Being Coyote-Smart: Developing a Rapid Assessment Protocol to Aid Coyote (Canis latrans) Management in NYC

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Abstract
We developed a pilot coyote (Canis latrans) rapid assessment protocol (Crap) to rapidly survey various public parks in the Bronx, NY for potential human-coyote conflict. We collected data on fences that could be either attractive or repellant, garbage, natural cover, and water and human use patterns. We used rapid assessment protocols (Raps) in other areas to identify priority areas for coyote management including education. This system allows for more efficient use of limited resources in coyote management and education in NYC. A map of priority sites for increased coyote management was created through ArcGIS. Finally, we conducted management recommendations for coyote-human conflict in NYC. The rapid assessment protocol Crap was used to identify priority areas for coyote management including education. This system allows for more efficient use of limited resources in coyote management and education in NYC. A map of priority sites for increased coyote management was created through ArcGIS. Finally, we conducted management recommendations for coyote-human conflict in NYC. The rapid assessment protocol Crap was used to identify priority areas for coyote management including education.

Results
We visited 11 different parks and assessed 36 sites (Table 1). Site conditions included well-maintained parks (both active and passive recreation), golf courses, seawall maintenance, grasslands, and woodlands. Overall, Crap identified larger tracts of wooded areas (PB08, PB07, PC01). Table 1 had lower risk scores in general. Open well-maintained parks (both passive and active recreation) that were adjacent to large natural areas scored the highest risk (BMP, SM03, BQ02). Only three sites (8.3%) out of 36 had covered garbage containers effective at keeping out coyotes. 22.0% of sites (11 of 50) contained large amounts of human-excreted food waste found on the ground. The resulting map of overall risk scores indicated areas that could potentially be at higher risk for human-coyote conflict (Map 1).

Discussion
This was a pilot study to determine if the Crap could be a useful tool to help wildlife managers to rapidly identify sites for prioritizing coyote management and education. It is important to note that the risk scores predicted by the Crap are relative to other sites and should not be considered a ‘universal’ or ‘absolute’ prioritization tool. This system allows for more efficient use of limited resources in coyote management and education in NYC. As shown on the Map (1), we found that three lowest risk scores were associated with large, relatively intact natural areas like woodlands and grasslands. However, the highest risk scores occurred in the heavily used by humans and well-maintained sites adjacent to large tracts of natural areas. These sites were used for both passive and recreational purposes and usually contain a green buffer area between the denser forest and more urban environments. The presence of nearby roads also increased risk through vehicle collisions.

The natural areas were relatively safe habitats for coyotes where they could largely go undetected because of high vegetation cover and relatively small population levels. Well-maintained tracts have been used for passive and active recreation and adjacent to natural areas within the city. Coyotes may use these for food sources. However, areas with higher risk scores should be avoided by children and adults.

Management Recommendations
1. Intentional or unintentional feeding of coyotes may lead to coyotes associating humans with food or habituating to human environments. Fences should include wire, and there should be no food or garbage left near coyote-scavenging areas. Garbage should be securely put away to prevent human-coyote conflict.
2. People on-leash: Coyotes are undisturbed by people on-leash. Coyotes may use these for food sources. However, areas with higher risk scores should be avoided by children and adults.

References

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Introduction
Coyote (Canis latrans) populations in North America have expanded their range and habitat over the last 50 years despite persistent efforts to kill them. Along their way, coyotes in the eastern U.S. have hybridized with grey wolf (Canis lupus) and eastern wolf (Canis lupus lycaon) and domestic dog (Canis lupus familiaris; Morin et al., 2014). Fast forward to today and coyotes are full-time residents in urban environments (Safrit 2004; the New York City coyote population). Research across the U.S. has found that this trend has become more widespread, as coyotes have found homes in urban parks and residential areas where they scavenge for food, build dens, and breed. Many notable research studies have shown that their home ranges can overlap both urban and rural coyotes, with four to five square miles, and solitary coyote home ranges averaging up to twenty-five square miles (Safrit 2007). This can lead to habitat loss in urban environments.

Continued research into the behavior and ecology of urban coyotes NYC is integral to the safety of the public and coyotes. Recognizing a clear need to develop wildlife management plans to mitigate the risk of human-coyote conflicts (Trone et al., 2012), we developed and tested a rapid assessment protocol (Crap) that identifies priority areas to implement preventative management measures. We used camera trapping and presence data collected by the Gotham Coyote Project to identify parks in the Bronx with high coyote densities in the year 2014. The rapid assessment data was collected as an extremely helpful tool for wildlife managers to identify high-risk coyote conflict areas and to prioritize management and education efforts. Our goal is to help create a coyote-smart NYC through a better understanding of coyote and human behavior.

Methods
We performed rapid assessments of site conditions in parks and natural areas where there are known resident coyotes (Nagy et al., 2010) within the Bronx, NY. The ongoing coyote presence was verified by camera trapping data collected by the Gotham Coyote Project. The coyote rapid assessment protocol (Crap) was developed from similar rapid assessment protocols used by the Natural Resources Group of the New York City Department of Parks and Recreation.

We collected information about potential physical, natural, and human-made features in the site that may be attractive or repellant for coyotes and increase the risk of human-coyote conflict. Sites within each park were identified through satellite imagery obtained from Google Earth. Preliminary boundaries for the site were drawn on a map before field visits. During the field visit, we collected data for both buffer and field conditions.

In buffer conditions, we collected the following information:
- Land use pattern (% residential, commercial, parks, roads)
- Presence of garbage (including types, size, and condition)
- Presence of water bodies (natural and man-made)
- Presence of garbage or human source of food (flea, cat food, etc.)
- Presence of natural vegetation (% woodlands, grasslands, wetlands)
- Presence of tree cover (% evergreen, deciduous, height)
- Presence of garbage or human source of food (flea, cat food, etc.)
- Presence of human activity (% use by people)

In site conditions, we collected the following information:
- Land use pattern (% residential, commercial, parks, roads)
- Presence of garbage (including types, size, and condition)
- Presence of water bodies (natural and man-made)
- Presence of garbage or human source of food (flea, cat food, etc.)
- Presence of natural vegetation (% woodlands, grasslands, wetlands)
- Presence of tree cover (% evergreen, deciduous, height)
- Presence of garbage or human source of food (flea, cat food, etc.)
- Presence of human activity (% use by people)

In addition, we briefly interviewed park visitors and NYC Department of Recreation staff members to obtain additional information about coyote behavior.

We gave each of our parameters a ‘risk score’ that indicated its potential to increase negative interactions between coyotes and humans. Risk score assessments ranged from 1-9 (low to high). Certain parameters like open spaces of food were given high risk scores. Risk scores were also higher depending on the likelihood of humans to be present. For example, the presence of apartment buildings was scored higher than the presence of single or dual family homes. Natural areas (woodlands, wetlands, grasslands) had lower risk scores because humans were less likely to visit these areas than urban-manicured parks.

Risk scores were generated for each site assessed by the Crap. The scores of each site were color-coded and displayed on a map generated with ArcGIS.