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Coyote attacks on humans, 1970–2015: implications for reducing the risks

REX O. BAKER, California State Polytechnic University-Pomona (*retired*), 24652 Gleneagles Dr., Corona, CA 92883, USA RBakerVertIPM@aol.com

ROBERT M. TIMM, Hopland Research & Extension Center, University of California (*retired*), 4070 University Rd., Hopland, CA 95449, USA rmtimm@ucanr.edu

Abstract: Beginning with the emerging pattern of urban and suburban coyotes (*Canis latrans*) attacking humans in southern California in the late 1970s, we analyzed information from reported attacks to better understand the factors contributing to changes in coyote behavior. We subsequently used updated data collected largely in urban and suburban environments in the United States and Canada during the past 30 years to develop strategies to reduce the risk of attacks. In the 1990s, increased incidents of coyote attacks were reported in states beyond California and in Canadian provinces. We documented 367 attacks on humans by coyotes from 1977 through 2015, of which 165 occurred in California. Of 348 total victims of coyote attack, 209 (60%) were adults, and 139 (40%) were children (age ≤ 10 years). Children (especially toddlers) are at greater risk of serious injury. The attacks exhibited seasonal patterns, with more occurring during the coyote breeding and pup-rearing season (March through August) than September through February. We reiterate management recommendations that, when enacted, have been demonstrated to effectively reduce risk of coyote attack in urban and suburban environments, and we note limitations of non-injurious hazing programs. We observed an apparent growing incidence of coyote attack on pets, an issue that we believe will drive coyote management policy at the local and state levels.

Key words: canid behavior, *Canis latrans*, coyote–human attacks, habituation, history, human safety, pets, predator management

BAKER AND TIMM (1998) reported an emerging pattern of urban and suburban coyotes (*Canis latrans*) attacking humans in southern California in the late 1970s. The increased incidences and importance of understanding the factors contributing to negative coyote–human interactions became apparent through review of case histories documented by Baker and Timm (1998) and Baker (2007). To mitigate the risk and severity of increased attacks, we have worked with municipalities, counties, and with state and federal agencies to develop coyote management strategies to reduce conflicts with coyotes in suburban and urban environments.

The first report of human-habituated coyotes was likely from Yellowstone National Park in 1947 (Young and Jackson 1951): “Two tourist-habituated coyotes, repeatedly observed begging for food and posing for pictures, causing tourist traffic jams along the main park highway...” (61). Ryden (1975) described a habituated female coyote in Yellowstone: “in her haste to photograph the animal, she left her car door open. The coyote leaped in, in search of food items, and refused to exit” (110). Ryden (1975) observed this same coyote’s interaction

with another tourist’s car, in which the coyote snapped at a child’s hand when the child reached out to pet the coyote, concluding “... it was only a matter of time before this brash animal would bite someone” (110). Howell (1982) reported on a developing situation in Los Angeles County, California, USA when from 1978 through 1981, ≥ 7 persons were attacked by coyotes; 1 attack resulted in the death of a 3-year-old girl in Glendale, California, USA (Gottschalk 1981, Howell 1982). Howell (1982) also noted many attacks on pets and coyote aggression toward children in protection of a den within a suburban yard, recorded in the Los Angeles region “for at least the past twelve years” (21). Subsequently, Carbyn (1989) summarized information on several coyote attacks on children that had occurred in North America, primarily in national parks in western Canada, mostly during the 1980s. Of the 14 reported attacks, 4 attacks resulted in major injuries.

Alexander and Quinn (2012) noted that in recent years, coyotes have become an increasing management concern because their significant behavioral plasticity allows them to live in cities. By the late 1990s, Baker and Timm

(1998) had compiled coyote-caused human safety incidents within California involving 53 persons in 16 locations, from 1988 through 1997, in which 21 people suffered coyote bites. We provided detailed case histories on 13 incidents or clusters of incidents, noting that >32 other people experienced human safety incidents due to habituated or aggressive coyotes during this same period. Six years later, Timm et al. (2004) had documented 89 coyote-caused human safety incidents in California from 1978 to 2003, of which 48 incidents had occurred from 1998 to 2003, suggesting an increasing problem. By May 2007, we had compiled 111 coyote attacks in California, including injuries to 136 individuals (87 adults, and 49 children ≤ 10 years of age). We also became aware of ≥ 76 coyote attacks that occurred in states other than California, as well as 17 reported attacks from 4 Canadian provinces (Timm and Baker 2007).

White and Gehrt (2009) tabulated 142 reported coyote attack incidents occurring in the United States and Canada (14 states and 4 provinces) from 1960 through 2006, resulting in 159 bite victims. However, in 10 of these attacks, the coyote was found to be rabid, affecting 15 victims. Alexander and Quinn (2011) found 26 reports of coyote attacks on people, involving 26 victims, in Canada from 1995 through 2010.

The purpose of the research was to update data previously reported by Baker and Timm (1998), Timm et al. (2004), Baker (2007), and others. To do this, we compiled records that contain information related to human-coyote incidents, including season and time of day of their occurrence, age and gender of victims, behaviors of coyote(s) and person(s) involved, and contributing factors such as presence of pets, evidence of intentional feeding, and other relevant information. This information was analyzed to better understand factors that contributed to the observed changes in coyote behavior. Because we worked closely with municipalities, counties, and with state and federal agencies to develop coyote management strategies, we had access to information on a sufficient number of incidents to begin to determine patterns and trends related to such attacks.

