

April 2007

OPERATIONAL CHALLENGES OF SOLVING URBAN COYOTE PROBLEMS IN SOUTHERN CALIFORNIA

Dennis L. Orthmeyer

USDA, APHIS, Wildlife Services, Sacramento, CA, USA

Terrance A. Cox

USDA, APHIS, Wildlife Services, El Cajon, CA, USA

John W. Turman

USDA, APHIS, Wildlife Services, El Cajon, CA, USA

Joe R. Bennett

USDA, APHIS, Wildlife Services, Taft, CA, USA

Follow this and additional works at: http://digitalcommons.unl.edu/icwdm_wdmconfproc



Part of the [Environmental Sciences Commons](#)

Orthmeyer, Dennis L.; Cox, Terrance A.; Turman, John W.; and Bennett, Joe R., "OPERATIONAL CHALLENGES OF SOLVING URBAN COYOTE PROBLEMS IN SOUTHERN CALIFORNIA" (2007). *Wildlife Damage Management Conferences -- Proceedings*. 69.

http://digitalcommons.unl.edu/icwdm_wdmconfproc/69

This Article is brought to you for free and open access by the Wildlife Damage Management, Internet Center for at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Wildlife Damage Management Conferences -- Proceedings by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

OPERATIONAL CHALLENGES OF SOLVING URBAN COYOTE PROBLEMS IN SOUTHERN CALIFORNIA

DENNIS L. ORTHMEYER, USDA, APHIS, Wildlife Services, Sacramento, CA, USA
TERRANCE A. COX, USDA, APHIS, Wildlife Services, El Cajon, CA, USA
JOHN W. TURMAN, USDA, APHIS, Wildlife Services, El Cajon, CA, USA
JOE R. BENNETT, USDA, APHIS, Wildlife Services, Taft, CA, USA

Abstract: We present challenges, methodologies, and solutions related to mitigating urban coyote (*Canis latrans*) problems in southern California. The physical environment, the diverse urban structure (green belts and parks) with its abundant food resources which support high coyote densities, combined with the human component (behavior, urbanization, politics) create operational challenges. The increasing disconnect between humans and wildlife, coyote emigration/immigration into the increasing rural/urban interface, and coyote life cycles that occur exclusively in urban environments, all contribute to the increase in coyote-human conflicts. California's southern counties' human population has expanded 13% over the period from 1990-2000 and is projected to increase 55% from 1990-2025. We documented a 228% increase in conflicts between coyotes and pet/hobby animals when comparing two 8-year periods, 1990-1998 and 1999-2006. In addition, we recorded a 300% increase in conflicts between humans and coyotes comparing the same periods. A large majority of coyote conflicts in southern California are urban conflicts. Resolving such conflicts in southern California requires knowledge of the urban environments that coyotes inhabit; knowledge of California statutes, regulations, and local ordinances as they relate to the use of control tools; and the ability to work with diverse groups of people. We describe integrated pest management solutions by providing specific technical assistance and direct control solutions when coyotes become aggressive or inflict harm to humans or pets.

Key words: attacks, behavior, *Canis latrans*, human-coyote conflicts, control strategy, coyote, damage assessment, human safety, laws and regulations, pets, southern California, technical assistance, USDA, Wildlife Services, urban/wildland interface

Proceedings of the 12th Wildlife Damage Management Conference (D.L. Nolte, W.M. Arjo, D.H. Stalman, Eds). 2007

INTRODUCTION

The challenges of providing solutions to urban coyote (*Canis latrans*) problems in southern California are encompassed by a myriad of issues including habitat, human laws and behavior, and coyote behavior. Several studies have documented the effect of urbanization on coyote ecology (Riley et al. 2003, Treves and Karanth 2003, Atwood et al. 2004).

Additional studies have documented wildlife responses to habitat fragmentation (Atwood and Weeks 2003, Crooks 2002, DeStefano and DeGraaf 2003, McClennen et al. 2001, Tigas et al. 2002), animal behavior modifications occurring in urban ecosystems (Ditchkoff et al. 2006, Tigas et al. 2002), habituation versus taming of wildlife (Geist 2007), coyote food habits and home range in urban environments (MacCracken 1982,

Fedriani et al. 2001), and changing human behavior toward coyotes, resulting in increased attacks on humans (Timm et al. 2004).

Grinder and Krausman (1998) and Baker and Timm (1998) discuss conflicts associated with urban coyotes; however, there has been limited discussion on types of effective control methods and complications associated with the use of each. Conflicts in urban areas consist of coyotes damaging property, displaying bold or aggressive behavior, harassing or attacking pets, and threatening or attacking humans. Expanding urbanization is increasingly forcing human interests and those of wildlife into conflict with one another. The escalating number of conflicts between coyotes and humans in these areas is the issue of most concern to wildlife damage professionals. We discuss the interaction of habitats, human and coyote behavior, and laws and regulations as related to resolving urban coyote problems.

STUDY AREA

We present data from the southern California Wildlife Services contract counties of Imperial, Santa Barbara, San Diego, and non contract counties of Los Angeles, Orange, Riverside, San Bernardino, and Ventura, which are all encompassed in the South and San Luis Districts of the California Wildlife Services (WS) Program of the Animal and Plant Health Inspection Service (APHIS) within the United States Department of Agriculture (USDA). These counties encompass over 45,000 square miles and have densities from 38 to 3,803 persons/mi² (U.S. Census Bureau 2000). Within these urban areas, there are approximately 170,000 acres of open space, parks, trails, and green belts between communities that create excellent habitat and corridors for coyotes. The current estimated human population in these

counties is 18 million, with that number expected to exceed 25 million by 2025 (U.S. Census Bureau 2000).

