Mule Deer Aversion Conditioning - Feasibility Assessment and Methodology in the Town of Okotoks 2022

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Executive Summary

Mule deer have been an ongoing concern in the town of Okotoks for many years. While many town residents find the deer an attractive feature of their day-to-day lives, many other town residents have expressed concern over uncomfortable encounters with deer, attacks on pets by deer, collisions or near collisions with deer on the roads and the destruction of private property by deer eating plantings and trampling upon flowers and vegetables. These concerns have led to an action plan by the Town of Okotoks to seek solutions whereby the residents and deer can better co-exist.

In 2021, an Urban Deer Task Force report was delivered to the Town of Okotoks outlining an in-depth study of the Okotoks deer problem. Some of the key features of this report were a general census of the deer population in town, a breakdown of the issues caused by the deer in town and a discussion surrounding possible solutions to reduce conflict between the deer and residents. Such solutions included but weren't exclusive to culling the deer population, relocating the deer, sterilizing the deer and aversion conditioning the deer. The report suggests that the most acceptable solution to reducing deer concerns was to create an aversion program. To this end, the Town of Okotoks engaged the services of Eagle Creek Wildlife Control Inc. to provide its own assessment of the problem and to recommend an aversion program, to offer a path forward for such a program and to estimate a cost for implementing an aversion/reconditioning program.

In the summer months of 2022, staff of Eagle Creek Wildlife Control undertook an assessment of the mule deer concern in Okotoks and determined that the best course of action for an aversion program would involve a 'gentle stressing by canine' program whereby a canine (dog) and handler, presenting a wolf-like 'stalking' scenario to the deer, provoke a mild stress response from habituated deer by simply maintaining an uncomfortable distance to the deer. This stress is constant and regular. The deer cannot rest and eventually feel that town limits are no longer the safe haven they have always found it to be. A biologist's study suggested that, although the deer often commingle, an aversion program can focus on individual clusters of deer in separate problem areas as a possible path forward. A technician with experience in deer reconditioning by dog provided input on methodology, and an additional technician reported on support methods to increase the overall effectiveness of the aversion/reconditioning program.

The following is a detailed examination of that assessment and recommendations:

Justification for Program

The mule deer is a large ungulate native to the prairies of North America. It is distinguishable by its large ears which resemble those of the mule after which it was named. The species is one of two deer commonly found in southern Alberta, the second of which is the white-tailed deer, so-named because of its large white tail that rises like a flag as a warning when danger is near. White-tailed deer are a more common species, and they tend to compete aggressively for habitat in areas where there is conflict. Therefore, hunting for mule deer is more tightly regulated and the deer has become a less common species for hunting in southern Alberta. One undesirable result of this change in conservation policy is that mule deer have become less afraid of humans, as they are rarely seen as a predator species in southern Alberta. This lack of fear of humans has led to increased human-mule deer conflicts.

In the town of Okotoks, Alberta, mule deer have begun taking up residence inside town limits, browsing on unsuitable vegetation such as juniper needles and processed foods, bedding down on residents' lawn, damaging trees through antler rubbing, regularly using roadways and pathways, reacting aggressively toward residents and domestic animals, depositing feces in parks and in playgrounds, drawing large predators into town limits and creating situations that are unsuitable for both the deer and the citizens of Okotoks in general.

Current estimates undertaken by Town staff and representatives of Eagle Creek Wildlife Control of the resident population of mule deer in Okotoks places the number of deer between 90 and 100. For a town with an area of approximately 20 square kilometres, this is a significant overpopulation (an area of 20 square kilometres would normally have a carrying capacity of 14-20 deer). This overpopulation creates some unique issues such as potentially allowing the rapid spread of disease between and among herds. The easy living environment along with a greater than usual supply of food leads to lower than normal fawn mortality and a more rapid population growth than would be sustainable in the wild. As generations of deer grow up habituated to humans and not facing the normal challenges of life in a rural setting, their ability to support themselves in the wild also decreases.

