Human-coyote relationships in urban environments: conflict or co-existence?

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Abstract

As the world becomes increasingly urbanized, the relationships between wildlife, especially predators, and humans become increasingly strained. Conservation and restoration initiatives increase the probability of human-wildlife interactions. It is increasingly important to study how wildlife can co-exist with humans in urbanized ecosystems, as well as how humans can accept the presence of wildlife in urban areas. By studying public perceptions of wildlife in urban areas, wildlife managers can better tailor management solutions geared for different segments of the public, whether it is education, outreach, hazing, capture and relocate, or lethal management.

The absence of larger predators (e.g. wolves or cougars) has allowed the relatively rapid expansion of coyotes (*Canis latrans*) through North America. The coyote has recently extended its range into many urban areas throughout North America (e.g. Denver, Boston, Chicago, New York City). The coyote has successfully taken advantage of urban environments because of its flexibility in activity, behavior, and diet. There have been multiple studies in urban areas to learn about coyote ecology in an urban ecosystem, as well as surveys of public attitudes towards the presence of a predator (e.g. coyote) in urban areas. Some researchers have employed citizen science to assist in gathering data about coyote ecology in urban areas, but also as a means to educate the public how to more safely co-exist with this urban predator.

Introduction

The world is increasingly becoming urbanized. Since 2007, the majority of the world's human population lives in urban areas (Sanderson & Huron 2011; Bateman & Fleming, 2012). Urban areas may include one town or city, and encompass areas outside of city limits, suburbs as well

as anthropogenically altered surrounding areas (Ilicheva, 2010; Bateman & Fleming, 2012); they may also be defined by population density of an area (Bateman & Fleming, 2012).

Many scientists believe that urban areas are lost causes, that they are 'unnatural' and unsuitable for wildlife, and that efforts for conservation are better spent elsewhere (Miller & Hobbs, 2002; Ilicheva, 2010). Meanwhile, there are over 145 major cities located in or adjacent to a global biodiversity hotspot (Miller & Hobbs, 2002), leaving few natural areas which have not been influenced or affected by humans at some time (Ilicheva, 2010).

The negative outlook of some scientists towards urban areas may be detrimental since devaluing a landscape results in the devaluation of the wildlife within (Ilicheva, 2010). While many scientists have given up on urban areas, some scientists are taking up the challenge to study and promote conservation in cities, and see importance in conserving the natural parts where people live, which is increasingly in urban areas. Sanderson and Huron (2011) acknowledge the challenge of conservation in cities, that it "pushes us to exceed our professional expectations" (p.422). Eric Sanderson (Senior Conservation Ecologist at the Wildlife Conservation Society) sees a larger picture, and acknowledges value in studying urban ecology by learning how elements of nature can survive in urban areas and applying what is learned to other conservation areas (Sanderson & Huron, 2011). When discussing restoration of the Bronx River in New York City, Sanderson stated, "if we can make it work here, we can make it work anywhere" (personal communication, October 23, 2014).

Miller and Hobbs (2002) view conservation and restoration in urban areas as important to the preservation of biodiversity. Those studying urban ecology see the benefit of saving nature in cities to connect urban dwellers with the environment, which can foster appreciation and positive attitudes towards wildlife and the conservation of biodiversity (Savard, Clergeau, & Mennechez, 2000; Miller & Hobbs, 2002; Magle, Hunt, Vernon, & Crooks, 2012).

Louv (2011) who coined the term '*nature deficit disorder,'* describes a political – cultural spectrum of how nature is seen as an object to be dominated or as a distraction, but that regardless of where people lie on the spectrum they still view nature as the 'other,' with humans 'in' nature, "but not of it" (p.45). Conservationist Oscar Pineda-Catalan believes that cities create an illusion of being isolated from nature, but we must be reminded that biodiversity provides necessary ecosystem services (Blaustein, 2013) such as pollination, improving air quality, and carbon sequestration (Magle, et al., 2012). Many urban and suburban dwellers view wildlife conservation as something that happens elsewhere in some wilderness area or rainforest, experienced via TV, magazine, or internet and not occurring in their own backyard (Miller & Hobbs, 2002; Magle, et al., 2012).