HABITATS

Southern California is classified as being within the Southern California Mountains and Valleys and Southern California Coast subregions (McNab and Avers 1994) of the California Chaparral Province within the Mediterranean Division (Bailey 1980). Home densities in southern California vary from 0.0/km² in rural environments to 140/km² in housing developments. Rural areas are defined as areas producing livestock and crops.

Primary plant communities include coastal sage scrub, lower chaparral and, to a lesser extent, grasslands, oak, and riparian woodlands (Jacobs 1998). This climate type is characterized by seasonal changes in rainfall, dry summers and rainy winters, and modest changes in annual temperatures. These habitats and conditions support populations of several prey species important to coyotes and other predators. A variety of native species, including deer mice (*Peromyscus* spp.), cottontail rabbits (*Sylvilagus* spp.), woodrats (*Neotoma* spp.), pocket gophers (*Thomomys bottae*), California ground squirrels (*Spermophilus beecheyi*), mule deer (*Odocoileus hemionus*) and other mammals; as well as birds, reptiles, and invertebrates occur in these areas. These habitats provide ample water, prey species, and suitable cover and den sites for coyotes to raise young, and the mild climate in the region is conducive to high survival rates.

Development has created areas of “edge” (or urban/wildland interface), which are the border between rural and urban areas. Southern California is currently the fastest-growing region in California. As homes and urbanization continue to increase, the “edge” continues to grow.

Urban habitats consist of open spaces, parks, drainages, and back yards that are completely surrounded by homes and development. Consultations with urban residents often reveal that many areas have been developed for 40 years or more, and only recently have coyotes begun causing problems.

HUMAN COMPONENT / BEHAVIOR

Human behavior plays a significant role in creating and solving human conflict with wildlife (Conover 2002). DeStefano and Deblinger (2005) discuss the evolving human behavior and philosophy in regard to management of, or living with, wildlife in urban environments. In the past, wildlife conflict was associated with rural environments only and was dealt with by state and federal wildlife agencies in order to protect livestock and harvestable resources. Human behavior plays an important role in wildlife interactions. Wildlife in urban and urban/rural interface areas provides significant value to residents (Ditchkoff et al. 2006); however, habituation of wildlife to humans creates wild animals that are potentially more dangerous than their rural counterparts (Geist 2007). Habituation results from the lack of negative reinforcement and a tolerance of coyotes. Some humans, unknowingly or knowingly, enable coyotes to live and be near their homes and pets by providing food and/or isolated habitat fragments in urban environment. Specific human activities that influence coyote/human relationships include pet husbandry practices, landscaping design regimes, refuse management, open-space management (i.e., parks, preserves, etc.), recreation, types of exclusion, and others. People intentionally feeding coyotes have also been linked to many coyote problems, including several human attacks (WS internal reports). An important element is how people respond to coyotes

when they encounter them in urban neighborhoods or along urban/rural interface areas (areas not typically associated with natural coyote habitat). If not exposed to negative reinforcement, coyotes will begin to associate these encounters in a positive way, thereby losing their natural fear of humans and their natural foraging habits.

These learned behaviors and adaptations to humans may be passed along to young coyotes raised in and around urban areas. Where some or all of these human activities are not properly addressed, coyotes will take advantage of whatever resources they need to survive, resulting in potential conflicts. Baker and Timm (1998) suggest that most coyotes in urban areas no longer regard humans as enemies; rather, they see them as a source of food. Losing their natural fear of humans is a direct result of coyotes' ability to adapt to human activities, when allowed to do so without consequence. The continued erosion of the human-wild animal separation turns to taming, which is created through feeding, actively providing cover, and thus removing any fear of humans. Taming creates an environment of adoption of humans into the wild animal's social circle, which potentially will put humans in critical danger (Geist 2007).

HUMAN COMPONENT / LAWS AND REGULATIONS

California voters, the California State Legislature, and the California Fish and Game Commission all have played important roles in creating a diverse set of statutes and regulations that relate to the management of coyotes and all predators in California. Significant among these is California's Proposition 4, a successful initiative measure, which revised state statutes and Fish and Game regulations (Table 1). Legislative actions and regulatory changes, particularly those linked to the abolishment of wildlife damage

control methods and/or increased protection of certain wildlife species/habitats have had a significant impact on coyote conflict solutions. The loss of padded-jaw leghold traps as a tool in the control of coyotes for livestock protection, pets, and property has likely had the greatest impact on the

professionals' ability to remove specific coyotes. Many coyote problems cannot be effectively addressed in urban areas due to this loss, and some coyote problems may escalate to the point where human safety is threatened or compromised (Figures 1 and 2).

Table 1. Significant California laws and regulations which affect the interaction of humans and wildlife. These laws and regulations affect the management of many predatory or non-predatory species.

Ban on the Use of Leghold Traps:

Proposition 4, which banned the use of leghold traps, sodium fluoroacetate and sodium cyanide was voted into law by the California public in November 1998. Section 3003.1(c) of the Fish and Game Code describes that it is unlawful for any person to use, or authorize the use of any steel-jawed leghold trap, padded or otherwise, to capture any mammal in California. Section 3003.1(c) of the Fish and Game Code further states that “[*The*] prohibition in this subdivision does not apply to federal, state, county, or municipal government employees or their duly authorized agents in the extraordinary case where the otherwise prohibited padded-jaw leghold trap is the only method available to protect human health or safety.”

