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ASSESSING THE IMPACT OF URBAN COYOTE ON PEOPLE AND PETS IN AUSTIN, TRAVIS COUNTY, TEXAS

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Abstract: The City of Austin acquires citizen reports of coyote (*Canis latrans)* observations or complaints through a toll-free non-emergency 311 telephone call system. The observed coyote behavior or activity reported by constituents is categorized into one of eight behavioral categories that correlate with observed changes in coyote behavior indicating an increasing risk to human safety. The categorical data is used to formulate indices of coyote behavior for accessing and monitoring the relative risk of urban coyotes to human safety over time. Behavioral indices with respect to established management zones are used to prioritize and target areas for preventing or alleviating bold or aggressive coyote behavior. Urban coyote management techniques focus on the dissemination of information to the public for preventing coyote habituation to humans, and trapping and removing coyotes from packs exhibiting behavioral changes associated with an increasing risk to human safety. Indices of bold or aggressive coyote behavior have decreased approximately 3.5% per month from December 2004 through March 2007, suggesting the impact and relative risk of urban coyote to people and pet safety has decreased since the implementation of the urban coyote management program in January 2005.

INTRODUCTION

Over the course of several years, numerous public agencies in the City of Austin and Travis County, Texas have reported an increase in public inquires and complaints about coyotes (*Canis latrans*) in urban neighborhoods. Some of these complaints involved missing pets in conjunction with coyote sightings in streets and yards near city green belts or in suburban residential areas. Increases in citizen complaints of coyotes has coincided with urban expansion and the establishment of the Balcones Canyonlands Preserve (BCP), an area comprising over 26,000 acres of undeveloped habitat that is managed to permanently conserve and facilitate the recovery of endangered species populations. Because the purpose of the BCP is endangered species conservation, public access and allowable recreational activities such as white-tailed deer hunting is severely limited. These limitations may negatively influence efforts to effectively manage white-tailed deer population abundance, a prey species that can potentially constitute a significant portion of the coyote's diet (Cook et al. 1971). Prey size and population abundance can influence coyote behavior, space use, and population dynamics (Gier 1968, Bowen 1978, 1981, Camenzind 1978, Bekoff and Wells 1980, Todd et al. 1981).

During the summer and fall 2004, coyotes in some residential neighborhoods were exhibiting bold and aggressive behaviors as evidenced by an increase in reports of coyotes attacking dogs, both on and off leash. Consequently, a coyote management program for minimizing the impact of coyotes on people and pets in urban landscapes was implemented that emphasizes public education and communication for minimizing or alleviating the impact that coyotes have on people and pets, and utilizes lethal control (i.e., trapping and shooting) of aggressive coyotes when it is deemed necessary for protecting human safety. Public concerns for animal welfare, and environmentalist concerns regarding the ecological effects of removing predators from protected areas and greenbelts, was addressed by establishing a goal to minimize the number of coyotes that are trapped and killed to minimize risk to human safety. To facilitate the selective management of coyote behaviors across the urban landscape, a method for monitoring the behavioral trends of the coyote population across established management zones within the city and county was established. The resulting coyote behavioral trends serve as the basis for choosing the appropriate method(s) (e.g., public education programs or selective trapping or shooting) for preventing, alleviating, or eliminating bold and or aggressive coyote behavior in specific management zones.

METHODS

The monitoring of urban coyote behavior to assess and affect the impact of coyotes on people and pets is accomplished by acquiring and monitoring citizen reports of observations or conflicts with coyotes. The coyote complaint and observation data is collected by city operators when constituents call a non-emergency 311 telephone call system. The data collected include: 1) the location of coyote(s) sighting; 2) the number of coyotes sighted; 3) the date of the sighting; 4) the time of the sighting; 5) the behavior of coyote (i.e., aggressive or non-aggressive); and 6) coyote contact with human or animal.

Table 1. Coyote behavior scores (CBS) categorized by changes in coyote behavior that indicates an increasing risk to human safety in (Baker and Timm 1998, Timm et al. 2004).