Methods

The senior author (ROB) initiated a survey of non-rabid coyote attacks to humans in 1997

by querying representatives of various federal, state, county, and city agencies as well as private wildlife control companies about incidents occurring in California since the 1970s. In Baker and Timm (1998), the incidents listed included only those documented by >1 reputable source, and preferably by a city, county, or state agency, or for which the authors had personal knowledge. In the absence of any statewide repository of coyote-human safety incidents, we have been aided by incident information shared with us by the USDA Wildlife Services California state office. By 2004, we used Internet capabilities to search media databases, yielding newspaper reports of coyote incidents gleaned from NewsBank and LexisNexis from throughout the United States and Canada. In recent years, we also obtained media reports of human-coyote conflicts via a Google News Alert using the search phrase "coyote attack." Efforts by the authors to document such incidents have continued to the present.

In response to the concern expressed by White and Gehrt (2009) that our use of the term "attack" was too broad and included incidents in which coyotes aggressively threatened humans, stalked children, or otherwise caused concerns for human health or safety without a bite occurring, we define a coyote "attack" on a human to be when physical contact between ≥ 1 non-rabid coyote and ≥ 1 person occurred at a single location at a point in time, when contact was not initiated by the person(s). This follows our definition of "attack" as stated in Timm and Baker (2007). For example, if a coyote bit ≥ 2 people at a single location at a specific time of day, we categorize this as 1 attack. However, if persons at 2 different locations were bitten by a coyote within a short time interval, we categorize this as 2 separate attacks.

In addition to coyote attacks, we compiled numerous human safety incidents within California where no physical contact was made between a coyote and a human (or physical contact was not mentioned in the incident report). These incidents are not included in the analyses of attacks discussed here. However, they are noted as potential indicators of emboldened (habituated) coyote behavior; we believe such events should be called to the attention of public health and safety personnel. For example, by 2004 we

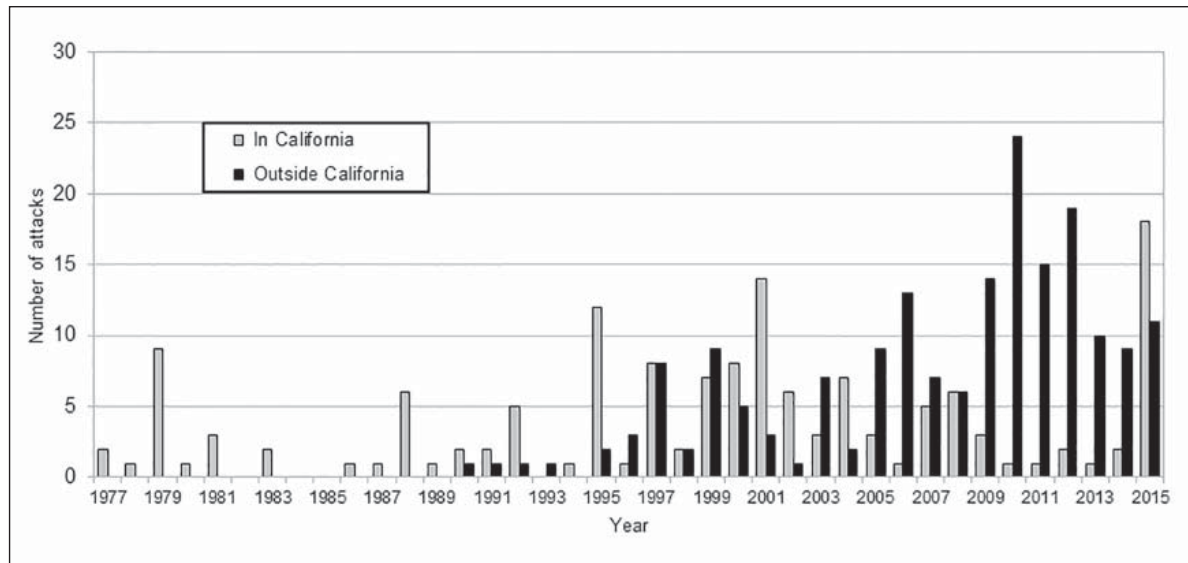


Figure 1. Number of coyote (*Canis latrans*) attacks on humans by year, 1977–2015, within California and in other areas of the United States and Canada.

recorded 77 incidents when coyotes stalked children, chased individuals, or aggressively threatened adults (Timm et al. 2004). In some incidents where coyotes stalked or approached children, we believe there was the possibility of serious injury to the child, had an adult not been present to intervene.

Results

To date, we have compiled 165 coyote attacks on humans in California from calendar years 1977 through 2015. An injury to ≥ 1 victims was reported in 121 (73%) of these attacks, resulting in injuries to 78 adults and 64 children (age ≤ 10). Of these 165 attacks, 17% were associated with the presence of dogs (e.g., persons walking dogs or to dogs within their yard). Timm et al. (2004) noted that of those attacks occurring in 5 counties in southern California, number of attacks was correlated with the human population size in those counties ($r = 0.9771$; $P = 0.004$).