Legal Status of Coyotes:

Chapter 6, Section 472 (a) in Title 14 of the California Code of Regulations (CCR) describes coyotes as nongame mammals. As such, coyotes may be taken at any time of the year and in any number, except as prohibited in Chapter 6.

Feeding of Coyotes:

Intentional feeding of coyotes and other wild animals is illegal in California, as described under Title 14 of the CCR. As stated in Subdivision 2, Chapter 1, Section 251.1 of Title 14, “...no person shall harass, herd or drive any game or nongame bird or mammal or furbearing mammal. For the purposes of this section, harass is defined as an intentional act which disrupts an animal’s normal behavior patterns, which includes, but is not limited to, breeding, feeding or sheltering...”. Although not often enforced, due to varied interpretation and difficulty in proving a violation, this regulation is important in addressing these activities. Some cities or counties may have similar regulations preventing feeding of wildlife.

Relocation of Coyotes:

Coyotes cannot legally be relocated in California. As described in Title 14, Section 465.5 (g) (1) “All furbearing and nongame mammals that are legal to trap must be immediately killed or released. Unless released, trapped animals shall be killed by shooting where local ordinances, landowners, and safety permit. This regulation does not prohibit employees of the federal, state, or local government from using chemical euthanasia to dispatch trapped animals”. In addition to legal reasons, there are also several other biological, logistical, ethical, liability and financial reasons why nuisance or damage-causing coyotes should not be relocated.

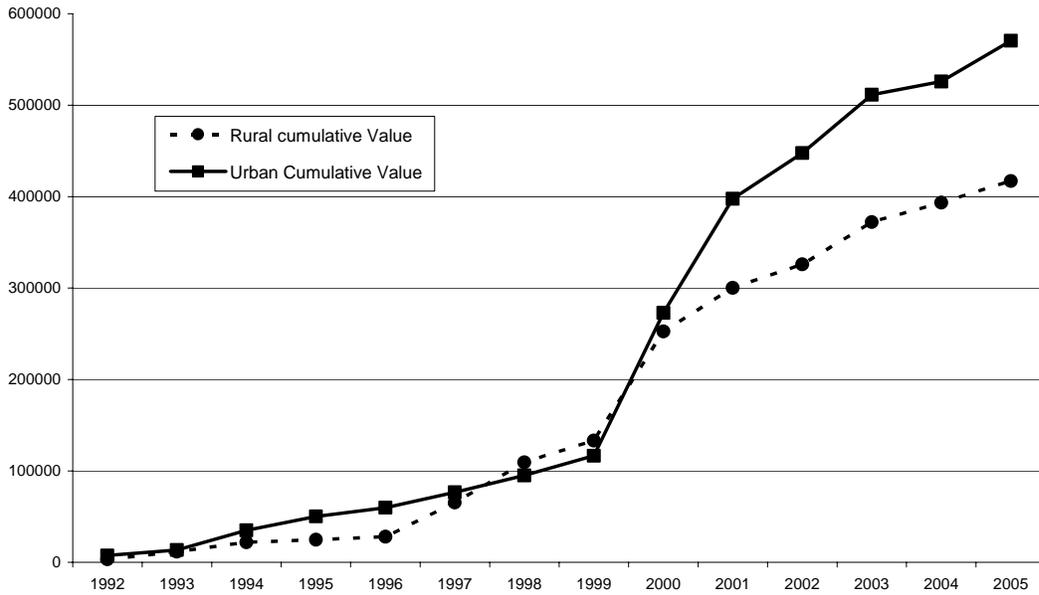


Figure 1. Cumulative damage estimates from Urban and Rural coyote complaints reported and verified by USDA Wildlife Service personnel 1992-2005.

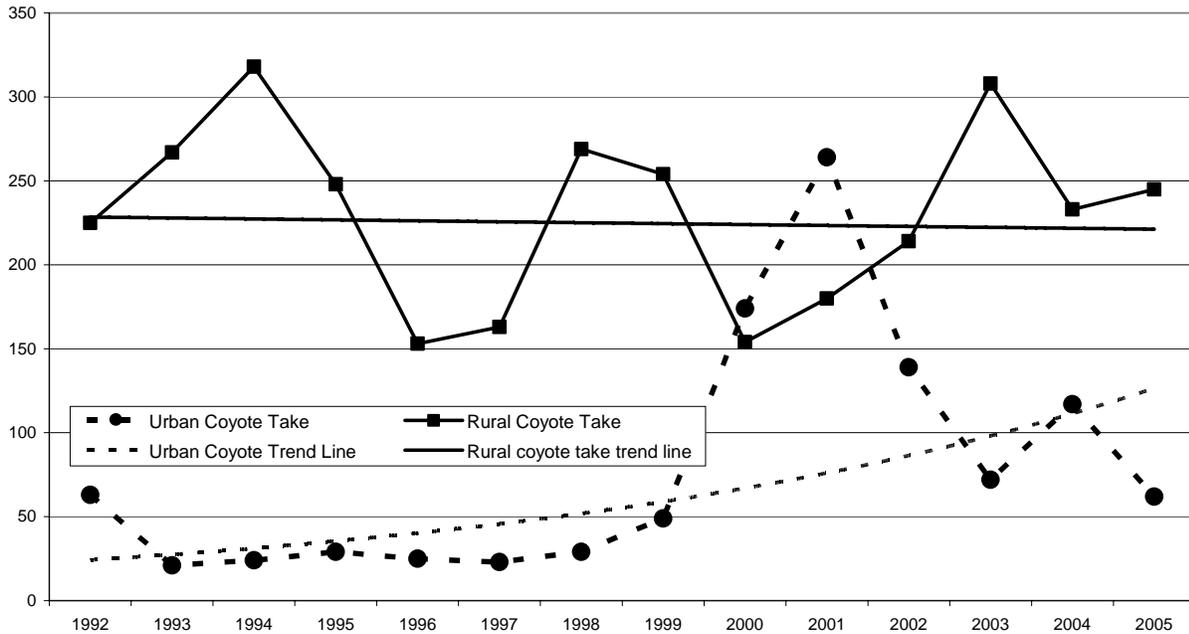


Figure 2. Coyotes taken in urban and rural habitats by USDA Wildlife Services in southern California 1992-2005.