CBS	COYOTE BEHAVIOR
0	coyotes observed exhibiting human avoidance behavior
1	observations of coyotes on streets and in yards at night
2	coyotes observed approaching adults and/or taking pets at night
3	early morning and late afternoon daylight observances of coyotes on streets and in parks and yards
4	daylight observance of coyotes chasing or taking pets
5	coyotes observed attacking and taking pets on leash or in close proximity to their owners, or coyotes chasing joggers, bicyclists, and other adults
6	seen in and around children's play areas, school grounds, and parks in mid-day
7	coyotes observed acting aggressively toward adults during mid-day

A coyote behavioral score (CBS) with a value of 0 - 7 is assigned for the reported coyote observation or conflict incident. The CBS used to classify coyote behavior are based on an analysis of coyote attacks on humans reported by Baker and Timm (1998), in which the authors identify a predictable sequence of observed changes in coyote behavior that indicates an increasing risk to human safety. Timm et al. (2004) further defined the seven changes of behavior in order of their usual pattern of occurrence, and seven of the eight CBS (i.e., CBS values 1 - 7) used to classify and monitor coyote behavior in the management area are assigned a value identical to the sequential order of observed pattern of occurrence indicating an increased risk to human safety (Table 1). In addition, an eighth CBS with zero value is assigned to reports of coyote observations in which it is determined the coyote(s) behavior does not fall within the behavioral pattern that indicates an increasing risk to human health and safety (e.g., coyote predation on free-ranging housecats or wildlife in greenbelts, or observance of coyotes in greenbelts or other undeveloped space).

The accumulated behavioral scores serve as the basis for formulating indices used in identifying trends in coyote activity and behavior over time. Indices of coyote behavior (ICB) reflecting behavioral trends over time, ICB1 and ICB2, were formulated by: 1) calculating the average of all CBS over a desired period of time; and 2) dividing the monthly summation of the CBS by the total number of days in a month, respectively. An index reflecting coyote boldness or habituation to humans over time (ICBH), was formulated by summarizing monthly reports of bold or aggressive coyote daylight activity (i.e., summation of total CBS reported with values from 3 through 7) divided by the total number of reports received.

Although the coyote behavior data collected is categorized, the behavior actually exhibited is a continuous variable, ranging from total human avoidance to unprovoked predation attacks on humans. Evidence of coyote population behavioral trends is established with a multiplicative model using log transformation and linear regression (Sauer and Geissler 1990). The coyote behavioral indices are log transformed to develop the log linear regression model. The slope of the linear regression is back transformed to estimate the slope which is used to calculate the percent change in behavior over time (Bradu and Mundlak 1970).

RESULTS

Urban coyote impacts on people and pets in the City of Austin and Travis County, Texas ranged from non-aggressive observations of coyotes in greenbelts to a single, unprovoked attack on a human. The non-emergency 311 telephone call system logged 1,236 observations or complaints of coyotes from December 2004 through March 2007 (Figure 1). Constituents classified approximately 22% of the total calls generated as "aggressive" coyotes ($n = 271$) (Figure 2). Approximately 9% ($n = 108$) of the total calls received were reports of observations of coyotes: 1) approaching adults and/or taking pets at night (CBS = 2; $n = 52$); 2) daylight observance of coyotes chasing or taking pets (CBS = 4; $n = 30$); 3) attacking and taking pets on leash or in close proximity to their owners, or coyotes chasing joggers, bicyclists, and other adults (CBS = 5; $n = 11$); 4) seen in and around children's play areas, school grounds, and parks in mid-day (CBS = 6; $n = 13$); or 5) acting aggressively toward adults during mid-day (CBS = 7; $n = 2$) (Figure 3). The remaining 91% ($n = 1,128$) of constituent observations or complaints of coyotes were reports of: 1) observations of coyotes on