Reports of attacks from other states within the United States began to appear in the early 1990s (see Timm and Baker 2007, White and Gehrt 2009; Figure 1) and began to be reported in Canada in 2000 (Alexander and Quinn 2011). We compiled reports of 141 coyote attacks in 25 additional states, and 61 attacks in 7 Canadian provinces. These attacks outside California resulted in injuries to 131 adults and 75 children. Of the 367 coyote attacks on humans within the United States and Canada, 2 attacks resulted in

fatalities: a 3-year-old girl was killed in Glendale, California, in August 1981 (Howell 1982); and a 19-year-old woman was killed on a hiking trail in Cape Breton Highlands National Park, Nova Scotia, in late October 2009 (Aulakh 2009).

Of 348 victims of coyote attacks in the United States and Canada from 1977 to 2015 where the victims' age was noted, 209 (60%) were adults, and 139 (40%) were children age ≤ 10 years, indicating adults are somewhat more likely to be victims of coyote attack. This is significantly different from a 50:50 ratio (Pearson's Chi-Square; $P = 0.008$). However, children (especially toddlers) were at greater risk of serious injury resulting from an attack. In ≥ 60 instances in California where a child was attacked by a coyote, the victim would presumably have been more seriously injured or killed had an adult not intervened to interrupt the attack.

Attack reports in California were seasonal, with 75 of 113 (66%) attacks occurring during the coyote breeding and pup-rearing season (March to August), versus the other periods. This seasonal pattern also was apparent when examining attacks throughout the United States and Canada (excluding California), except for a relatively greater number of December attacks (Figure 2a, b).

Discussion

We have long recognized that our data set of incidents is incomplete. Baker and Timm (1998) reported that numerous animal regulation

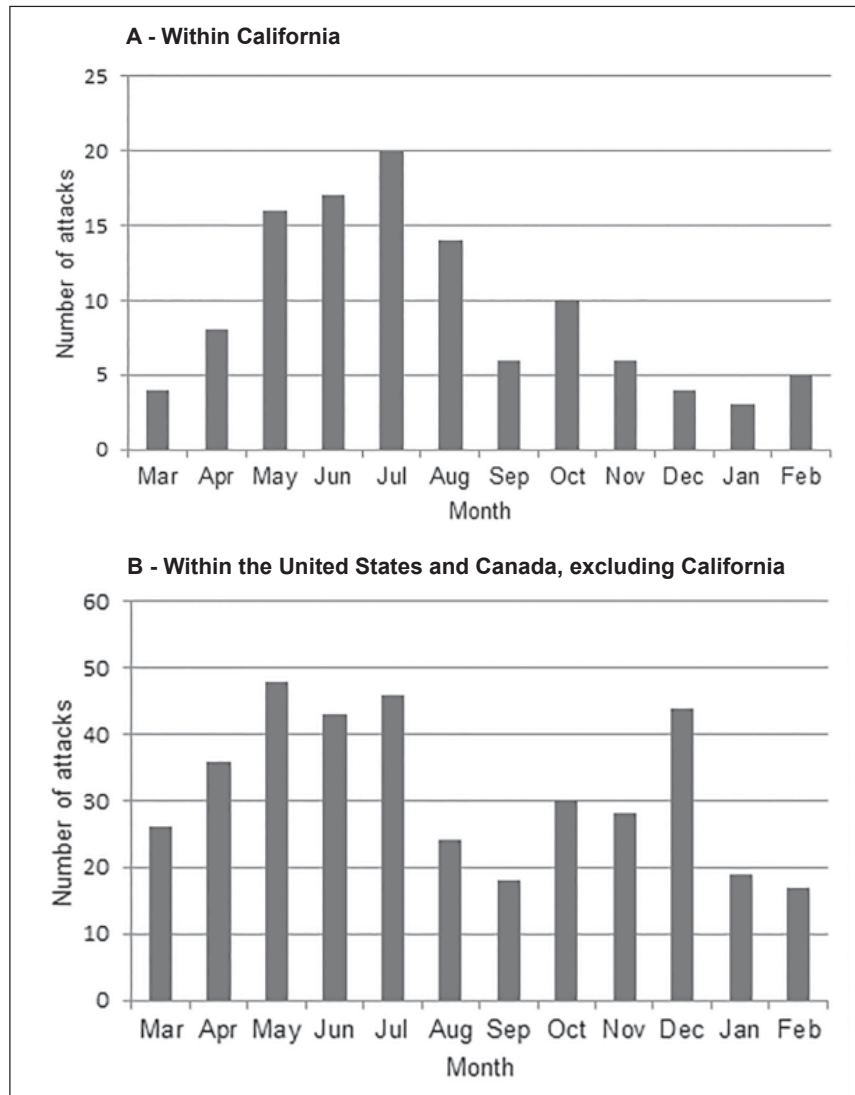


Figure 2. Seasonality of coyote (*Canis latrans*) attacks on humans, 1977–2015.

organizations and city authorities declined to cooperate in gathering these data, to avoid adverse publicity toward their management of wildlife or the specific cities. Park rangers also reported a reluctance of some citizens to file reports after being attacked by coyotes (Baker and Timm 1998). We also found that some agencies or entities that received such reports would not share this information with researchers or others, and some reports were said to have been discarded after a few years or were not maintained in a manner that was easily accessible (Timm et al. 2004).