COYOTE BEHAVIOR

The coyote preference is natural environments (Riley et al. 2003); however, the coyote has adapted well to urban environments. The general pattern of coyote behavior of rest during the day and foraging at dusk and during the night is well documented (Laundré and Keller 1981, Shargo 1988, Tigas et al. 2002). Tigas et al. (2002) did suggest some behavioral avoidance of humans during the day, while McClennen et al. (2001), Tigas et al. (2002), and Riley et al. (2003) have reported that when large predators persist in an urban ecosystem, they adjust behaviorally to human activity through temporal avoidance. In essence, they reduce activity during daylight hours in urban settings compared with those in areas where human activity is minimal. In addition, coyotes have included urbanized fragments in their home range (Bradley and Fagre 1988, Grinder and Krausman 1998 Tigas et al. 2002) and human-induced stress has influenced density (Ditchkoff et al. 2006). Coyote density (2.4-3.0 coyotes/km²) in heavily human-impacted areas was significantly different than densities in the least humanized area (0.3-0.4/km²) in southern California (Fedriani et al. 2001). The adaptability of coyotes enables them to survive and flourish in nearly all natural and unnatural habitat types in southern California. Riley et al. (2003) reported that survival rates for bobcats and coyotes in their study area (a mixture of natural areas and human land uses) in southern California were similar to those reported in other, unexploited populations and did not vary with urban association. Furthermore, years of anecdotal accounts and observations by WS personnel and others involved in wildlife damage management support the idea that coyotes have come to include many human-exploited areas as their own “turf.” Species

that are able to survive and even prosper in the mosaic of urban habitat fragments are opportunistic and highly adaptable. These characteristics bring adaptive species into conflict with urban residents. Though adaptable, these species are often less able to coexist with humans than are “less-threatening” species like raccoons (Riley et al. 2003). Individuals located in habitat fragments are also more susceptible to disturbance and may shift their foraging behaviors to nocturnal patterns. Habitat fragmentation also brings animals into more frequent contact with vehicles and with toxins such as rodenticides (Riley et al. 2003).

Consumption of human waste food may impair the health of individual animals and also negatively impact their natural foraging or predatory behavior (Grace 1976). Some individuals, dependent upon substitute feeding, may damage property in search of unnatural food sources (Peine 2001). Other problems include habituation to human contact, intra and inter-species aggression, and animal injury or disease (Orams 2002, Burns and Howard 2003). A dependency upon handouts can result in the culling of “problem” animals or populations that become too aggressive or too large (Conover 2002).

RESULTS

Urban coyote problems in southern California have been steadily increasing over the past several years (Timm et al. 2004). Contrasting two periods, 1990-1998 and 1999-2006, human population growth was 13%. In comparison, human conflicts with coyotes increased over 300%, while pet conflicts with coyotes increased over 228% (USDA, WS. unpublished data). Reported and verified coyote damage and incidents from 1991-2006 have increased, with the larger increase occurring after 1998 (USDA,

WS, unpublished data). There were 362 coyote conflicts and \$78,232 damages recorded to pets/hobby animals throughout 1991-1998 contrasting to the 1,079 coyote conflicts and \$402,540 in damage and loss of pets/hobby animals 1999-2006. We documented a 228% increase in conflicts between coyotes and pet/hobby animals when comparing these two 8-year periods, and an increase of over 500% in dollar damage between (Figure 1). During the same 8-year period (1991-1998), there were 834 coyote conflicts associated with human health/safety, while from 1999-2006 there were 1,899 human-related coyote conflicts, a 300% increase between the two 8-year periods (USDA, WS, unpublished data). Over the 15-year reporting period (1991-2006), coyote take (removal) in the urban habitat has continued to grow, while the take of rural coyotes has slightly decreased (Figure 2). The significant spike in urban coyote take during 1999-2002 is a direct result of the implementation of the WS Public Safety positions, which were eliminated in 2003 due to lack of funding. However, coyote take in the urban habitat has continued to increase while the take of rural coyotes has slightly decreased (Figure 2) over the 15-year reporting period.

CONVERGENCE OF HUMANS, HABITATS, AND COYOTES

Wildlife responds to human presence in three ways: attraction, avoidance, and habituation (Knight and Temple 1995). Attraction behavior results from positive experiences with humans, which eventually results in habituation between humans and coyotes. Avoidance behavior results from negative experiences. Vaske et al. (1995) noted that animal responses to human intrusion or disturbance are not uniform even within species, and are multifaceted. The escalating number of conflicts in southern California confirms this. The

unpredictability of individual coyotes escalates as habituations increases. Additionally, short or long-term behavioral changes may occur at the individual level or at the population level, and, importantly, these may carry over into individual or species-level ecologies (Knight and Cole 1995). The differing habitats in southern California play an important role in the dispersal and home range of coyotes (Shargo 1988). Heavily wooded or brushed urban back yards can provide an opportunity for human-coyote interaction at very close ranges, while golf courses, drainage areas, and open spaces may allow coyotes and humans to remain at greater distances. The urban/rural interface provides the greatest opportunity to remain separated depending on how humans choose to react to coyotes. Conflicts created by convergence of urban habitats, human laws and behavior, and coyotes interacting are important to address early. If the interactions are not met with initial negative reinforcement, a continuum of escalating aggressive behavior in coyotes may be seen.