streets and in yards at night (CBS = 1; n = 294); 2) early morning and late afternoon daylight observances of coyotes on streets and in parks and yards (CBS = 3; n = 429); and 3) coyotes exhibiting human avoidance behavior (CBS = 0; n = 405).
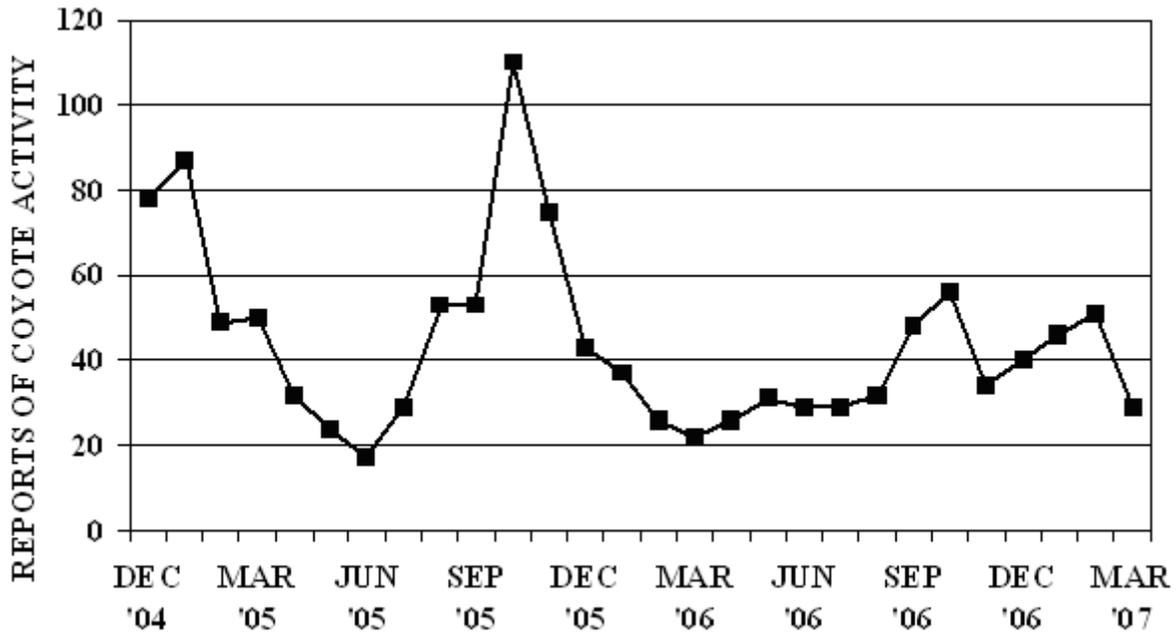

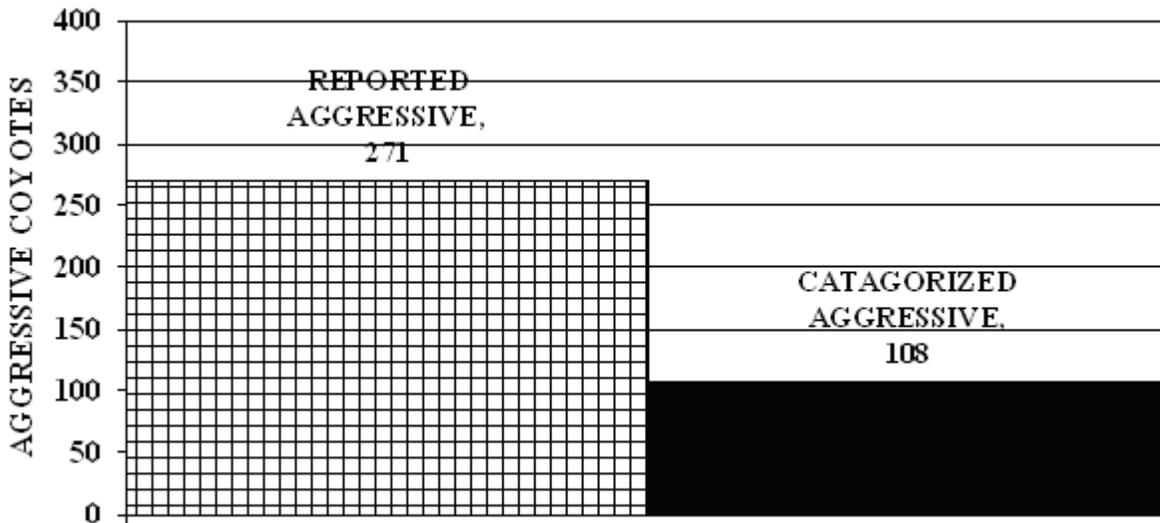**Figure 1. Constituent reports of coyote activity received December 2004 - March 2007.**

