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# An Evaluation of Aggressive White-tailed Deer Behavior on a College Campus

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**ABSTRACT:** The Berry College campus has a population of white-tailed deer habituated to the presence of humans. One area of the campus contains residential houses, and apartments for faculty and staff. In this area, there have been numerous anecdotal reports, as well as photographic and video evidence, of white-tailed deer exhibiting aggressive behavior, particularly toward dogs being walked on leashes. In addition, deer following individuals or circling humans at a distance, making them uncomfortable, have been reported. The objective of this study was to document and establish the locations, frequency, and types of behaviors exhibited by deer in response to humans walking with and without leashed dogs. During the summer of 2019, a total of 13 instances of aggressive behavior were encountered by residents of the area and the investigators. In a majority of the events, ( $n = 12$ ), deer would follow individuals with their dogs an average distance of  $212.7 \text{ m} \pm 24.8$  (100%), circle in front of the individuals, and stop in the walking path (50%), forcing them to turn another direction or be subjected to warning snorts or grinding teeth (33%), and/or pawing behavior (33%). We had proposed to administer a negative reinforcement stimulus in the form of impact of a needleless paint-marking dart delivered by a tranquilizer dart gun. It was hypothesized that the negative reinforcement might reduce the likelihood of individual deer repeating the aggressive behavior. However, no deer presented the aggressive behavior when researchers were carrying the tranquilizer dart gun. The investigators are planning on continuation of this project in 2020.

**KEY WORDS:** aggressive behavior, deer, human-wildlife conflict, leashed dogs, *Odocoileus virginianus*, white-tailed deer

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## INTRODUCTION

Animal attacks on humans, particularly related to numerous species of carnivores in the United States, has included alligator (*Alligator mississippiensis*), cougar (*Felis concolor*), bear (*Ursus spp.*; Conover 2019), coyote (*Canis latrans*; Timm et al. 2004, Baker and Timm 2017, Conover 2019), various venomous and non-venomous snakes (Conover 2019), and raptors (Parker 1999). Similarly, extensive reviews of attacks involving African and Asian predators have also been reported (Kelly et al. 2019).

While perhaps less noted by media, attacks to humans by various bovidae and cervidae species have been documented as well. Attacks on humans by elk (*Cervus canadensis*; Conover 2019), moose (*Alces alces*; Conover 2002), American bison (*Bison bison*; Oliff and Caslick 2003, Cherry et al. 2018), and European bison (*Bison bonasus*; Haidt et al. 2018) have been described. The most frequent animal related injuries to humans at Yellowstone National Park since 1980, have been caused by interactions with bison (Cherry et al. 2018).

Regardless of species, the risk to humans encountering an animal attack has been reported to be very low (Conover 2019, Kelly et al. 2019). However, the potential of undesired human-wildlife interaction increases in areas where the habituation of wildlife to humans is reported to most frequently occur, such as in urban areas (Conover 2019) and protected rural regions, including national parks (Cherry et al. 2019) or similarly managed environments. While some instances of attacks on human can be attributed to being predatory driven (Conover 2002, Baker and Timm 2017, Conover 2019), territorial or defensive

actions are more likely the cause for numerous species including wild pigs (*Sus scrofa*; Mayer 2013), coyotes (Timm et al. 2004), various raptors (Parker 1999), elk (Cherry et al. 2018), moose (Conover 2002), and numerous other animals. In reported European bison attacks, 85% of the encounters were directly attributed to provocation by humans coming too close or directly attempting to scare the animals (Haidt et al. 2018). Similar reports of these types of human induced interactions were evident with bison (Cherry et al. 2018) and elk (Conover 2019) at Yellowstone National Park.

The white-tailed deer (*Odocoileus virginianus*) represents a conservation success story, existing at near extirpation levels in the early 1900s to more recent estimated numbers ranging from 10 million to 80 million in the United States (Adams and Hamilton 2011, Hanberry and Abrams 2019). Over two decades ago, it was predicted that, with the continued growth in the white-tailed deer population, overabundance would create significant challenges in the United States, particularly in urban areas (Warren 1997). While deer-vehicle collisions account for significant injury and mortality (Conover 2019), physical attacks by deer are not well documented.