One significant concern for residents of Okotoks and the reason for this examination of a possible deer control program by the Town of Okotoks and Eagle Creek Wildlife Control is the damage mule have been causing to private property. Mule deer have been known to strip evergreen trees and shrubs as

high as they are able to reach when browsing. The deer have destroyed flower beds and vegetable gardens, and their beds, feces and urine have caused damage to lawns and parks. Residents of Okotoks should have a reasonable expectation to enjoy their property without undue concern about damage by wildlife.

Habituated mule deer tend to view humans as a non-threatening species and, therefore, have become comfortable in and around people; however, a doe with a fawn may become very defensive should a human with a dog get to within an unacceptable distance. This is because deer see pet dogs as predators just as they see coyotes and wolves as predators. Therefore, deer may attack a dog aggressively if the dog approaches to within an unacceptable range. The kick from a mule deer is capable of killing a domestic dog.

As the population of resident mule deer in the town of Okotoks continues to grow and as they vacate the surrounding countryside, the threat of large predators such as cougar and bear entering town limits while hunting mule deer increases. There are many concerns that may arise from this possibility.

The Town of Okotoks has begun exploring a program to recondition deer to avoid contact with humans and dogs and to see humans and dogs as an undesirable presence. This aversion-reconditioning program will assist with reducing conflict between humans/canines and deer. This program is intended to begin achieving results prior to the birthing season, thus avoiding the most sensitive times for humans and dogs to interact with deer. It is hoped that over time there will be fewer conflicts of any kind between the residents of Okotoks and the deer that reside in town.

The consultation provided by Eagle Creek Wildlife Control for the Town of Okotoks followed four stages: 1. Safety Assessment; 2. Biological Assessment; 3. Technician Assessment #1 and Dry Run; and 4. Technician Assessment #2. Although our assessment focused on the four areas identified above, a technician assigned to this program would be available to assist in any area of concern identified by the Town at any time during normal work hours and possibly on a call-out basis in an emergency situation.

The result of that work is as follows:

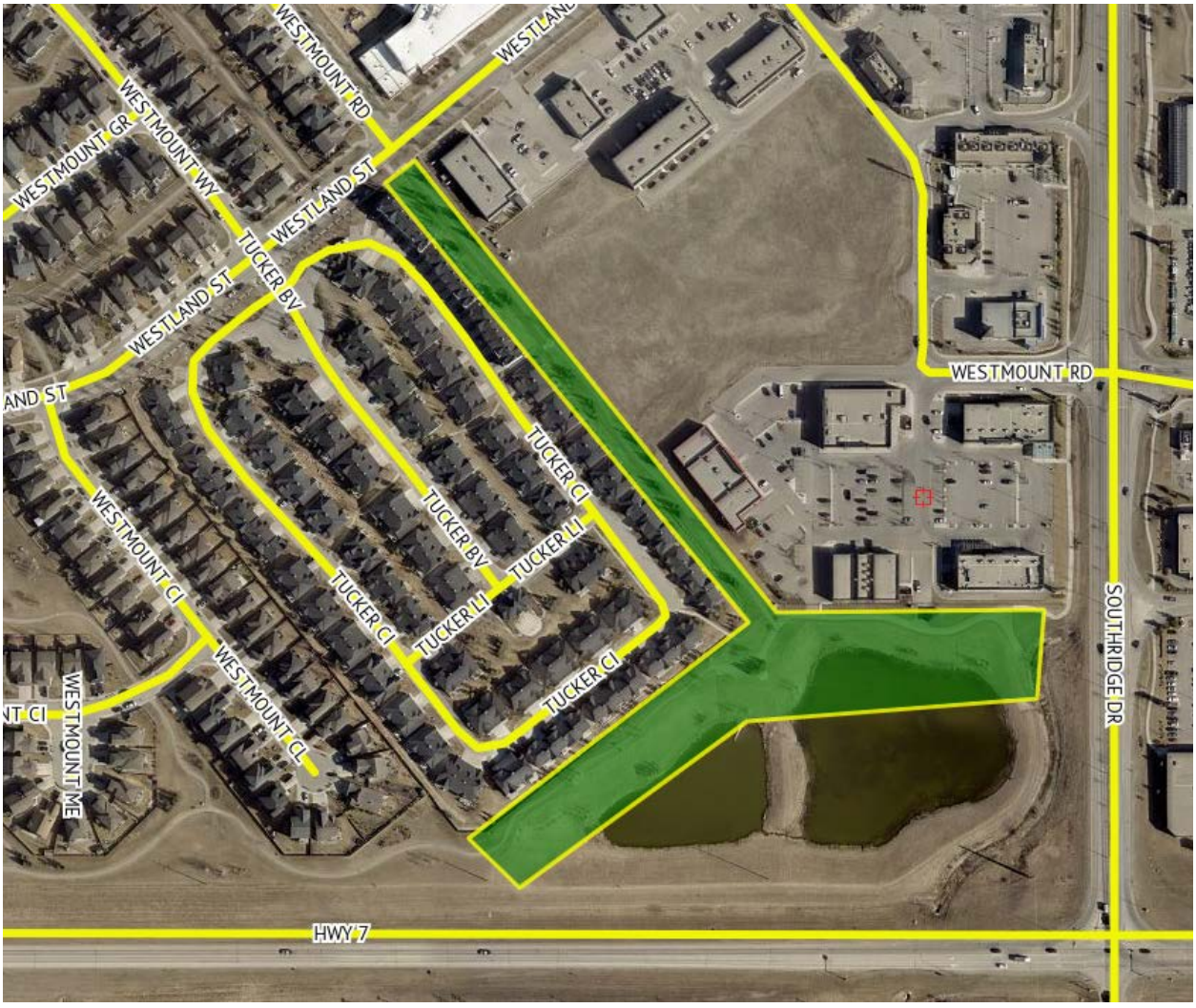
Worker Safety Assessment

On July 12, Eagle Creek CFO, Ron Hanson, and OH&S Officer, Aundria Hood, attended the town of Okotoks to assess safety concerns that could arise from staff and contractors undergoing a problem mule deer assessment and considerations for the development of a control program for the Town. The assessment has been divided into four areas of concern which we shall label zones 1 through 4. This labelling shall remain consistent throughout this report.

Zone 1 **Cimarron**

The ravine is a somewhat rugged, but generally the zone is safe to traverse. As with all zones, proper footwear is recommended to help prevent slips and falls. It is fairly safe to move off the paved pathways along foot trails but watch for uneven ground.