Figure 2. Constituent reports of aggressive coyotes versus the number of reports categorized as aggressive coyotes by CBS from December 2004 - March 2007.
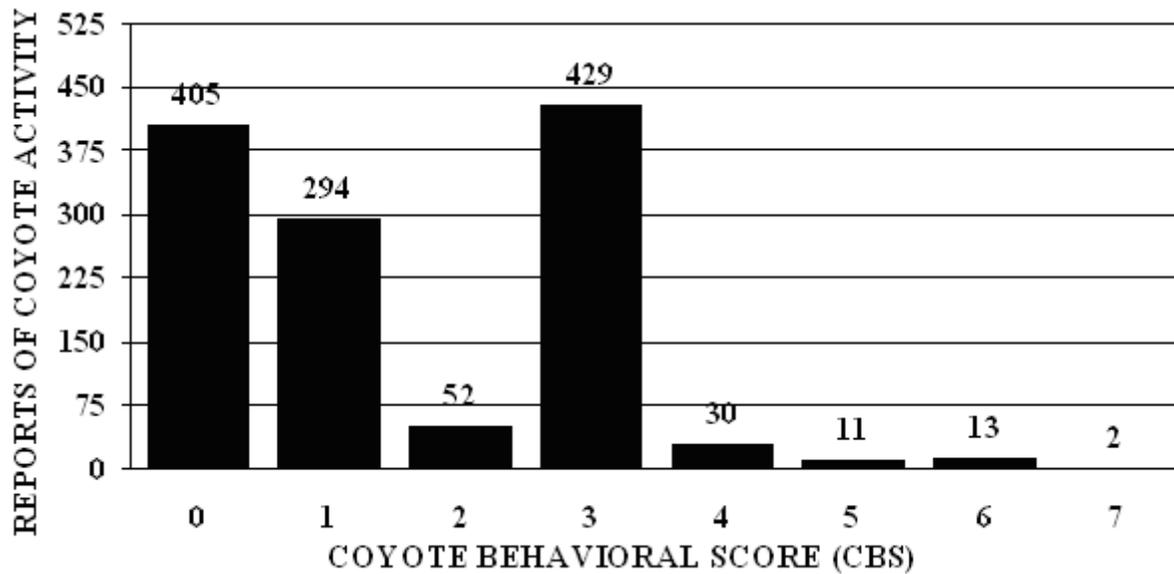
Figure 3. Constituent reports of coyote activity received December 2004 - March 2007 as categorized by coyote behavioral score (CBS).
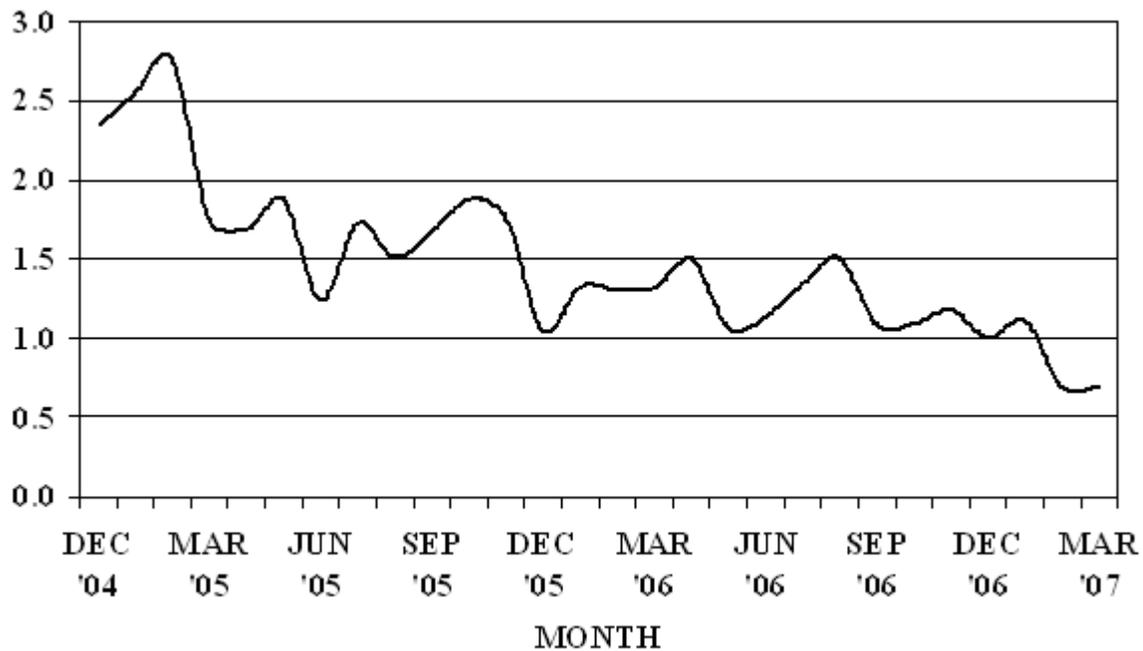