Some years ago, we learned from agency personnel of 32 separate coyote attacks that occurred within a national park in California in 4 separate years (D. Simms, Sr., U.S. Department of Agriculture [USDA] Wildlife Services, personal communication), none of which had

ever been reported in the news media. These alone represented a 38% increase in known coyote attacks. Similarly, ≥ 13 persons were bitten by coyotes in 1 geographic area within Los Angeles during 10 separate attacks that occurred over 24 weeks in late 2015 (N. Quinn, University of California Cooperative Extension, personal communication; M. Wall, California Department of Fish and Wildlife, personal communication). Only 1 of these attacks was known to have been reported in the news media.

These experiences differ from Alexander and Quinn (2011) who stated: "...there is sufficient anecdotal evidence to argue that human bites always (or nearly always) get reported to the media, but do not always get reported to agencies" (356). We hypothesized that number of coyote attacks on humans is significantly

greater than has been documented in either media or agency reports.

This raises questions whether the number of coyote-caused human safety incidents reported by media sources or received by agencies accurately represents trends, or if the number of such reports may vary due to factors unrelated to incident frequency. For example, the coyote-caused fatality in Nova Scotia in late 2009 resulted in a 375% increase in number of “primary articles addressing coyotes” in Canadian media during the 14-month period following that attack (Alexander and Quinn 2011). We suspect that coyote attacks on pets in some suburban areas are now so common that they are no longer considered news. If indeed the frequency of coyote attacks is increasing in some suburban and urban areas, we hypothesize that reasons for such an increase may include range expansion by coyotes into certain suburban and urban environments, increase in coyote densities, increase in human population densities, and changes in both coyote behavior and human behavior toward coyotes.

After 30 years of investigation, it is our conclusion that urban and suburban coyote conflicts are continuing to increase as coyotes increasingly adapt to living in proximity to humans. Based on reported coyote attacks in California, attacks increased from 31 during 1990–1997 to 50 during 1998–2005. Complaints received by USDA Wildlife Services in southern California related to human health and safety totaled 834 during FY1991–FY1998, and increased to 1,899 during FY1999–FY2006, with the human population increasing only 13% (Orthmeyer et al. 2007). A representative of the California Fish and Game Commission stated several years ago that in California, “coyote attacks on humans are now routine” (Western Association of Fish and Wildlife Agencies [WAFWA] 2009). Based on coyote attacks outside California we have compiled, attacks increased from 43 during 1990–2003 to 139 during 2004–2015. This apparent increase in coyote–human attacks and other conflicts in urban and suburban environments has led us to seek to better understand the circumstances and reasons responsible for this relatively recent change. Unfortunately, there is a lack of field research concerning this topic, perhaps because studying predators such as coyotes in urban

and suburban settings can be challenging. Better knowledge about coyote (and human) behavior could allow wildlife managers to develop adaptive management strategies that will reduce occurrence of such conflicts.

Factors affecting coyote behavior

Understanding habituation by coyotes to human-occupied environments is helpful to our understanding of how to prevent, or perhaps reverse, increasingly bold coyote behavior. Geist (2007b) defined habituation as “animals’ decreased responsiveness to humans due to repeated contact.” Geist (2007b) explained: “Unfortunately, habituated animals, those who have developed a psychological patience with our presence, are potentially much more dangerous than non-habituated, or ‘wild’ animals, because habituation is a state of unconsummated interest on the part of the animal, expressing itself as tolerance of and even an attraction to humans” (35).

Froman (1961) stated “...I was able to find no record or even unsubstantiated report of any Los Angeles coyote that had ever attacked a man, woman or child” (111–112). We are not aware of any attacks on humans by non-rabid coyotes in suburban environments in California prior to 1977, and only a few such bite incidents occurred in California in the 1960s and early 1970s, primarily in campgrounds at state or national parks. Howell (1982), reporting the emergence of aggressive coyote behavior and attacks on humans in suburban Los Angeles County, surmised that lack of human harassment coupled with a resource-rich environment that encouraged coyotes to associate food with humans could result in coyotes losing their “normal” wariness of humans, producing “abnormal numbers of bold coyotes.” He noted it was not unusual for joggers, newspaper delivery persons, and other early risers to see 1–6 coyotes daily in such residential areas.

Carbyn’s (1989) account of coyote attacks on children in national parks supports the notion that a food-rich environment that places coyotes in proximity to humans leads to attacks. Carbyn (1989) noted, “Coyotes appeared to have lost fear of humans and regarded the children as prey,” stating that a Jasper National Park representative observed, “Loss of fear of humans has been widespread in national parks and urban areas where this predator

associates humans with food at campgrounds” (445). A habituated coyote near a campground during the late 1990s in Joshua Tree National Monument, CA, USA, was observed to fake a limp when tourists were present, to successfully obtain greater food handouts (L. Clapp, National Park Service [retired], personal communication). Humans unintentionally provide food to wildlife: campgrounds or public use areas in parks often provide opportunities for animals to obtain human food items, either from careless storage of foods or from garbage containers that are not animal-proof or are full to overflowing. Baker and Timm (1998) noted intentional and unintentional feeding as a factor in multiple case studies of urban and suburban coyote conflicts, and also described a situation in which a feral cat (*Felis catus*) colony served as an attractive food source for urban coyotes; the coyotes eventually killed most of the cats and continued to feed on the cat food placed daily by well-meaning citizens.