Zone 2 – **Tucker Area**

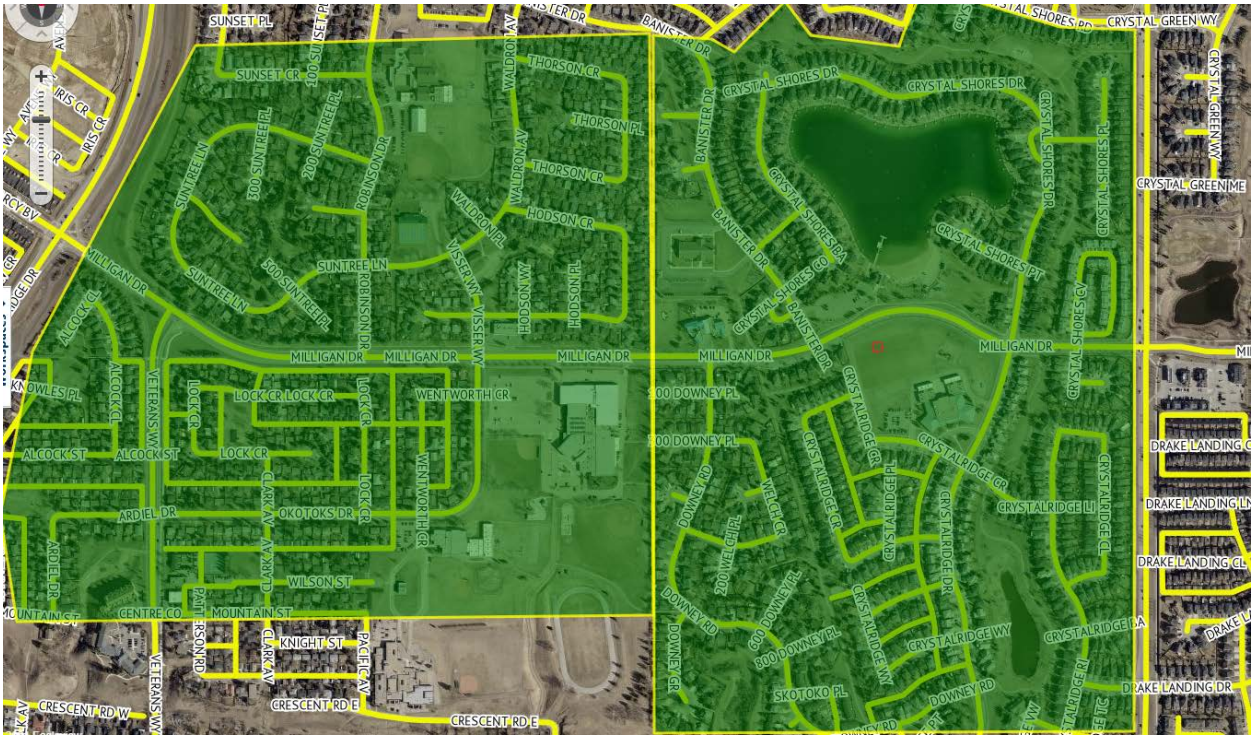


This is an area of least concern for safe travel. Care must be taken around the ponds. The area is the most open and level of all we examined and there are little to no traffic concerns.

Zone 3 – **Hunters Crescent Area**

The pathways run along the river. The larger area at the east end is a little rugged and hilly, but generally safe to travel especially along the established pathways. We followed the pathway outside the highlighted zone, and the pathway gets very close to the riverbank where it is very steep and potentially deadly. We recommend staying on the pathway should you travel in that location. I suspect conflict in this zone would arise due to the bottleneck. It seems likely deer would feel unable to retreat to a safe location when an encounter occurs.

Zone 4 – **North and South of Milligan Drive**



This is also rugged and somewhat rolling terrain, but there are no areas where we feel a life-threatening danger exists. It is a very residential area with some arteries of traffic to be aware of. There is a large stormwater pond in the north-east quadrant and a smaller pond in the south-east quadrant that requires safe practices around water.

During the following evaluations, a dog was used to help determine the practicality of the use of a dog for deer stressing and reconditioning. A dog was used only during Technician Evaluation number 1, and the dog was only used to determine how well it could move in and around the areas should it be employed to stress deer. Since a research and collection license had not been issued to the Town of Okotoks nor Eagle Creek, staff could not directly interact with deer during this process; however, our technician did report that the mere presence of the dog on a leash and behaving in an assertive manner provoked a moderate to strong response from those deer that she did encounter, causing the deer to become alert and to move away from the presence of the dog and handler in a controlled way.

Biological Assessment

Okotoks Mule Deer Summary for Eagle Creek Wildlife Control, July 13-15, 2022

R. Bjorge, M.Sc. Certified Wildlife Biologist

Background – Okotoks is a beautiful community of about 30,000 people, nestled in the Foothills about 30 km south of Calgary. The town has arisen on both sides of the Sheep River, a scenic river with extensive Cottonwood-dominated flood plains and, in most areas, a distinctive river valley. Wildlife, including mule deer, are common in this area and appreciated by residents. However, mule deer have become very common, causing a variety of concerns including aggressive behaviour towards dogs and occasionally people, the eating of plantings and other concerns. Accordingly, the town of Okotoks has established a relationship with Eagle Creek Wildlife Control for assistance and advice.