Documented examples of attacks to humans by white-tailed deer are limited. Direct reports of mature deer exhibiting defensive or aggressive behavior toward humans have been reported, particularly in instances where fawns were being captured for research purposes (Garner and Morrison 1980, Grovenburg et al. 2009). Grovenburg and coworkers (2009) reported that aggressive behavior towards humans occurred 45% of the time when capturing

fawns. Confirmed injuries to 13 humans inflicted by white-tailed deer were reported at a university campus (Hubbard and Nielsen 2009). While some individuals indicated the presence of fawns in the area, only one report indicated direct contact with a fawn prior to the attack. In most instances, a doe stood on hind legs with flailing front limbs to deliver the attack (Hubbard and Nielsen 2009).

In the summer of 2018, a series of media reports from the Atlanta, Georgia area indicated numerous events of white-tailed deer injuring dogs in suburban areas (NBC News 2018). Beginning in 2017, anecdotal evidence of undesirable interactions with white-tailed deer became evident on a college campus in northwest Georgia. In no cases were humans injured. The Berry College campus, in Mt. Berry, Georgia, has a population of white-tailed deer habituated to the presence of humans. One area of the campus contains residential houses, and apartments predominantly for faculty and staff. In this area there have been numerous reports, as well as photographic and video evidence, of white-tailed deer exhibiting aggressive behavior, particularly toward dogs being walked on leashes. In addition, deer following individuals or circling humans at a distance making them uncomfortable has been reported. Therefore, the objective of this study was to document and establish the locations, frequency, and types of behaviors being exhibited by deer in response to humans walking with and without leashed dogs and administer an aversion stimulus to determine if non-desirable behavior could be prevented.

## METHODS

### Study Site

The Berry College campus encompasses 11,340 ha in Mt. Berry, Georgia. We conducted our study in a 25-ha area (34°17'00.80"N, 85°11'16.58"W; elevation: 187 m) that is located at the south end of the 170-ha main campus, adjacent to the city of Rome, Georgia. This area is characterized by the presence of numerous dormitories and academic buildings, roads, and parking lots typical of a college campus. In addition, over 20 single and multi-residential houses in the area are primarily occupied by faculty and staff. The landscape within the study area consists of expansive lawns containing fescue (*Schedonorus phoenix*), white clover (*Trifolium repens*), and Bermuda grass (*Cynodon dactylon*), extensive areas of horticultural gardens, as well as numerous species of native trees including pines (*Pinus* spp.), oaks (*Quercus* spp.), hickories (*Carya* spp.), and non-native trees.

This study, conducted between 15 May 2019 and 26 July 2019, was approved by the Berry College Institutional Review Board (IRB), the Berry College Institutional Animal Care and Use Committee (IACUC) and the Georgia Department of Natural Resources Scientific Collecting Permit (#29).

### Phase I

With the propensity of anecdotal evidence of undesired behaviors of white-tailed deer (e.g., verbal reports, photographic, and video recordings), a single-page questionnaire intended to identify locations, specific behaviors, and activities encountered was developed. This document was made available to the faculty and staff

residing within the study area. Based upon anecdotal evidence, a 25-ha area of the 170-ha main college campus was selected as the study site. An aerial photograph of the study site was used to further delineate the area into 12 evenly distributed regions of approximately 2 ha. A 2-km route, including sidewalks, lawn, and along the edge of paved roads that traversed the entire study area, was established.

A total of 60 laps around the established 2-km route were walked by investigators individually or in pairs in the morning hours (n = 30; 0700h-1000h) or in the evening (n = 30; 1900h-2200h). Those walks included investigator(s) only (n = 25) or investigator(s) with a single leashed dog (n = 35). Dogs used for this study belonged to investigators and included a terrier mix (10 kg), a border collie mix (25 kg), a Weimaraner mix (35 kg), and a great dane (50 kg). During each lap, observations recorded included environmental conditions, number of mature deer and fawns within given designated areas, any significant human activity, and any unusual behavior by deer.