Intentional feeding of coyotes by park visitors often is the cause of predators losing their fear of humans, resulting in their approaching humans at close distances where risk of negative interactions is highly likely. Bounds and Shaw (1994), in a survey of United States national parks, found that in parks reporting aggressive coyotes, intentional feeding of coyotes by tourists was more commonplace than in those parks that did not report aggressive coyotes. Elliott et al. (2016) found via a survey that about 25% of Los Angeles County residents report they leave food outside for pets, wildlife, and stray animals. White and Gehrt (2009) attributed intentional or unintentional feeding of coyotes as a factor in 30% of the attacks they investigated. However, they suspected that the number of cases when coyotes were being fed was greater than reflected in the reports they analyzed. Fedriani et al. (2001) found human-related foods in as much as 25% of coyote diets in areas of high human population densities, whereas Alexander and Quinn (2011) found food conditioning to be directly or indirectly identified in 100% of the coyote attacks occurring in urban areas in Canada. Schmidt and Timm (2007) speculated that it may not require many residents within a neighborhood providing food to coyotes to defeat efforts to keep urban coyotes from becoming habituated to humans.

Schmidt and Timm (2007) discussed numerous factors that may have led to behavioral changes in coyotes in southern California, beginning in the late 1970s, and which resulted in coyote attacks on humans. Among the factors they listed as likely contributing to changes in coyote behavior were:

- An attractive, resource-rich suburban environment
- Human acceptance of, or indifference to, coyote presence
- Lack of understanding of coyote ecology and behavior
- Intentional feeding
- Reduction or cessation of predator management programs

Our experience in evaluating such factors has been similar to that of White and Gehrt (2009), who noted that lack of standardized record-taking following attack incidents makes it difficult to analyze all factors that may contribute to attacks.

Evaluating habituation

Baker (2007) first outlined, from personal experience dealing with managing habituated coyotes in southern California, a progression of increasingly bold coyote behaviors toward humans (Table 1). This “Behavioral Progression of Increasing Coyote Habituation” has been used by agencies at local and state levels to evaluate observed changes in behavior of urban and suburban coyotes, as well as to specify action levels in deciding when to remove problem coyotes from a population (e.g., see Farrar 2007, 2016). Generally, we believe that when behaviors such as chasing or taking pets in daylight, attacking pets on a leash or near owners, or chasing joggers or cyclists occur, it is prudent to preemptively remove several coyotes from the population before a human safety incident occurs. Experience has shown that such action can change the behavior of remaining coyotes in the local population, reducing the likelihood that habituation will progress to the extent that some coyotes may attack adults or children. When accompanied by environmental measures to make the local habitat less inviting and less attractive to coyotes, it is possible to reduce or prevent aggressive coyote behavior from reoccurring for months or even years (Baker 2007, Farrar 2007).

Table 1. Sequence of increasingly aggressive coyote (*Canis latrans*) behaviors (from Baker and Timm 1998).

Behavioral Progression of increasing coyote habituation to suburban environments
1. Increase in coyotes on streets and in yards at night
2. Increase in coyotes <i>non-aggressively</i> ^a approaching adults and/or taking pets at night
3. Coyotes on streets, and in parks and yards, in early morning/late afternoon
4. Coyotes chasing or taking pets in daytime
5. Coyotes attacking and taking pets on leash or near owners; chasing joggers, bicyclists, 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 in mid-day

^a Clarification added by Baker, 2008

Parallels exist between coyotes and other wild canids (e.g., gray wolves [*C. lupus*], dingoes [*C. l. dingo*]) regarding some individuals inclining to act aggressively toward humans and even attack, once they have come to associate humans with food or view humans as prey (Schmidt and Timm 2007). Dingoes have, in recent years, become habituated to certain suburban areas of coastal cities in Queensland, Australia, where numerous tourists have been attacked and injured, including 1 fatality (Burns and Howard 2003). In the past century, 41 wolf–human attacks (2 of the attacks fatal) were reported in North America (McNay 2002, 2007; Geist 2008, Butler et al. 2011). After witnessing behavior of a wolf pack on Vancouver Island, BC, Canada, Geist (2005, 2007a) created an Escalation Model (Table 2) describing habituation of wolves to humans, unaware of Baker’s (2007) similar observations regarding habituated urban coyotes (Geist 2016). These 2 scales can serve as guidelines to assist observers or agencies in better understanding when management action may be necessary to prevent increasingly severe conflicts with humans.

Characteristics of attacks

Early on, Carbyn (1989) speculated that the coyote attacks on children he reported might be related to food stress, as 3 of the 4 most serious attacks occurred when coyotes were either about to have pups or were feeding pups. Timm et al. (2004) noted that of human safety incidents occurring in California up to that point in time, 63% (and 72% of incidents involving children) occurred during March through August, when adult coyotes would most likely be provisioning pups or experiencing increased food demands because of the female’s gestation. For our

current data set, 66% of attacks in California have occurred during March through August, and a similar pattern exists for combined data from the other states plus Canadian provinces (Figures 2a, b). As most coyote pups are born in early spring, we note that incidence of attacks is greatest when parents would be provisioning pups (May, June, and July), although these data sets are too small to show statistical significance. Increased attacks during this period could also be associated with territoriality, reproduction, and defense of den sites and/or pups.