Figure 4. Index of coyote behavior generated from the monthly average of the Coyote Behavioral Score, ICB1, observed from December 2004 - March 2007.

The index of coyote behavior generated from the monthly average of the CBS, ICB1, has declined at a monthly rate of 3.5%, from a high of 2.8 in February 2005, to a low of 0.7 in February and March 2007 ($P < 0.0001$, $r^2 = 0.726$) (Figure 4). The index of coyote behavior generated from the summation of monthly CBS divided by the total number of days in the month, ICB2, has declined at a monthly rate of 4.6%, from a high of 7.2 in January 2005, to a low of 0.65 in March 2007 ($P < 0.0001$, $r^2 = 0.352$) (Figure 5). The index reflecting coyote boldness or habituation to humans, which was derived from the summation of total CBS reported with values from 3 through 7 divided by the total number of reports received, ICBH, has declined at a monthly rate of 3.5%, from a high of 70% in January 2005 to a low of 17% in March 2007 (Figure 6).

DISCUSSION

Indices of bold or aggressive coyote behavior have decreased approximately 3.5 - 4.6% per month from December 2004 through March 2007, indicating the impact and relative risk of urban coyotes to people and pet safety has decreased since the implementation of the urban coyote management program in January 2005. The above analysis illustrates how constituent reports of coyote activity and behavior may provide an objective perspective of the relative risk that coyotes pose to human safety, when the reported activity or behavior is ranked with respect to coyote behavioral patterns associated with an increasing risk to human safety. This perspective of categorizing coyote behavior by its associated risk to humans also affords a means of quantifying the impact of urban coyotes on people and pets. An objective assessment of the risk that urban coyotes pose to human safety also provides public health administrators accurate information for assessing the necessity and feasibility of establishing and maintaining an urban coyote management program for protecting human safety. Alternatively, administrators must rely on inaccurate and subjective reports of so called "aggressive" coyote behavior that constituents may mistakenly perceive is a risk or threat to their safety. This inaccurate public assessment of coyote behavior is reflected in the number of "aggressive" coyotes reported by constituents versus the number of coyote observations that were actually classified as aggressive behavior in the management area (i.e., CBS 2, 4, 5, 6 and 7).

Monitoring coyote activity and behaviors reported by constituents over time allows urban coyote managers to focus public education efforts for reducing incidents of emboldened but non-aggressive coyote activity in residential areas (e.g., CBS 1 and 3), or to focus coyote trapping and removal efforts for reducing or eliminating incidents of bold and aggressive behaviors that indicates an increasing risk to human safety (e.g., CBS 2, 4 - 7). Establishing a predetermined behavior threshold (e.g., CBS 4) for determining when to initiate trapping and the removal of coyotes that are exhibiting behavior indicating an increased risk to human safety, allows managers to minimize the number of coyotes that are trapped and removed to reduce the coyote threat behavior. Such a threshold minimizes any potential ecological effect resulting from natural predator removals from protected areas and greenbelts, whether the potential for any such proposed effect is real or not.

