes rarely kill each other over territory...	1	2	3	4	5
--	---	---	---	---	---

In one scientific report, a coyote who had previously played with a golden retriever dog approached the dog while being walked by it's owner one night, presumably for another positive interaction.....	1	2	3	4	5
---	---	---	---	---	---

Coyote attacks on

humans are very rare; the cause of the attacks can usually be traced back to disease, intentional or unintentional feeding or other human behavior...	1	2	3	4	5
---	---	---	---	---	---

The only known human fatality due to a coyote was caused by human behavior.....	1	2	3	4	5
---	---	---	---	---	---

Coyotes can live alone, as bonded pairs, or in family groups.....	1	2	3	4	5
---	---	---	---	---	---

In coyote packs, nonbreeding adults often help in the care of the pack's pups; these pups are usually their younger siblings....	1	2	3	4	5
--	---	---	---	---	---

Coyotes have only caused one human death; on the other hand, domestic dogs killed 28 people in 2005, in the US.....	1	2	3	4	5
---	---	---	---	---	---

Now that you have heard/seen more, we would like to ask you some questions again about coyotes.

Q30. How much do you or don't you support the coyote's existence in the DC metro area?

- ☐ very much
- ☐ somewhat
- ☐ not very much
- ☐ coyotes should be eliminated or driven out of DC metro area

Q31. How much do you like coyotes?

- ☐ dislike very much
- ☐ dislike somewhat
- ☐ neutral
- ☐ like somewhat
- ☐ like very much

Q32. Please tell us whether you strongly agree, somewhat agree, somewhat disagree, or strongly disagree with the following statements on a five point scale where one is strongly agree and five is strongly disagree.

The DC metro area coyote population should be protected and preserved...	1	2	3	4	5	DK
--	---	---	---	---	---	----

The DC metro area coyote population size should be controlled..	1	2	3	4	5	DK
---	---	---	---	---	---	----

The DC metro area coyote population should be completely eliminated..	1	2	3	4	5	DK
---	---	---	---	---	---	----

Q33. Please indicate the extent to which you believe coyotes have the following characteristics on a scale from 0 to 5, where 0 is "strongly agree" and 5 is "strongly disagree."

Coyotes are aware of what is happening to them...	1	2	3	4	5	DK
---	---	---	---	---	---	----

Coyotes are capable of experiencing a range of feelings and emotions (e.g. pain, fear, contentment, maternal affection)...	1	2	3	4	5	DK
--	---	---	---	---	---	----

Coyotes are able to think, to some extent, to solve problems and to make decisions about what to do...	1	2	3	4	5	DK
--	---	---	---	---	---	----

Coyotes are more like computer

programs, i.e. mechanically
responding to instinctive urges
without awareness of what
they are doing...

1 2 3 4 5 DK

Demographics

Q36. Do you live on campus or off campus?

- ☐ On campus
☐ Off campus

Q37. Did you grow up in the Northern Virginia/Metro DC area?

- ☐ Yes
☐ No

Q38. Please indicate your sex.

- ☐ Female
☐ Male

Q39. In what year were you born? _____

Q40. Please indicate the highest level of education that you have completed.

- ☐ Less than high school
☐ High School Graduate/GED
☐ Some College/No 4-year Degree
☐ College Graduate
☐ Master's degree
☐ Some graduate school
☐ Ph.D., M.D., D.V.M., or other terminal degree

Q41. a. What is your mother's profession? _____

b. What is your father's profession? _____

Q42. Are you a member of or do you contribute to any environmental, wildlife or animal protection organizations?

- ☐ Yes
☐ No

If so, which ones? _____

Q43. What year are you expecting to graduate? _____

Q44. If you are a degree-seeking student, have you declared a major?

- ☐ Yes
☐ No (continue to Q45)

If you have declared a major, what is it? _____

Q45. If you are a degree-seeking student, have you declared a minor?

☐ Yes

☐ No (continue to Q46)

If you have declared a minor, what is it? _____

Q46. If you have not yet declared a major, do you have an idea of what you want to study?

☐ Yes

☐ No (you are finished!)

If you have an idea of what you want your major to be, what category does it best fit?

☐ Biological sciences

☐ Environmental sciences

☐ Physical sciences

☐ Social sciences

☐ Applied sciences

☐ Humanities

☐ Fine or performing arts

☐ Other (please specify): _____

What is your intended major?: _____

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Curriculum Vitae

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