CONTROL / MANAGEMENT

The majority of problems in southern California relate to property damage, pet/hobby animal depredation, threats to human safety, or actual human attacks. Connolly (1992) determined that only a fraction (19-23%) of coyote predation on domestic sheep is reported to, or confirmed by Wildlife Services. Wildlife Services believes these findings are also applicable, to varying degrees, to nearly all resources afflicted by wildlife damage. Although urban conflicts and the presence of coyotes are most often reported by the press, the costs of medical attention, property repair, and coyote exclusion are typically omitted in news stories. Additionally, the lack of available specialized wildlife damage management personnel in certain areas

greatly influences the ability to address coyote problems in a timely manner.

Coyote control in urban areas is a difficult proposition for several reasons. Many of these areas are densely populated subdivisions and neighborhoods, surrounded by open-space areas of various sizes. The presence of normal human activities in these areas, which include yard work, walking pets, jogging, cycling, kids playing, maintenance workers, etc., is generally not conducive to coyote control activities. As a result, there may be few, if any, suitable locations to safely, legally, and effectively apply control measures.

In southern California, the myriad of city, county, state, or municipal parks, open space areas, and preserves all support dense coyote populations; yet they are surrounded by highly-populated residential areas. Coyotes living in these areas often roam the streets of neighborhoods, hunting in backyards, common areas, playgrounds, golf courses, schools and other areas surrounding homes in search of pets and small wild mammals that are often attracted to urban landscapes. Tracks, scat, or other evidence often can be found along trails coming from these areas and leading into the neighborhoods. From a coyote management perspective, control methods should be applied at the source of the problem, i.e., the area closest to where the damage is occurring. However, this is often not practical for a variety of reasons; therefore, alternate locations for conducting control must be determined. The next logical location for control is often the park or open space area, i.e., the source of the coyotes. Obtaining authorization for control is rarely simple: land managers/property owners in these areas are reluctant to authorize any control of coyotes. Wildlife Services has found this is often due to philosophical differences regarding the severity of the

problem and resultant attitudes toward the need for control.

Conflicts between humans and coyotes in urban areas range from pet depredation, displays of aggressive behavior toward humans, pet attacks in close proximity to people, and actual human attacks. In many situations, coyote attacks on pets can be viewed as precursors to more serious human-related conflicts (Baker and Timm 1998). Most coyote-human conflicts occur as a result of the coyote's ability to learn from and adapt to human actions or, in some cases, the lack thereof. These adaptations and/or conditioning occur over a period of time, the length of which is likely dependant on the level of human-related activities coyotes are exposed to, particularly those that result in a positive outcome for the coyote. Timm et al. (2004) provided a sequence of seven behavior changes of coyotes moving from fear of humans to attack:

1. An increase in observing coyotes on streets and in yards at night.
2. An increase in coyotes approaching adults and/or taking pets at nights.
3. Early morning and late afternoon daylight observance of coyotes on streets and in parks and yards.
4. Daylight observance of coyotes chasing or taking pets.
5. Coyotes attacking and taking pets on leash or in close proximity to their owners; coyotes chasing joggers, bicyclists, and other adults.
6. Coyotes seen in and around children's play areas, school grounds, and parks in mid-day.
7. Coyotes acting aggressively toward adults during mid-day.

At each level of escalating severity there should be a decision whether to use either technical assistance and/or direct control and deal with the problem.

TECHNICAL ASSISTANCE

Technical assistance provides solutions to resolve conflicts by modifying habitats, coyotes, and/or human behavior. Technical assistance is provided to help others help themselves. Technical assistance is generally provided through individual personal consultations, telephone conversations, written or electronic communications, group meetings or presentations, or a combination of all these methods. Information on exclusionary techniques (e.g., fencing, barriers), pet confinement, harassment, removing attractants (e.g., pet food, pets, fallen fruit, vegetables, garbage), and habitat manipulation is provided to the client. The WS Wildlife Specialist tries to determine the level of commitment the client is willing to incorporate into resolving the conflict. The client must be comfortable with the consequences of the technical assistance, otherwise they will not follow through. The California WS program has developed a fact sheet entitled "Managing Urban/Suburban Coyote Problems" (USDA 2002), which is frequently provided to homeowners in urban areas to help them in resolving coyote problems. In addition, The California Department of Fish and Game utilizes similar brochures as part of their "Keep Me Wild™" campaign (CDFG 2006). WS records indicate the three most common recommendations provided to residents experiencing urban/suburban coyote problems are those associated with eliminating wildlife feeding (direct or indirect), exclusion techniques, and harassment of coyotes. With some exceptions, most urban/suburban coyote problems can be resolved by: 1) removing what they are attracted to (i.e., food, water, or shelter); 2) excluding them from gaining access to what they are attracted to; or 3) harassing them away from what they are attracted to. When these general

recommendations are not effective, direct control of coyotes is considered.