Factors that may be contributing to the apparent increase in coyote-human and coyote-pet interactions in the management area from 2000 though 2004 include: 1) human population increase and associated space use (i.e., urban sprawl); 2) human
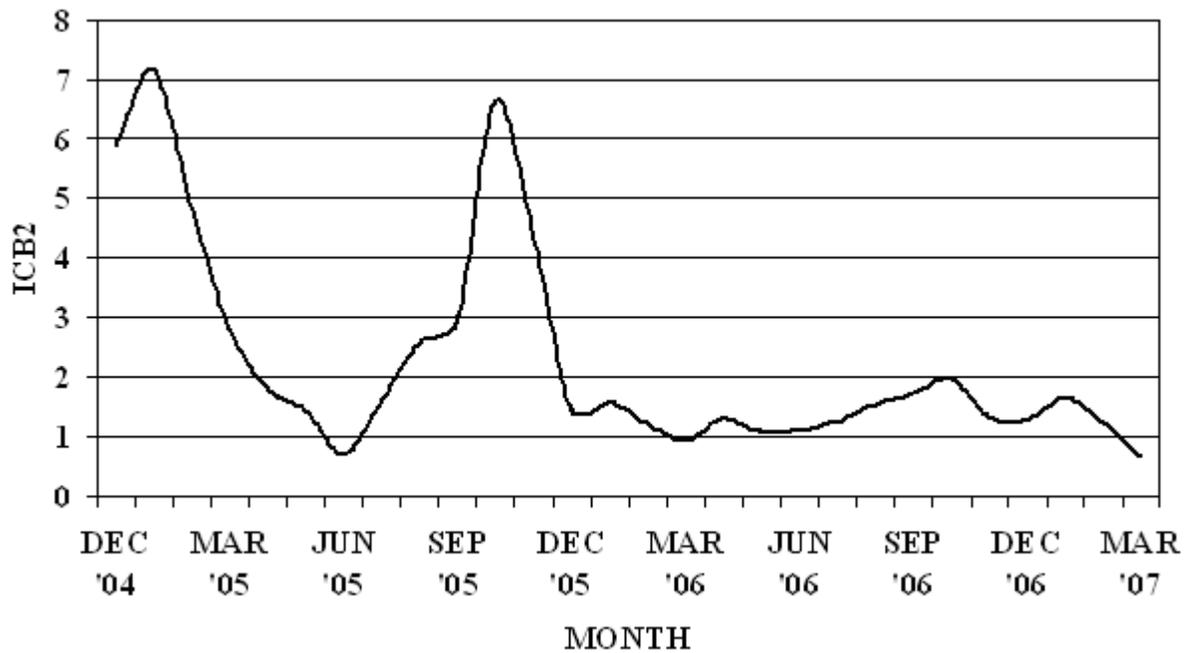
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Figure 5. Index of coyote behavior generated from the summation of monthly Coyote Behavior Scores divided by the total number of days in the month, ICB2, observed from December 2004 - March 2007.
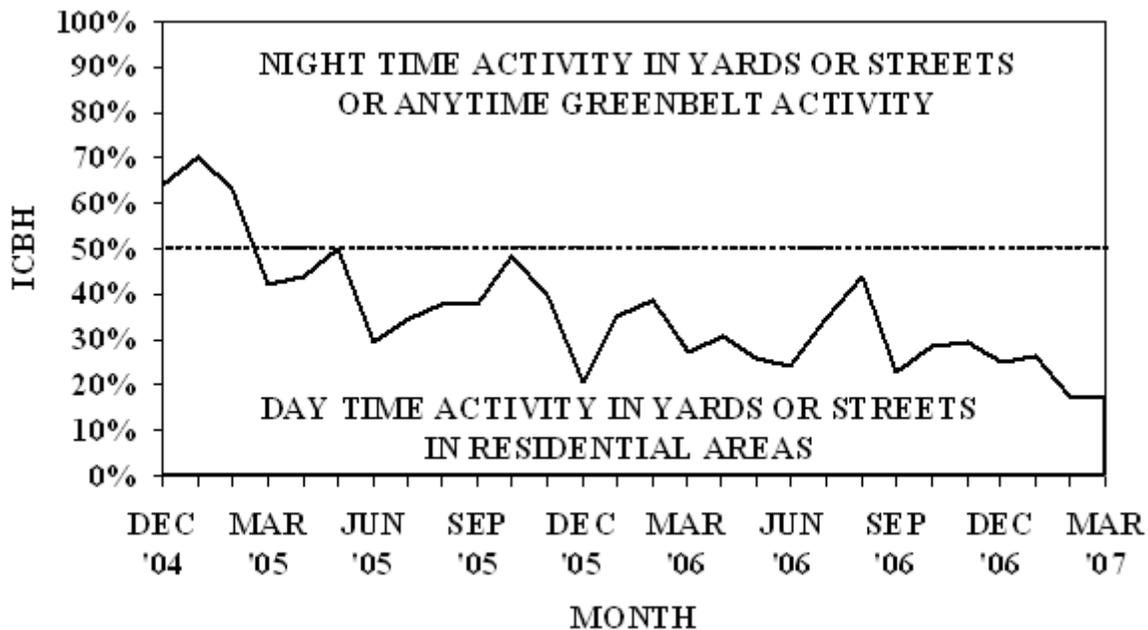