Human-wildlife relationships

Increasing global urbanization coupled with increasing biodiversity conservation initiatives results in the increase likelihood of human-wildlife interactions. The outcome of this interaction may feed back to conservation initiatives in a positive or negative manner. If humans develop negative views and attitudes toward wildlife, these attitudes can be detrimental to biodiversity conservation (Miller, Caplow, & Leslie, 2012), resulting in retaliation.

Peterson, Birckhead, Leong, Peterson, and Peterson (2010) argue that the phrase '*human-wildlife conflict*' often used in publications when describing wildlife research is detrimental to the coexistence of humans and wildlife. When reviewing literature referring to 'human-wildlife conflict,' Peterson, et al. (2010) discovered that most cases referred to animal damage (e.g. crops, livestock, property damage), and rarely actual conflict; the few cases that involved conflict actually involved conflict between humans, and how to manage wildlife and potential threats to human interests or safety.

The role of public perception

To add to the importance of how messages are framed, Miller and Hobbs (2002) charge conservationists with failing to convey the message of the importance of biodiversity to a wide, diverse audience; that scientists need to communicate with more elements of society and not spend all their time with other scientists. They believe that scientists need to understand the importance of broad-based public support to the success of biodiversity conservation (Miller & Hobbs, 2002). Some researchers are currently employing citizen science, which not only allows for the gathering of more data, but also establishes a link to residents and creates a pathway for education.

Human-wildlife relationships are complex and there is need for both short-term and long-term policies and planning of management (Sundriyal & Dhyani, 2014). Understanding public perception of wildlife assists managers with decision-making. Several researchers have surveyed urban residents for their views and attitudes towards the presence of urban carnivores. The pattern of how the public values wildlife falls along a 'protection-use continuum' (Vaske &

Needham, 2007). With those on the protectionist end believing that wildlife have similar rights as humans and that wildlife have value in their community; and those on the other end of the continuum believing that wildlife have a utilitarian value or consider wildlife to be pests in the community (Vaske & Needham, 2007).

The wildlife acceptance capacity (WAC) is another spectrum, which describes a person's acceptance threshold for specific situations regarding wildlife (Vaske & Needham, 2007). The WAC continuum ranges from nuisance situations to economic to safety concerns (Vaske & Needham, 2007). Suburban dwellers in New York were found to be more tolerant of aesthetic or economic impacts from wildlife than threats to health; research also showed that people differ in their criteria in determining what is a nuisance versus a safety threat that is some people are more tolerant than others are (Vaske & Needham, 2007).

Media plays an important role in influencing public views, especially with large carnivores (Smith, Nielsen, & Hellgren, 2014). The media often plays on fear mongering, which is detrimental since for many the source of knowledge regarding large carnivores is mass media (Smith, et al., 2014). This increases the need for outreach and education for urban residents, since the success of carnivore populations is dependent on the public's acceptance of the impacts resulting from co-existence (Smith et al., 2014).

It is also important to distinguish between perceived threats and real ones. Miller, et al. (2012) described a study of crop damage by Zanzibar colobus monkeys, and how the amount of actual crop damage measured was not consistent with the perceived amount. In reference to coyotes in

the Denver metropolitan area in 2009, the city of Aurora reported 209 dog attacks on humans, while only one coyote incident and one coyote attack were reported (Poessel et al., 2013). In 2009, in Jefferson County, 327 dog attacks were reported, while only two coyote conflicts with humans were reported (Poessel et al., 2013).

Smith, et al., (2014) discusses results from a mail survey of the public perception by Illinois residents of large carnivores (e.g. wolves, black bears, and cougar). Interestingly, more residents perceived cougars to be the largest threat of the three species in the survey and black bears were viewed the most positively, while Smith, et al. (2014) cites studies in which researchers state that black bears pose more of a real threat to humans than cougars. This disconnect may be due to older European views and experience of wolves and bears, and lack of long-standing awareness of cougars in our culture (Smith, et al., 2014). Carnivores elicit strong emotions from people, which may be an expression of an ancient innate predator-prey relationship (Bateman & Fleming, 2012). The survey of Illinois residents also revealed that the majority believed that the risks associated with large carnivores were low, that humans could learn to coexist over time, and favored protection of large carnivores (Smith, et al., 2014). While many expressed positive views and attitudes towards large carnivore, some results suggested that people had low levels of tolerance and would not accept them in close proximity (Smith, et al., 2014).