In Lukasik and Alexander’s (2011) analysis of coyote incidents collected in Calgary, Alberta, Canada that occurred between January 2005 and August 2008, incidents involving physical contact with humans or pets most commonly occurred during the May–August “pup-rearing season” (as defined by Morey et al. 2007). This finding is similar to our data from attacks in California.

Alexander and Quinn (2011) found that in 16 of 67 (23.9%) direct encounters between humans and coyotes, dogs (*C. l. familiaris*) were present, but only in 4 cases were people bitten when they tried to intervene and protect their dogs. White and Gehrt (2009) reported the presence of a pet (dog, cat, or other not specified) in 8 of 142 attacks (6%). Dogs were noted as being present in 28 of 165 (17%) of our recorded coyote attacks on humans. In defining a coyote attack, we have attempted to exclude instances when a human was only incidentally scratched or bitten in the act of initiating contact with the attacking coyote to rescue a pet. However, when the coyote was described to intentionally turn its attention to, and injure the person, we have regarded this as an attack.

Table 2. Sequence of increasingly aggressive wolf (*Canis lupus*) behaviors (from Geist 2007a).

Escalation Model of increasing wolf habituation to humans
a) Severe depletion of natural prey.
b) Followed by wolves searching for alternative food sources among human habitations.
c) The brazen behavior of wolves was due to the wolves being undeterred by and habituated to inefficiently armed humans (or ineffectual use of weapons or outright protection of wolves).
d) Wolves shifted to preying on pets and livestock, especially on dogs. (In our neighborhood, 1 or several wolves attacked dogs despite the physical intervention by their owners, which the wolves more or less ignored).
e) Wolves tested and killed livestock; the tests resulted in docked tails and ears of cattle.
f) The wolves commenced deliberate, drawn-out exploration of humans be such on foot or on horseback, (this is not merely visual and olfactory, but included—weeks before these wolves attacked a human—the licking, nipping, and tearing of clothing [Beatty 2000]).
g) This was followed by wolves confronting humans.
h) Wolves attack humans.

Classification of attacks and victims

We found significantly more adults than children (age ≤10 years) were victims (209 vs. 139) of coyote attack. This differed from findings of Alexander and Quinn (2011), whose evaluation of coyote attacks in Canada found 13 adults and 13 children were victims. White and Gehrt (2009), evaluating 159 victims in 142 attack incidents, found a slightly greater number of coyote attacks on children (75) than on adults (67), noting that in attacks they classified as predatory, most victims were children (47 children vs. 10 adults). Their definition of predatory attacks included those "...in which a coyote directly and aggressively pursued and bit a victim, causing multiple or serious injuries (often to the head and/or neck) ... typified by coyotes running straight to the victim and continuing to attack even after being discovered by the victim" (422). White and Gehrt (2009) noted, "In predatory attacks, injuries were usually more severe than other cases and victims and/or bystanders had to exert considerable effort to stop the attack" (422).

Mitigation strategies

One of the challenges in dealing with urban coyote management is an absence of common understanding of the problems and of potential solutions, not only among suburban residents, but among decision-makers. Educating the public is a need often expressed by agencies and individuals attempting to solve such conflicts. However, in today's society, reaching consensus on how to manage suburban wildlife involves not only effective biological solutions,

but sociological, attitudinal, economic, and political challenges (Schmidt 2007).

Baker and Timm (1998) expressed the need for centralized record-keeping of coyote-caused human safety incidents so that cities, counties, and states could track this problem and have some objective means of measuring success of implemented management efforts. White and Gehrt (2009) and Lukasik and Alexander (2011) noted a similar need for comprehensive reporting of coyote-human incidents. Localities that keep records of coyote conflicts can better pinpoint and respond to developing problems in specific neighborhoods. Consequently, they can concentrate timely efforts in education and coyote management in ways that are more likely to reduce or prevent attacks on pets and humans, as officials have done in Glendale, California (Baker 2007), Austin, Texas, USA (Farrar 2007, 2016), and San Bernardino County, California, USA (N. Quinn, personal communication).

We list components of strategies that should be initiated to prevent coyotes from becoming habituated to humans, and to correct problem behavior when coyotes have become bold and pose potential human safety risks. The methods have been tested and proven over the last 25 years, and they are listed here in order of importance:

I - Programs to prevent coyotes from losing fear of humans

- 1.1 Public education to inform citizens about wildlife, what habitat components attract animals, and effective hazing methods

- 1.2 Development of statutes to prohibit feeding wildlife and regulate refuse handling
- 1.3 Develop coyote behavior monitoring regarding daytime activity, boldness to humans, pet losses, and human conflicts
- 1.4 Initiate coyote population reduction when needed

II - Programs to address existing bold coyote problems

- 2.1 Public education to warn about safety for humans and pets
- 2.2 Initiate coyote behavior monitoring to pinpoint and evaluate potential problems and specific target areas
- 2.3 If necessary, and when feasible, start trapping or shooting in specific target areas
- 2.4 Continue to monitor behavior, as trapping of 1 or 2 coyotes may reintroduce fear into the target coyote family group
- 2.5 Public education to eliminate components of attractive habitats, such as food, water, shelter, and friendly humans (Baker 2007)