Mule deer have their fawns in the late spring and early summer and typically hide them for almost all of the first two weeks. After that, the fawns gradually begin traveling with their mothers. During this period, adult female mule deer tend to be more sedentary than at other times of the year. Mule deer does are much more aggressive than white-tailed deer in defending their young, especially when very young. Larger groups of mule deer are more typical in the fall and winter. Here deer may be more secure when associated with a group.

Study Area – Four priority areas within the town were chosen by Okotoks, based on past mule deer/human experiences. Photo maps of the four areas were provided to Wildlife Biologist R. Bjorge, by Ron Hanson by email on July 14, 2022. These sites were examined in Okotoks by Ron Bjorge on July 13-15, 2022, where details related to deer presence and use, suitability for mule deer, and aspects related to human use were noted. Fifty-two mule deer were observed. The intent was to be as hidden as possible while observing deer. Management approaches are suggested. Key observations are outlined below.

Zone 1 – Cimarron

This zone is mostly surrounded by homes in the Cimarron area of Okotoks plus a naturalized area (disturbed from natural state but replanted with trees and shrubs

and sometimes left partially un-mowed) and a schoolyard to the south. The most northerly edge is directly up against Cimarron Drive. This Zone contains the headwaters of two drainages, which seem to originate to the south and east of the mapped zoned area. There are remains of native vegetation (trees, shrubs, and forbs) within the drainages, but much of the zone (only 5-8 ha in size) consists of urban park, complete with paved trails, planted grass and trees. Recently an off-trail bike path has been built through this zone and park area, including portions of it running through the drainage bottoms. Beyond the zone proper, this naturalized area continues across Cimarron drive to the south-east, where some elongated wetlands (about 1 km long) are surrounded by natural and planted vegetation, as well as walking paths and homes. The north end of the zone is only 75m from the Sheep River Valley and connected deer habitat.

Several of the homes, particularly on the north-west side of the zone proper, have erected fences to keep deer out of their yards. The area is heavily used by dog walkers, walkers and on-path bikers.

Deer Observed – The entire zone was walked 3 times as well as the entire naturalized area that is associated with this zone. One smaller mule deer doe was observed on July 13 resting in the shade between a few trees in the zone and the immediate back fence of a yard in the north-west portion of the zone. This deer was one of only 52 deer encountered on the entire 3 days in Okotoks, which appeared bothered by my presence. She stood her ground, appeared agitated by moving both body and feet. As I backed away, she stayed put. Another observation was made on July 14 of a smaller mule deer doe (could have been the same one as seen the previous day) standing in the bottom of the most westerly drainage, only 100m from the July 13 observation. Fawns may have been hidden in the long grass.

No other deer were observed within the zone or the adjacent naturalized area on July 13, 14 or 15 when visited. Two vehicle drives along Cimmaron Estates Road (the adjacent wetland complex to the south-east) on July 13 and 15 did not result in any observations of deer.

Discussions with residents during my walk indicated that deer do indeed use the lands associated with the extended wetlands area to the south-east and that deer in larger numbers are more common in Zone 1 and the associated naturalized area during fall and winter.

The logical place for all deer coming and going from this general area is from the north end of Zone 1, which is only about 75m from the cottonwood dominated flood plain of the Sheep River.

Management opportunities. The limited natural vegetation and hiding cover, clearly can put these deer near humans and pets. This site would appear relatively easy to steer deer away from problem areas. These deer do have a corridor connection to the Sheep Valley through the north end of the zone, across Cimarron Drive There is no other natural corridor to and from this general area, which is mostly surrounded by homes.