The single page questionnaire was used throughout the duration of this study to record information related to any current undesirable deer encounters by investigators or residents of the area. Residents would typically report having an undesired deer encounter to a member of the research team. At that point, the questionnaire/document was sent to the individual for completion, or the investigators of the study completed it via telephone or personal interview. This information was utilized to identify both the undesired human-deer interaction as well as the most likely locations for these occurrences. Descriptive statistics including means, where appropriate, and frequencies of events were completed using IBM SPSS 226.0 (SPSS 2019).

### Phase II

Once a pattern and common conditions of undesirable deer activity was established, the objective was to administer an aversion stimuli in the form of a paint marking dart (Remote Marking Device-Type C; PNEU-DART, Williamsport, PA) containing 2 cc livestock marking paint (Liquid Prima Sprayon, QC Supply®, Schuyler, NE), projected from a tranquilizer dart gun (Model 193; PNEU-DART, Williamsport, PA), to any deer that intentionally blocked the path and/or approached an individual with a dog from the front. In addition to the negative stimuli of the needleless dart contacting the animal, the paint marking, a 20 × 20-cm cross pattern, would further help identify offending animals. To accomplish the administration of the aversion stimulus, a single investigator carried the dart gun with the paint marking dart, while a second investigator handled the dog on a leash and collected data, during a total of 16 laps around the 2-km established pathway.

## RESULTS

Investigators completed 60 total laps of walking around the designated 2-km path through the experiment site, without a dog (n = 25) and with a dog present (n = 35), recording an average  $15.3 \pm 1.4$  deer/lap, consisting of mature deer ( $10.4 \pm 1.1$ ) and fawns ( $4.8 \pm 0.5$ ). Virtually all mature deer encountered were does. Only on rare

occasions were bucks observed within the study area. The highest average number of deer recorded during the walks ( $9.8 \pm 1.0$ ) occurred in the 2-ha quadrant in the NW corner of the 25-ha study site.

During this experiment (15 May 2019 to 26 July 2019), a total of 13 aggressive deer behavior events were reported. Among those encounters, only one event did not involve a leashed dog. In this encounter, a mature doe followed a couple and a child in a stroller for more than 200 m. The human adult male charged the deer to encourage the animal to leave the area. While anecdotal reports from previous years indicated aggressive deer behavior toward humans walking alone, none was reported by cooperative faculty/staff members living in the area, or by the investigators completing 25 walks around the 2-km circuit encompassing the study area.

Among the deer encounters recorded involving dogs ( $n = 12$ ), ten were reported by faculty/staff collaborators, while the remaining two encounters involved investigators on separate occasions. Typical characteristics of the deer-human encounters are presented in Table 1. Among the events, 58% ( $n = 7$ ) involved a single human with a leashed dog(s), while remaining encounters 42% ( $n = 5$ ) involved two individuals with dog(s). Encounters including a single dog ( $n = 8$ ) occurred in 68% of the events and two dogs ( $n = 4$ ) occurred 32% of the time. The sizes of dogs ranged from 9 kg to 50 kg. In all cases, deer followed the person(s) and leashed dog(s) an average of  $212.7 \text{ m} \pm 24.8$ , often as close as 3-5 m. In approximately half of the events, deer would circle in front of the individuals and block the pathway. In most instances, individuals reported changing their course of travel to avoid the animal. In at least one case, a doe blocked the path of an individual with a dog. The person reversed  $180^\circ$ , only to have the deer follow and block the path a second time. During the encounter with one of the investigators, walking with a 50-kg great dane, the individual continued to walk toward the deer that was blocking the travel route. The deer yielded with a snort/blow and left the area when the individual and dog were within 5 m of the animal. While deer presented other behaviors, including defensive stomping of the feet and grinding of teeth, in no instance was it reported deer directly engaged a person or the leashed dog. While not occurring among collaborators of our study, anecdotal evidence of deer injuring dogs with front hooves has been suggested.