The Eastern Coyote: Canid hybrids

The eastern coyote is different morphologically and genetically than the western coyote (Way, Rutledge, Wheeldon, & White, 2010). Using genetic analysis, researchers discovered that eastern coyotes are actually hybrids, with about 64% western coyote, 26% wolf ancestry, and

10% domestic dog ancestry (Bogan, 2014). This has led researchers to believe that eastern coyotes originated in Canada, where western coyotes and wolves hybridized and subsequently rapidly expanded south into the Northeastern United States arriving in New York in the 1930s (Foster, Motzkin, Bernardos, & Cardoza, 2002; NYSDEC, 2015a). Eastern coyotes are larger, heavier, and have larger teeth than their western counter parts, these combine to endow eastern coyotes with the tools to fill a niche formerly occupied by wolves (Bogan, 2014).

While eastern coyotes do not form true packs like wolves, they do exhibit pack-like behavior consisting of family units, males and females mate for life, and form the core of the family group (Foster, et al., 2002; Bogan, 2014). The remaining group is composed of pups from that year and occasionally yearlings from the previous litter (Bogan, 2014).

Coyotes are generalists, and opportunistic omnivores, they are highly flexible with their diet, taking advantage of what is available during each season (Wine, Gagne, & Meentemeyer, 2015; NYSDEC, 2015a). Staples of the coyote diet include mice, voles, rabbits, raccoon, groundhogs, birds, insects, plants, and white-tailed deer (Foster, et al., 2002; NYSDEC, 2015a). During summer they supplement with fruit, berries and insects; during the fall they consume more small mammals and insects; during the winter coyotes take advantage of white-tail deer that have collided with vehicles; in the spring coyotes depredate fawns (Magle, Simoni, Lehrer, & Brown, 2014; NYSDEC, 2015a). Researchers following radio-collared coyotes in New York found that 92% of the deer carcasses eaten by coyotes were killed by vehicle collisions, and that the remaining 8% of deer carcasses were killed by coyotes, displayed preexisting injuries (NYSDEC, 2015a).

Urban Coyote ecology: what do studies reveal?

The diet of urban coyotes

The coyote's flexibility in diet has allowed coyotes to expand their ranges into human-dominated urban landscapes across North America, including the Denver metropolitan area, Chicago metropolitan area, New York City, its northern suburbs, and along the Eastern Seaboard (Vaske & Needham, 2007; Gehrt, Anchor & White, 2009; Bateman & Fleming, 2012; Magle, et al., 2014; Wine, et al., 2015). In addition to previously describe diet items, when coyotes reside in urban areas, scat studies have revealed that coyotes will exploit new available items such as pet food, garbage, and domestic cats (Wine, et al., 2015) and synanthropic rodents and birds (Bateman & Fleming, 2015). Bateman and Fleming (2012) cite studies that reveal 1-13% of urban coyote diets consisting of domestic cats. In the Chicago metropolitan area, coyote scat analysis revealed 42% rodents (Bateman & Fleming, 2012). In Chicago, deer remains an important food source as well, with vehicle collisions as the main cause of deer mortality, coyotes readily have a source of carrion, and as in elsewhere, depredation of fawns in the spring is common (Bateman & Fleming, 2012). The absence of larger predators has allowed urban coyotes to dominate food webs (Wine, et al., 2015).

In addition to the coyote's flexibility in diet, its ability to alter its activity patterns in relation to human presence has allowed the coyote to exploit urban areas of higher human activity. Coyotes in urban areas exhibit a nocturnal activity peak, whereas those coyotes inhabiting less developed areas typically exhibit crepuscular peaks of activity (Gehrt, et al., 2009; Wine, et al., 2015).

Coyotes have also been tracked moving quickly in areas of high human presence to increase their chances of being undetected.