Association with other groups of deer. These deer have ready access to the Sheep River Valley and would be associated with other deer that have access to this area. However, during certain times of the year, deer may spend considerable time in this area way from the Sheep River Valley and the deer that live there.

Zone 2 – Tucker Area

Zone 2 consists of naturalized land associated with managed storm water retention ponds and is on the southern edge of Okotoks. It is in the vicinity of 5 ha. There are a few trees, with uncut grass and some natural shrubs and other plants. A paved walking trail goes through the north end of the main part of the zone. This zone also includes a landscaped walkway extending northerly from the main part of the zone between the Tucker residential area and the shopping development to the east. The main zone is surrounded by major highways 2A on the west, and highway 7 on the south, with the Tucker residential area and the shopping development on the north. There is limited natural mule deer habitat here.

The area is heavily used by walkers, dog walkers, bikers, and others.

Deer observed. There were 14 observations of deer combined on July 13 and 15 in Zone 2 or the immediate vicinity. These included a large and a small mule deer buck, two observations of does with fawns (likely the same ones), 4 additional observations of mule deer does (3 of which were lactating) and two mule deer does across highway 7, immediately south of Zone 2. Of deer observations, the minimum number of individual deer would be 7, but the number of individuals was likely closer to 10. Clearly some observations were duplicated. It was thought that the fawns were just beginning to travel with their mothers.

Deer Use of the Area. Deer heavily utilized the Tucker residential area for foraging, shade, and cover, given the overall lack of cover in Most of Zone 2. They

also use the northerly portion of the landscaped walking trail frequently. From here they spread out to the residential areas. In the Tucker area, deer were seen on the street and sidewalk, lying between and behind the houses and in the green areas within the residential development. Deer were observed walking along the narrow part of Zone 2 extending to the north, a narrow area heavily utilized by residents. Two deer were also observed jumping the 1.25 m fence into the weedy area adjacent to the shopping development. The large mule deer buck was agitated by my presence and stood his ground by the fence in the weedy area. As I backed off, he jumped the fence into the walkway, walked through an open area of the fence into the back yard of a Tucker Close residence and immediately laid down in the shade, ignoring residents coming and going up the trail.

Deer trails were obvious leading from the storm water pond in Zone 2, southward to Highway 7. It is expected that many of the deer moving to and from Zone 2 travel from natural habitat across highway 7 to the south.

Casual conversation with several residents of the area, indicate that deer are very common. One mentioned that only a week or so ago, there were one or two aggressive deer in the Zone 2 which charged people and pets. Another mentioned how beautiful the deer were but wished they did not eat the flowers.

Association with other groups of deer. Of the 4 Zones inspected in Okotoks, deer in this location are the most separate from others. There is no direct natural habitat link to other deer groups associated with the Sheep River. The trails leading to and from Highway 7, and the presence of deer seen immediately on the south side of the highway, suggests that this is a common access route for deer in Zone 2. Alternatively, some no doubt wander through residential areas to the Sheep River valley, which provides connected deer habitat for most of the deer in Okotoks.

Management considerations. Highway 2A and 7, both heavily utilized highways, must be considered in looking at management opportunities. However, deer utilize the main portion of Zone 2 often, which are public areas with no residences. Redirection from residential areas to the main portion of Zone 2, might encourage these deer to move across highway 7, at their own pace. It is unlikely that deer would persist in this area much time, given the sparse cover and thus exposure to people, pets other human related disturbances. Direct stressing from the main portion of Zone 2 across highway 7, would be dangerous. Signage or some other form of education should be directed to help people give deer the right of way in the tight area between the shopping development and the backyard fences of Tucker Close.

Zone 3 – Hunters Crescent Area.