DIRECT CONTROL

Many conflicts require greater attention, either due to a lack of success in implementing technical assistance recommendations, or to a more serious escalating coyote behavior brought on by multiple human influences or behaviors. In addition, some conflicts are more serious (e.g., attack on a pet or human), thus requiring immediate attention in order to resolve the problem. In this situation, WS will often consider direct control of coyotes as the first option. However, when the decision is made to directly control coyotes, WS always provides technical assistance as a means to prevent future problems. This may be accomplished through one-on-one meetings with residents, group meetings with homeowner associations, distribution of fact sheets or other literature door-to-door or through association newsletters, or meeting with officials from the cities, counties, and state and federal governments. The decision to engage in direct control of coyotes is based on safety and a professional biological assessment of the situation. The following questions must be positively answered prior to the implementation of direct control:

1. Can control measures be safely and effectively applied?
2. Will removal of the coyote(s) resolve the problem?
3. Are conditions legally and operationally conducive to effective control?
4. Can written authorization be obtained to conduct control operations where needed?
5. What methods of control are available for this situation?

Direct control tools include but are not limited to firearms (shotgun or suppressed rifle), dart gun, padded leghold

traps in public safety situations, snares, and cage traps. These tools are used only by trained Wildlife Specialists who are trained in their use, and their application is covered under WS directives and training. Because each conflict is different, there are many factors to consider when engaging in direct control activities in urban areas. In some situations, direct control of coyotes is impractical, such as in neighborhoods that are too congested, or in areas not conducive to safe and effective application of control methods. At this point, alternative properties frequented by the coyotes are sought for application of direct control methods. However, there may be circumstances or conditions that prevent the use of control techniques in these areas as well. Some homeowners do not agree with the need to control coyotes and will not provide written authorization for control; other landowners either are not known or cannot be reached in a timely manner to obtain authorization.

DAMAGE

Decisions to lethally remove coyotes after an incident or attack are usually left up to resource management agencies. However, within wildlife agencies there are often variable interpretations of what a human health and safety attack is. Are all attacks on pets a human health and safety event? Or, if a coyote approaches humans, is this a human health and safety issue? Does the attack have to inflict damage? Another human influence is how neighbors and the general public react to an attack. Riley and Decker (2000) discuss the “Not in My Back Yard” phenomenon, explaining that wildlife in the backyard is tolerated until the mayor of the city is sprayed by a skunk, or some influential person contracts Lyme disease from tick-infested deer; then, removal is demanded immediately. Conducting coyote damage management in

urban areas is often very time-consuming. It may take several days or weeks for the offending coyote(s) to return to the area where equipment has been placed. Methods used in the control of coyotes in urban/suburban areas vary greatly, depending on the situation and location. In California, these include padded-jaw leghold traps, snares, shooting (e.g., 12-gauge shotguns, or small-caliber suppressed or conventional rifles), spotlighting/shooting, and calling/shooting (electronic and manual). Although cage traps have been used in some situations, they have not been found to be practical or effective method of coyote control (Shivik et al. 2005). The application of these methods in urban/suburban areas must be performed with great professional discretion, keeping the public’s safety as a matter of highest importance.

There are many legal and safety issues that must be considered when choosing options for coyote control. WS Specialists are knowledgeable of state and federal codes and regulations in regard to the use of selective equipment while doing coyote conflict control. However, human behavior (codes, regulations, propositions, etc.) has led to the abolishment of certain methods or causes severe restrictions on their use. Neck snares are seldom used by WS in urban areas, due to the density of pets frequenting these locations and the fact that children playing in these areas could also present a safety concern. In most urban areas, shooting is a difficult option for safety reasons. Finally, if the coyote incident does not constitute a threat to human health and safety (e.g., attacks on pets, or property damage), the use of padded-jaw leghold traps is not legal. California Department of Fish and Game regulations allow padded-jaw leghold traps only when the conflict is considered a human health and safety conflict. Even then, the same questions are

asked concerning safety of surrounding humans, pets, etc. Through this assessment process, which factors in all safety, legal, human and coyote behavior, and logistical considerations, there are some coyote damage situations that cannot be resolved.

DISCUSSION

The increasing urban/rural interface created by human expansion is providing a large amount of habitat for coyotes, and this the most difficult situation to find solutions for coyote conflicts. The rural/urban interface is the fastest growing habitat and provides the greatest protection and food resources for coyotes (Fedriani et al. 2001), as they can move into and out of this habitat freely. Landscaping regimes in this habitat are rich in food, water, cover, and attract many prey species for coyotes. This creates artificially increased populations of both native and nonnative species, such as ground squirrels, commensal rodents, gophers, rabbits, and others, all of which are on the urban coyote's menu. Similarly, anthropogenic food items, such as pet food, small dogs and cats, garbage, vegetable gardens, and wind-fallen fruit, often become a food base for coyotes. The use of integrated pest management to find solutions using technical assistance and/or direct control provides the best interaction between cooperators and wildlife specialists. Providing technical assistance and direct control assistance in urban habitats requires a large amount of time and effort. Educating the public through the programs and brochures provided by the various city, county, state, and federal agencies is an excellent step. However, landowners and citizens must be willing to be active (by providing negative reinforcement to coyotes) and be aware of the potential conflict created by close contact with coyotes. The more proactive residents become in harassing coyotes and in reducing

coyote friendly resources in the environment surrounding their properties, the less likely a coyote has the opportunity to become habituated to human activity.