Urban coyote habitat preferences

Urban coyote ecology studies using radio-telemetry, camera traps, and citizen science has revealed habitat preferences. Coyotes prefer the presence of natural vegetation, which they use as refuge, concealment, and source of prey (Wine, et al., 2015). Studies of coyotes in Tucson, Cape Cod, Denver, Chicago, and Mecklenburg County, North Carolina reveal the land use categories favored by urban coyotes as altered open spaces, especially golf courses and cemeteries and undisturbed natural areas with forest canopy cover (Gehrt, et al., 2009; Magle, et al., 2014; Wine, et al., 2015). In general, coyote population densities tend to be higher in urban areas when compared with densities in rural areas, most likely due to their ability to exploit the additional food resources available in urban areas (Bateman & Fleming, 2012).

The habitat land types least likely to be selected by urban coyotes are those that are highly developed, showing a preference to avoid humans. Even for those coyotes with home ranges that were predominantly developed, coyotes generally avoided those areas associated with humans (Gehrt, et al., 2009). Urban coyotes that resided in large parks, typically avoided trails and areas with human activity (Bateman & Fleming, 2012); Magle, et al. (2014) while using camera traps in Chicago to study coyote and deer distribution and relationships, also revealed a negative relationship between coyote occupancy and those areas where cameras revealed the presence of humans and dogs. Coyotes in Chicago were more likely to be found further from the urban center, where housing density and road density is lower (Magle, et al., 2014).

Human-coyote conflict: Can citizen science help?

New York City area

Citizen science in the form of surveys has been used to map the occurrence of coyotes as well as predict possible hot spots of conflict. Weckel, Mack, Nagy, and Christie (2010) distributed surveys to schoolchildren, from kindergarteners to high school seniors, in Westchester County, New York, a northern suburb of New York City. The survey directed the participant's parents to the project website, Mianus River Gorge Preserve Backyard Coyote Project, which provided information regarding the project, coyotes, and how to identify them (Weckel, et al. 2010). The researchers were able to map human- coyote interactions (HCI) this information is valuable to managers for targeting outreach education for how residents can minimize conflicts (Weckel, 2010). Other similar projects in the northeastern US include the Narragansett Bay Coyote Study, The New York Suburban Coyote Study, and the Gotham Coyote Project (Weckel, et al, 2010).

Nagy, Weckel, Toomey, Burns and Peltz (2012) used camera traps to map coyote distribution in parks in Westchester County, NY and one park in Bronx, NY. The Gotham Coyote Project is tracking the occurrence of coyotes as they travel through New York City. Currently there are no breeding pairs of coyotes on Long Island, but Weckel believes that coyotes making their way through New York City will eventually settle in Long Island next (personal communication, January, 2015). Nagy, et al. (2012) believe that following the movement of coyotes from Westchester County (suburban) through New York City (highly urbanized) and into Long Island (suburban) offers a unique opportunity to view the range expansion of coyotes.

Using stakeholders in the process helps educate the public about conservation plans and management, and they may be more receptive to policy when they have a hand in collecting the data (Weckel, et al., 2010; Nagy, et al., 2012). Weckel, et al., (2010) believes that using citizen scientists offers advantages such as obtaining information from owners of private properties that may be difficult to obtain access to otherwise, and acts as a bridge between scientists and the local community – which Miller, et al. (2012) complained most scientists fail to achieve.

Denver

Surveys also offer the opportunity to learn the attitudes and views of residents towards the presence of coyotes near their homes, as well as views towards management options. Vaske and Needham (2007) surveyed residents within the South Suburban Park and Recreation District in the Denver metropolitan area to find their views on lethal management of coyotes. The results of the survey revealed that the largest segment of the public (42%) believed that lethal management was acceptable only under certain conditions, such as a pet being injured or killed; 23% displayed protectionists views believing it was unacceptable under any conditions; while 35% of the public believed it was acceptable to use lethal management (Vaske & Needham, 2007). Knowledge of the views and attitudes of residents of an area assist managers with how to best deal with and resolve conflict situations.

Poessel et al. (2013) used reports of coyote sightings and conflicts to reveal seasonal patterns of human-coyote conflicts in Denver, with peaks of observations and conflicts, including pet attacks, occurring during winter (December- March). Poessel et al. (2013) cite that in Chicago coyote attacks on dogs peaked during the winter as well during the period 1990-2007. Poessel et

al. (2013) posit that seasonal patterns of conflict occur due to coyotes increasingly entering more developed areas in search of food during the harsher winter months, and coyotes becoming territorial and aggressive during breeding season. The increase of coyote observations could also be due to the marked decrease of vegetative cover during winter months, making it easier to spot coyotes. Poessel et al. (2014) see coyote conflicts with pets as an emerging problem for urban managers, and that understanding the patterns can help target outreach, education and other management options to mitigate conflict.