Effectiveness of hazing

When coyotes first venture into a suburban area, they likely have some degree of wariness toward humans. In this situation, certain hazing techniques may, when combined with modifications to make the environment less attractive, reduce the chance that coyotes will lose their wariness of humans. Suburban residents who see a coyote in their neighborhood should attempt to frighten it away by shouting, throwing rocks, squirting it with a water hose, blowing portable air horns, or otherwise acting aggressively to reinforce its fear of people (Timm et al. 2007). Motion-sensitive lights on houses or outbuildings may deter coyotes from approaching.

Baker (2007) stated, “In observed coyote behavior at stages 1 and 2 [see Table 1], a fair level of success was often obtained by using various hazing or aversive conditioning methods, when practiced consistently every time coyotes were observed close to humans. The effect could last for several months or even years. However, in stages 3 and beyond, any changes in coyote behavior due to hazing was usually temporary, only lasting a few weeks or months (depending on the methods used), unless one or more coyotes

was trapped or shot” (389–390).

Without any real threat, many coyotes quickly adapt or habituate to sounds and to human activity. Recent research in suburban environments in the Greater Denver, Colorado, USA area has concluded that hazing at times can be a useful tool for short-term relief from a coyote encounter, but in other circumstances non-injurious hazing may have little effect on coyote behavior, especially if the coyote has already become somewhat habituated to human presence (Bonnell and Breck 2017, Breck et al. 2017). Breck et al. (2017) noted, “Unfortunately, because of the nature of urban coyote conflict, managers and the public often tend to ignore coyotes until an individual begins to show extreme forms of aggressive behavior. It is only after a problem individual develops that these techniques are implemented, and we believe this is a grave mistake that dooms the effectiveness of nonlethal methods” (143).

Politics of managing urban coyotes

An ongoing dilemma for wildlife managers and local decision-makers is the degree to which urban coyote problems quickly become politicized. As Alexander and Quinn (2011) noted, “Highly charged discourse concerning urban coyotes often plays out in the media, especially after a public report of a negative encounter” (346). This has certainly occurred in southern California (see Timm and Baker 2007), and people typically have a wide range of opinions about presence of urban coyotes or need for their management (Schmidt 2007). In urban and suburban populations, some segment of the citizenry will oppose active coyote management, especially if it includes lethal removal of coyotes. Some animal welfare and animal rights groups gain a large following (and presumably substantial financial support) from inflaming the issue of coyote control (Oleyar 2010). In California, an important tool for selectively removing problem coyotes from suburban environments was lost with passage of Proposition 4, an initiative measure approved by voters in November 1998 (Animal Legal and Historical Center 2006). Promoted by proponents primarily as an anti-fur trapping measure, the regulatory measure banned use of leghold traps, except in declared human safety emergencies. This had the effect of limiting the ability of local, state, or federal agencies to remove coyotes

unless a person had been attacked and/or bitten by a coyote; attacks on pets are generally not considered human safety emergencies. Thus, preventive removal of increasingly bold coyotes, to reduce risk of coyote attacks on people, became more difficult to accomplish.

Failure to take timely action

Our investigation of the substantial number of coyote attacks on humans has revealed that failure to remove the responsible problem coyote(s) in a timely manner can lead to multiple attacks, presumably by the same coyote or family group of coyotes. This situation can occur in municipalities that do not wish to undertake lethal removal of coyotes because of philosophical reasons or political pressures. It can also occur in parks and other such public use areas, when managers may not wish to incur negative publicity regarding their park or facility.

Carillo et al. (2007) reported on a series of coyote attacks on humans in November 2006, when coyotes attacked and injured 8 people during a 13-day period in a retirement community in Green Valley, Arizona, USA. In this instance, multiple problem coyotes, and the difficult logistics involved in safely and selectively removing coyotes from the suburban environment, likely contributed to the number of persons attacked. In 2004, we learned of 32 attacks that had occurred (in 1975, 1976, 2000, and 2001) when coyotes had bitten visitors in a specific national park within California (D. Simms, Sr., USDA Wildlife Services, personal communication). In the series of attacks in mid-summer 2001, ≥ 14 individuals were bitten before successful action was taken to remove the responsible coyote(s).

Similarly, during 2015, there were ≥ 13 people bitten by coyotes within Los Angeles, California, of which only 1 attack was reported in the news media (N. Quinn, M. Wall, personal communication); no corrective action began until approximately 3 months following the first bite incident. Absent these accounts, there were only 6 other coyote bites to humans in California during that calendar year. In this series of incidents, local Los Angeles authorities failed to share information on these attacks with other agencies and did not initiate effective management actions for a prolonged period. Failure to actively manage the mounting problem of habituated coyotes can result in

additional local loss of pets and the potential for increased attacks on people. Local decision-makers need policies in place that will allow for a range of responses that are appropriate to the situation. They must weigh sometimes unpopular actions, such as lethal removal of coyotes, against the risk of delay or taking ineffective actions, which could lead to human safety incidents and resulting liability.