Southern California's human population will continue to expand. This will be accompanied by the creation of additional urban/rural interface and additional human/coyote conflicts. The lack of understanding about wildlife behavior is a major contributing factor to human-wildlife conflicts. Urban coyotes are not in an overpopulation status, nor are they a product of over abundance by the removal of a limiting factor. However, they are one of the most adaptable species known to man and have been allowed to expand and exploit the lack of negative reinforcement situations. As the number of aggressive actions toward humans and pets increase, they now are starting to be considered pests (DeStefano and Deblinger 2005), not wildlife. Habituation of humans to coyotes and vice versa, combined with the habitats they share and the myriad of local and state laws and regulations that are inconsistently interpreted and enforced, depending on location, leads to conflict between coyotes and humans. Human nature is to enjoy wildlife, especially when it is close. However, California's growing population is experiencing an escalating number and ferocity of attacks from coyotes and other larger predators. People are being told to keep their pets indoors, watch their children in their own private backyards, and to not walk in the evening with their pets. People are essentially being told to live in fear of these predators. Being wary of predators in urban environments is healthy. Accepting coyotes' habituations and their lack of fear of humans is not. Such policies and recommendations that restrict human movements, enacted to provide protection to citizens, are counter to the general public's use of parks and open spaces in urban

environments. These factors, combined with the well-known cunningness and intelligence of coyotes, leave wildlife damage managers with few options to resolve problems.

The urban coyote manager must recognize that not everyone is entirely supportive of the idea of controlling coyotes. Even the next-door neighbor of a resident who has experienced coyote damage may not believe there is a problem. In some cases, that neighbor may have even been feeding them. Philosophical opinions on the subject are quite numerous and varied. Because of this, control methods must be applied with the utmost of discretion and professionalism. Control equipment placed in these areas must be inspected early (i.e., before sunrise) and in some cases, more than once daily, depending on the level of potential exposure to the public. When multiple coyote control projects are being conducted simultaneously, careful coordination between state game agencies, local law enforcement, and other federal agencies is a must. Consideration of schedules, locations, commuting distance, and other factors is paramount in order to avoid public relations problems.

MANAGEMENT IMPLICATIONS

Solving wildlife-related conflicts is a human issue. In the continuing development of urban areas into rural areas, creating a longer urban/rural interface line, humans have created ideal areas for wildlife, especially coyotes, to live, breed, and raise their young. The societal perceptions of creating these urban wildlife populations have had inadvertent consequences (Conover 2002). Overpopulated deer herds, resident Canada geese, and expanding wild turkey populations are all issues being dealt with by city, county, state, and federal government agencies. Along with the increase in prey species, predator species

such as coyotes have responded to the food sources (Fedriani et al. 2001) and the urban/rural interface gradient (Atwood et al. 2004) and have changed their behavior (Ditchkoff et al. 2006, McClennen et al. 2001). However, accepting responsibility so as not to put wildlife in harm's way is a step not yet taken. It takes recognition of the problem initially, followed by the private citizen, city, county, state, and federal government's ability to work together, which provides the mechanisms to resolve conflict and manage urban populations of wildlife.

The increasing dollar amounts of damage and number of coyotes taken by direct control (Figures 1 and 2) demonstrate the need for continued and aggressive public outreach. Technical assistance does provide methods and suggestions to alleviate conflicts. However, the suggestions must be implemented and supported by local residents and general public.

The number of technical assistance calls and direct control of coyotes in southern California will continue to increase as the number of attacks on pets and humans by coyotes continue. We suggest that specific policies and guidelines should be put in place and followed by all officials when dealing with conflicts that are deemed "public safety." Government officials must be knowledgeable when establishing such policies, and they should seek to understand the complexities of coyote management in the differing urban habitats. Inaction, lack of public outreach, and the absence of specific policies will result in additional coyote removals.

LITERATURE CITED

ATWOOD, T.C., AND H.P. WEEKS JR. 2003. Spatial home-range overlap and temporal interaction in eastern coyotes: the influence of pair types and fragmentation. *Canadian Journal of Zoology* 81:1589-1597.