Chicago

Gehrt, et al. (2009) claim that few coyotes in Chicago were reported as nuisances and nearly all those that were involved in conflicts were revealed as sick (e.g. mange) or had been exposed to humans feeding wildlife. Some populations of coyotes are becoming desensitized to humans, showing less fear and displaying more aggressive behavior (Bateman & Fleming, 2012; Wine, et al., 2015). Bateman and Fleming (2012) believe that the increase in carnivores present in urban areas will continue, but others suggest that overall carnivore diversity will most likely decrease due to future human action.

Management implications: How to prevent human-coyote conflict

For those urban areas in which coyotes are suspected or predicted to appear, but have yet to be reported basic coyote education should prescribed to inform the public. For those areas in which there is a high prediction of human- coyote interaction, then educating residents of precautions and steps they can do is in order. The New York State Department of Environmental Conservation offers recommendations to reduce and prevent coyote problems (NYSDEC,

2015b). Many other state wildlife agencies offer similar information, as well as other organizations such as the Project Coyote, (projectcoyote.org) which promotes coexistence. The best tactic is to be proactive, keeping coyotes that venture and colonize urban areas behaving as normal as possible, that is to keep them afraid of humans, and otherwise not *inviting* conflict.

Precautions include:

- Do not feed coyotes
- Remove attractants such as unintentional food sources
    - Do not feed pets outside
    - Secure garbage and compost

- Do not allow coyotes to approach people or pets.
    - "Haze" coyotes near homes and community spaces.
    - If you see a coyote, be aggressive in your behavior, be big and loud, wave your arms and throw objects towards it.

- Supervise children outdoors, teach them to appreciate coyotes from a distance
    - Supervise pets outdoors
    - Keep cats indoors (helps birds too!)
    - Walk dogs on a leash
- Talk to your neighbors. Ask them to follow the same precautions.
- If you encounter a coyote(s) exhibiting "bold" behavior and expressing no fear of humans contact your local police department and wildlife agency officer for assistance

Coyotes in the media

There have been many articles recently published in newspapers (e.g. The New York Times) and on the internet raising public awareness and promoting coexistence. It is easier to educate the

public and promote coexistence before a wildlife encounter, than after a negative incident. A recent article in The New York Times, by Lisa Foderaro (March 6, 2015), sent the message to New Yorkers that yes, there are coyotes in New York City, and if you catch a glimpse of one consider yourself "lucky Enjoy how special it is". It is important to take advantage, proactively to persuade those individuals which may otherwise not have set opinions, positive or negative, towards wildlife and promote tolerance, coexistence and to be accepting of wildlife before the typical fear-mongering mass media we experience daily on TV paints a negative picture of wildlife.

Conclusion

To help preserve the world's biodiversity it will become increasingly important for humans to become more tolerant of wildlife. It will be increasingly important to conserve and restore natural spaces in our urban areas. Studies of urban ecology and the occurrence of carnivores in urban areas have important implications for application elsewhere such as biodiversity hotspots. Surveys of public views and attitudes are important to use as a gauge for targeting outreach and education to promote coexistence. We must also be cognizant of how issues and potential conflict are framed, such as use of the term '*conflict.*' Is reported human-wildlife conflict, *true* conflict or is the mere observation of a wild animal, behaving normally, reported as conflict?

The use of citizen science in studying wildlife, urban or otherwise, is extremely valuable, as it educates the public about wildlife conservation and can positively affect and influence the acceptance of future conservation and management policies. Citizen scientists also offer researchers 'inside' possibilities and observations that may otherwise not be available.

Just as many of the precautions suggested to prevent human-coyote conflict are pro-active, this approach is best when dealing with any potential human-wildlife conflict. Education is pro-active; promoting awareness mitigates potential 'human-wildlife conflict', whether it is animal damage, threats to safety, human-human conflict or true human-wildlife conflict.

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