Zone 3 is immediately south of the Sheep River and immediately to the west of Highway 2A in the vicinity of the north portion of Hunters Crescent. It is less than 5 ha. Of the 4 Zones inspected, this one is the most connected to intact deer habitat in Okotoks. Thus, many deer have access to this area. Zone 3 consists of a narrow area squeezed between the street and walkway and the steep southern banks of the Sheep River. The area immediately adjacent to the Sheep banks is natural trees and shrubs, but it is a very narrow strip, about 10 m in some areas. The zone widens to include a portion of the natural cottonwood-dominated floodplain, bound by the river, Highway 2A and the easterly portion of Hunters Close.

This area is very heavily used by dog walkers, bikers, walkers, and others.

Deer use of the area. As indicated above, this area is highly connected to much other deer habitat in Okotoks and thus is accessible to many deer. Further the pinch point between the residential activity and the north bank of Sheep Creek, combined with both high use by deer and human use, makes this a prime area for close contact between mule deer and human residents.

A total of 22 mule deer observations were made in Zone 3 or within .5 km of connected habitat. These included 2 small bucks, one doe and two fawns, one doe with a yearling doe, one single fawn and 14 additional does. At least 3 of the does, other than the doe with fawns was lactating. In most cases lactation was difficult to determine due to high vegetation, poor light, or other factors. Nine of the 22 observations were within Zone 3 proper. Some of the observations may have been duplicates, but there are clearly significant numbers of deer in this area.

The main bridge over highway 2A has capacity for deer to pass underneath to provide free access down river. Direct observation and tracks indicate they clearly use this underpass frequently. There is excellent habitat across the river to the north, and inspections indicate an abundance of deer sign and observations of deer. Mule deer are excellent swimmers, and the river is often low so they can just walk across. There is also connected habitat upriver on the south side of the Sheep.

Clearly deer can come and go from this Zone with ease.

Association with other groups of deer. As indicated above, because this area is highly interconnected with other habitat in Okotoks, deer that frequent this zone will have an association with most other deer in Okotoks.

Management Considerations. Aversion should be directed towards identified problem animals. Given the abundance of suitable habitat in the vicinity, moving problem animals to a safe, natural site with food and cover would be a realistic goal. Perhaps signage or some other form of education should be considered for the restricted narrow area in the western portion of the zone to help people give deer the right of way in this restricted area. Some animals may show aggression simply because they are in such tight association with people and do not have an escape route.

Zone 4 – North and South of Milligan Drive

Zone 4 is unique. This is a large residential area with several hundred homes and little if any natural deer habitat. In addition to residences, there are large school and recreational areas, several churches and a senior's complex. Milligan Road and Veterans Way are two major roads in this area. Highway 2A is on the west side. Just beyond the south end of this zone lies the prominent escarpment of the north bank of the Sheep River valley. In some areas, it close to two hundred meters wide and in others it is narrower. Here there is natural cover in the form of trees and shrubs as well as grasses and forbs. This represents the only natural habitat observed in the proximity of Zone 4. However, the cottonwood-dominated floodplains of the Sheep River, and its associated connected habitat, is only about 350-500m to the south of the most southerly edge of this Zone. However, much of this is directly through downtown Okotoks, including main street and the rail line and there is no easy travel corridor through this area.

Deer use of this Area. Deer may have traditionally accessed this area from the north or across the highway from the north-west. However, areas to the north and north-west are currently under major construction, as the community expands. Access by deer via these routes would currently be challenging. There are deer trails leading north/south through the escarpment (as described above), suggesting that deer travel from the escarpment to and from the downtown area and presumably, down to natural vegetation along the river. No trails were observed leading to and from Highway 2A and the escarpment as it continues westerly, suggesting this is not a common travel area for deer.

Despite extensive searching, deer were only located in the very south-west corner of Zone 4 on Mountain Street (directly across the street from the escarpment). Here the escarpment is more than 200m wide and contains natural trees and other vegetation. Deer tracks and trails indicate heavy deer use. Twelve mule deer

observations included 5 small bucks, a doe and 2 fawns and 4 mule deer does. Given these observations occurred at 4 different times over 3 days, some deer were clearly observed more than once. At a minimum, there were 2 small mule deer bucks, a doe and two fawns and 1 additional mule doe. These deer were commonly bedded in front and back yards along Mountain Street. One small mule deer buck was observed resting in the shade under a large trampoline in a back yard. Two small bucks were observed moving from the escarpment area, across Mountain Street to lawns on July 14th.