**Table 1. Activities of white-tailed deer exhibiting aggressive-type behavior toward humans and leashed dogs on a college campus.**

Event	Number of Events (n = 12)	Percentage of Encounters
Following	12/12	100%
Circled and Blocked Path	6/12	50%
Stomped Front Foot	4/12	33%
Vocalization (Snort/Grinding Teeth)	4/12	33%
Pinned Ears	1/12	8%

## DISCUSSION

The results of this study are in contrast to those presented by Hubbard and Nielson (2009) where deer initiated direct attacks on humans, also on a college campus, resulting in 13 individuals being injured. It was also reported in that study that fawns were observed in the area. It was suggested that defensive behavior was being displayed by does to protect fawns (Hubbard and Nielson 2009). In the current study, there was no evidence to suggest does were protecting fawns. It should be noted that participants, to our knowledge, did not directly approach or attempt to handle fawns.

There are significant reports of territorial or defensive actions resulting in unfavorable wildlife-human encounters, including wild pigs (Mayer 2013), coyotes (Timm et al. 2004), various raptors (Parker 1999), elk (Cherry et al. 2018), and moose (Conover 2002). Unfavorable encounters that resulted from provocation by humans has been reported in European bison (Haidt et al. 2018) as well as American bison (Cherry et al. 2018) and elk (Conover 2019) at Yellowstone National Park. At least one of the white-tailed deer encounters leading to human injury on a college campus did involve an individual handling a fawn prior to the attack (Hubbard and Nielson 2009). Similar defensive behavior was reported when white-tailed fawns were captured and handled to accommodate a research project (Grovenburg et al. 2009).

Virtually all anecdotal and documented aggressive deer events at the current study location occurred during the summer after fawning has been completed. During this time, does and fawns are readily observed within the study area and the entire campus. This may be due to numerous feed resources provided on the campus in the forms of extensive lawns and gardens, and perhaps less predation by closer association to humans. The summer is also the period where greater activity by humans in the form of morning and evening walks would occur, thus increasing the opportunity for deer-human interactions. In the current study, investigators completed 60 total laps around the established 2-km path through the study area, with and without dogs. On many occasions, investigators traversed between does and fawns without eliciting any observable action beyond being watched by does. On some occasions, no discernable observation of does was visibly expressed. On occasions where discernable observations were made, deer followed humans and dogs for over 200 m before either leaving or blocking the direction of movement.

It is significant that 10 of the 12 reported events were all initiated within the NW corner of the 25-ha area. On two occasions, the same individual deer followed investigators with a dog for approximately 20 m and 30 m, respectively, but then stopped the pursuit. These were the only events when investigators were carrying the dart gun with the paint marking dart, where deer encounters were initiated. However, the deer failed to block the path of the investigator and thus did not receive administration of the paint marking dart. With most events initiated in the same general area, and the investigators followed briefly by the same animal in that area, it would seem likely that only a few individual animals are directly involved in the observed aggressive behavior.

The undesirable aggressive behavior by deer during these encounters would seem to be best classified as being territorial in nature, but perhaps differs from those described for numerous other species (Parker 1999, Conover 2002, Timm et al. 2004, Cherry et al. 2018). In this case (Mayer 2013), deer appear to be exhibiting a defensive territorial behavior, expressed primarily toward dogs on leashes. Resident deer in this environment present very different responses to dogs on leashes versus those off-leash (pers. observ.). While dogs are required to be on-leash on the college campus, dogs not on leash tend to evoke more intense observation and often flight response by deer. Dogs on leash pose no direct threat to the deer and often display no observable concern. In the current study, deer may be expressing a more opportunist, selective territorial display of aggression toward leashed dogs. Based upon observations and experiences, leashed dogs represent little threat, and the animals as well as humans can often be readily intimidated. Similar selective territorial aggression may be expressed by domestic animals such as goats.

Due to the academic schedule and requirements to prepare for the fall semester, this study was terminated at the end of July (2019), without application of the paint marking dart to deer eliciting the undesirable behavior. It appears that the encounters are relatively rare and have not caused any human injuries. With most aggressive deer events occurring in a specific area of the campus, it is likely that a few deer are primarily involved in the events. The investigators are planning on the continuation of this research project in 2020.

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