Coyote attacks on pets

Attacks by coyotes on pets are an issue that is closely related to human safety events. Alexander and Quinn (2011) noted that several news articles from Canada described coyote attacks on dogs and cats, as well as pet disappearance, prior to the first attacks by coyotes on children in specific localities. Baker's scale of Behavioral Progression for coyote attacks (Baker and Timm 1998) and Geist's (2007a) Escalation Model of wolf habituation to humans note occurrence of pet attacks as an indicator that may precede attacks on people. Yet, information on distribution, number, and severity of coyote attacks on pets is largely lacking.

It is our perception that number of news articles about coyote attacks on pets in southern California has increased in recent years. Whether this is a result of an increasing number of coyotes, an increase in suburban coyotes' level of habituation, an increasing pet population, or has simply become a more newsworthy story (or some combination of these factors) is difficult to determine. However, some measures of the coyote-pet problem suggest that the number of such incidents has been increasing. The USDA Wildlife Services program in California received 362 complaints of coyote attacks on pets/hobby animals with estimated damage totaling \$78,232 during FY1991-FY1998, and 1,079 such complaints with estimated damage of \$402,540 during FY1999-FY2006 (Orthmeyer et al. 2007). The police department of Huntington Beach, California recorded that the number of suspected coyote attacks on pets increased from 37 in 2014 to 80 in 2015, and again increased to 107 in 2016 (Mellen 2015; K. Miller, Huntington Beach Police Department, personal communication).

By the early 1980s in Glendale (Los Angeles County), coyote attacks on pets were very common (Baker and Timm 1998), and stomach

contents of Glendale coyotes were found to contain “chiefly garbage” and included a measurable quantity of domestic cat remains (Wirtz et al. 1982). Following the fatal coyote attack on a child in Glendale in August 1981, an intensive program of coyote removal was initiated (Howell 1982), followed by an urban coyote management program administered by the Glendale Police Department that included an intensive public education effort accompanied by selective removal of problem coyotes when necessary. This strategy was credited with reinstating in coyotes a fear of humans. The program managers reported that during 1993–1997, a low incidence of pet attacks was reported (averaging slightly >4 cats and 1 dog lost per year), compared to much smaller communities that report 20–50 pet losses per year (Baker and Timm 1998). Farrar (2007) provided a report from Austin, Texas that suggests an urban coyote management program targeting removal of aggressive coyotes, based on standardized behavioral observations, was effective in reducing safety risks to pets (as well as to humans).

Alexander and Quinn (2008) were among the first to report specifically on coyote attacks on pets in suburban environments. Alexander and Quinn (2012) subsequently found that trauma was reported in 6% of cases where a human watched their pet be killed by coyotes, noting “Humans now view pets as family members and thereby the loss of the animal has the significance of a loss of a child to some individuals. As a result, response by agencies should reflect a level of concern for these losses and address the issue with appropriate regard” (18).

While the risk of human safety incidents, especially attacks on children such as those that have occurred in southern California and elsewhere, is often the most likely factor to generate headlines, we believe that coyote attacks on pets, because of their sheer numbers, is likely to be a principal factor driving public policy toward urban coyote management in the foreseeable future. Persons whose pets become victims may change their attitude toward urban coyotes. Alexander and Quinn (2008) found that in 13% of news articles regarding coyote attacks on pets, there was a request for authorities to take lethal action against coyotes, noting “lack of response by authorities may be a key issue

that exacerbates contempt for coyotes” (4). Decker et al. (2002) have reported, “People are more likely to want a population decrease if they believe a high probability of negative impacts exists or if they personally have experienced such impacts. Similarly, people concerned about such impacts are more willing to accept lethal and invasive management actions” (12).

Management implications

We believe that coyote attacks on humans in suburban areas are preventable (Baker and Timm 1998). However, unless policies permit agencies, or homeowner groups and their agents, to proactively initiate recommended mitigation measures including removal of problem coyotes when reported coyote activity exceeds stage 3 of Baker’s Behavioral Progression scale, the risk of coyote attacks to children and adults in suburban areas, parks, and other such environments will likely continue to increase.

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Associate Editor: Bruce D. Leopold

REX O. BAKER is professor emeritus at California State Polytechnic University-Pomona (CSPUP), taught Wildlife Pest Management and Pesticide Regulatory Programs for 26 years, and was project director of the Vertebrate Integrated Pest Management Research Program. He became heavily involved with coyote/human conflict problems and worked closely with governmental agencies and nuisance wildlife control operators. He continues to stay active with the coyote issue. Prior to joining CSPUP, he served as biologist and deputy agricultural commissioner for San Diego County, California. He has a B.S. degree in agricultural biology and an M.S. degree in agricultural science from CSPUP.



ROBERT M. TIMM retired in 2014 after 27 years as director and extension wildlife specialist at the University of California's Research & Extension Center at Hopland. Previously, he was associate professor and extension vertebrate pest specialist at the University of Nebraska-Lincoln, where he established a wildlife damage management class and compiled and published the 1983 edition of *Prevention and Control of Wildlife Damage*.



He has edited the *Proceedings of the Vertebrate Pest Conference* since 2002. He holds a B.S. degree in biology from the University of Redlands and earned his M.S. and Ph.D. degrees in ecology at UC Davis.