- ATWOOD, T.C., H.P. WEEKS, AND T.M. GEHRING. 2004. Spatial ecology of coyotes along a suburban-to-rural gradient. *Journal of Wildlife Management* 68:1000-1009.
- BAILEY, R.G. 1980. Description of the ecoregions of the United States. U.S. Department of Agriculture, Miscellaneous Publication No. 1391. 77 pp.
- BAKER, R.O., AND R.M. TIMM. 1998. Management of conflicts between urban coyotes and humans in southern California. *Proceedings of the Vertebrate Pest Conference* 18:299-312.
- BRADLEY, L.C., AND D.B. FAGRE. 1988. Movements and habitat use by coyotes and bobcats on a ranch in southern Texas. *Proceedings of the Annual Conference Southeast Association of Fish and Wildlife Agencies* 42:411-430.
- BURNS, G.L., AND P. HOWARD. 2003. When wildlife tourism goes wrong: a case study of stakeholder and management issues regarding dingoes on Fraser Island, Australia. *Tourism Management* 24(6):699-712.
- CALIFORNIA DEPARTMENT OF FISH AND GAME. 2006. Keep Me Wild™ website. California Department of Fish & Game. <http://www.dfg.ca.gov/keepmewild/index.html>.
- CONNOLLY, G.E. 1992. Coyote damage to livestock and other resources. Pages 161-169 in A.H. Boer Editor. *Ecology and management of the eastern coyote*. University of New Brunswick, Fredericton, New Brunswick, Canada.
- CONOVER, M.R. 2002. *Resolving human-wildlife conflicts: the science of wildlife damage management*. Lewis Publishers, Inc., CRC Press, Boca Raton, FL. 418 pp.
- CROOKS, K.R. 2002. Relative sensitivities of mammalian carnivores to habitat fragmentation. *Conservation Biology* 16:488-502.
- DESTEFANO, S., AND R.D. DEBLINGER. 2005. Wildlife as a valuable natural resource vs. intolerable pest: a suburban wildlife management tool. *Urban Ecosystem* 8:179-190.
- _____, AND R.M. DEGRAAF. 2003. Exploring the ecology of suburban wildlife. *Frontiers in Ecology and the Environment* 1:95-101.
- DITCHKOFF, S.S., S.T. SAALFELD, AND C.J. GIBSON. 2006. Animal behavior in urban ecosystems: modifications due to human-induced stress. *Urban Ecosystems* 9:5-12.
- FEDRIANI, J.M., T.K. FULLER, AND R.M. SAUVAJOT. 2001. Does the availability of anthropogenic food enhance densities of omnivorous mammals? An example with coyotes in southern California. *Ecography* 24:325-331.
- GEIST, V. 2007. How close is too close? Wildlife professionals grapple with habituating wildlife. *The Wildlife Professional* 1:34-37.
- GRINDER, M.L., AND P.R. KRAUSMAN. 1998. Ecology and management of coyotes in Tucson, Arizona. *Proceedings of the Vertebrate Pest Conference* 18:293-298.
- GRACE, E. 1976. Interactions between men and wolves at an Arctic outpost on Ellesmere Island. *Canadian Field-Naturalist* 90:149-156.
- JACOBS, C. 1998. Department of Biology website, California State University–Dominguez Hills. http://www.leap.org/UCLASP/local_habitats/habitats/index.html.
- KNIGHT, R.L., AND D.N. COLE. 1995. Factors that influence wildlife responses to recreationists. Pages 71-79 in R.L. Knight and K.J. Gutzwiller editors. *Wildlife and recreationists: coexistence through management and research*. Island Press, Washington, D.C.
- _____, AND S.A. TEMPLE. 1995. Origin of wildlife responses to recreationists. Pages 51-69 in R.L. Knight and K.J. Gutzwiller, editors. *Wildlife and recreationists: coexistence through management and research*. Island Press, Washington, D.C.
- LAUNDRÉ, J.W., AND B.L. KELLER. 1981. Home range use by coyotes in Idaho. *Animal Behavior* 29:449-461.

- MACCRACKEN, J.G. 1982. Coyote foods in a southern California suburb. *Wildlife Society Bulletin* 10:280-281.
- MCCLENNEN, N., R.R. WIGGLESWORTH, S.H. ANDERSON, AND D.G. WACHOB. 2001. The effect of suburban and agricultural development on the activity patterns of coyotes (*Canis latrans*). *The American Midland Naturalist* 146:27-36.
- MCNAB, W.H., AND P.E. AVERS. 1994. Ecological subregions of the United States. Publication WO-WSA-5, U.S. Forest Service, Washington, D.C.
- ORAMS, M.B. 2002. Feeding wildlife as a tourism attraction: a review of issues and impacts. *Tourism Management* 23:281-293.
- PEINE, J.D. 2001. Nuisance bears in communities: strategies to reduce conflict. *Human Dimensions of Wildlife* 6:223-237.
- RILEY, S.J., AND D.J. DECKER. 2000. Risk perception as a factor in wildlife stakeholder acceptance capacity for cougars in Montana. *Human Dimensions of Wildlife* 5:50-62.
- RILEY, S.P.D., R.M. SAUVAJOT, T.K. FULLER, E.C. YORK, D.A. KAMRADT, C. BROMLEY, AND R.K. WAYNE. 2003. Effects of urbanization and habitat fragmentation on bobcats and coyotes in southern California. *Conservation Biology* 17:566-576.
- SHARGO, E.S. 1988. Home range, movements, and activity patterns of coyotes (*Canis latrans*) in Los Angeles suburbs. PhD. dissertation, University of California-Los Angeles, CA. 76 pp.
- SHIVIK, J.A., D.J. MARTIN, M.J. PIPAS, J. TURMAN, AND T.J. DELIBERTO. 2005. Initial comparison: jaws, cables, and cage traps to capture coyotes. *Wildlife Society Bulletin* 33:1375-1383.
- TIGAS, L.A., D.H. VAN VUREN, AND R.M. SAUVAJOT. 2002. Behavioral responses of bobcats and coyotes to habitat fragmentation and corridors in an urban environment. *Biological Conservation* 108:299-306.
- TREVES, A., AND K.U. KARANTH. 2003. Human-carnivore conflict and perspectives on carnivore management worldwide. *Conservation Biology* 17(6):1491-1499.
- TIMM, R.M., R.O. BAKER, J.R. BENNETT, AND C.C. COOLAHAN. 2004. Coyote attacks: an increasing suburban problem. *Proceedings of the Vertebrate Pest Conference* 21:47-57.
- UNITED STATES DEPARTMENT AGRICULTURE 2002. Urban and suburban coyotes. USDA, APHIS, Wildlife Services Fact sheet. 2 pp.
- UNITED STATES CENSUS BUREAU. 2000. U.S. Census 2000. <http://www.census.gov/main/www/cen2000.html>.
- VASKE, J.J., M.P. DONNELLY, K. WITTMANN, AND S. LAIDLAW. 1995. Interpersonal versus social-values conflict. *Leisure Sciences* 17:205-222.