Figure 6. Index of coyote boldness or habituation to humans (ICBH) observed from December 2004 - March 2007.

behavior affecting pet vulnerability to coyote predation and coyote habituation to human activity; and 3) an increasing and overabundant natural prey population (e.g., white-tailed deer) residing on thousands of acres of protected habitat and city greenbelts. Research efforts investigating coyote behavioral responses to prey such as white-tailed deer populations, which are not subjected to regulated hunting so as to affect population abundance in or near residential areas, may provide valuable insight into the effect that prey biomass and distribution may be contributing to coyote population abundance and changes in behavioral patterns exhibited in urban landscapes. Such insight may provide human health administrators and urban land managers' critical information necessary for considering alternative coyote prey management strategies (e.g., urban archery deer hunting).

LITERATURE CITED

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.

BEKOFF, M., AND M.C. WELLS. 1980. The social ecology of coyotes. Scientific American 242:130-148.

BOWEN, W.D. 1978. Social organization of the coyote in relation to prey size. Ph.D. Dissertation, University British Columbia, Vancouver, Canada. 230 pp.

_____. 1981. Variation in coyote social organization: the influence of prey size. Canadian Journal of Zoology 59:639-652.

BRADU, D., AND Y. MUNDLAK. 1970. Estimation Of Lognormal Linear Models. Journal Of The American Statistical Association 65:198-211.

CAMENZIND, F.J. 1978. Behavioral ecology of coyotes on the National Elk Refuge, Jackson, Wyoming. Pages 267-294 in M. Bekoff, editor. Coyotes: Biology, Behavior, and Management. Academic Press, New York, NY.

COOK, R.S., M. WHITE, D.O. TRAINER, AND W.C. GLAZENER. 1971. Mortality of young white-tailed deer fawns in South Texas. Journal of Wildlife Management 35:47-56.

GIER, H.T. 1968. Coyotes in Kansas, Revised ed. Kansas State College, Agriculture Experiment Station Bulletin 393.

SAUER, J.R., AND P.H. GEISSLER. 1990. Estimation of annual indices from roadside surveys. Pages 58-62 in J.R. Sauer and S. Droege, editors. Survey designs and statistical methods for the estimation of avian population trends. U.S. Fish and Wildlife Service, Biological Report 90(1). 166 pp.

TIMM, R.M., R.O. BAKER, J.R. BENNETT, AND C.C. COOLAHAN. 2004. Coyote attacks: an increasing suburban problem. Pages 47-57 in R.M. Timm and W.P. Gorenzel, editors. Proceedings of the Vertebrate Pest Conference 21:47-57.

TODD, A.W., L.B. KEITH, AND C.A. FISCHER. 1981. Population ecology of coyotes during a fluctuation of snowshoe hares. Journal of Wildlife Management 45:629-640.