Two other observations of deer were made, just beyond Zone 4. A mule deer doe was observed on the escarpment due west from Mountain Street, but across Highway 2A. Also, a mule deer doe was observed in downtown Okotoks in the middle of the hot afternoon on July 14, exiting a front yard directly across from Big Dipper ice cream shop.

Fencing designed to keep deer out of yards occurs here and there throughout Zone 4, indicating that deer have made their presence known. As there is almost no natural food in this Zone, deer dietary requirements will be coming directly from food items in yards, boulevards, and other areas.

Associations with other groups of deer. It is anticipated that deer in this area travel through the downtown area and east of the main downtown area to mingle with other Okotoks deer using natural habitat in association with the Sheer River. However, during certain times of the year a group may become 'homebodies' in this area and spend considerable time here in this residential area.

Management Considerations. The large size of this area could prove challenging, as deer may be hard to locate in backyards and there are few natural areas to steer deer towards. On the other hand, deer densities may be low here given the large size of the area and lack of natural food, especially in winter. One approach may be to steer deer towards open areas (school yards, recreational areas) and from there to natural areas. Given the possibility of low deer numbers, dog-walkers should receive education in some form to advise them to give deer the right of way when encountered at close range.

Conclusions

Mule deer in Okotoks are very comfortable living in close proximity to streets, buildings and people. The potential for conflict is evident, especially in areas with limited vegetation for cover or in confined spaces. Targeted education for residents walking or walking dogs in confined areas should be considered as well as a aversion/reconditioning program to discourage deer from frequenting key areas. Fencing to discourage deer from entering yards or from eating certain plants is obvious throughout Okotoks, and this should be continued and encouraged. Additional approaches may be recommended pending further assessment and research of approaches used elsewhere.

Technician Assessment #1 – Assessment for Use of Canine Stressor

Zena Leclercq. B.Sc. - Conservation Biology

Background

In North America, mule deer (Odocoileus hemiounus) have adapted to live in urban settings, resulting in human-wildlife conflict (Wright et al. 2020). The town of Okotoks, Alberta is currently experiencing an increase of human-wildlife conflicts. This has provoked safety concerns expressed from the residents of the municipality. Lacking a natural wariness to humans indicates the mule deer have become habituated to urban living. Displays of aggression between humans/pets and the mule deer have resulted in injury, damage to property and increased anxiety for some residents.

Effective management plans may include both conflict reduction strategies as well as population reduction strategies. This part of the report will focus on a single conflict reduction strategy, one that has been a personal practice of the author. This section of the report is going to identify best practice for the use of domestic dog(s) to mimic predation pressure applied onto urban deer population(s) of Okotoks, Alberta.

The town of Okotoks has defined 4 areas of concern where mule deer-human conflict persists. On July 23-24th, 2022 the sites were visited by Zena Leclercq and her stock dog, Jedd - a border collie. Having a history of sheep and cattle work, both handler and dog also have experience in wildlife control. Notably, the pair were part of the team that constructed and executed the (mule) Deer Aversion Program in Pincher Creek Alberta (2018-19).

Proposed methods

The proposed methodology to deer aversion/reconditioning through a handler and dog is to engage the deer in areas in which the deer are comfortable. The following outlines a proposed methodology to reconditioning the habituated urban deer of Okotoks Alberta:

- First scan the area. Is there a route available for the deer to move through?
- While bedding, foraging or not currently in any aggressive posture in sight of the handler/dog, the handler and dog should approach into the subject's

comfort zone until the deer is roused. This occurs when the deer cease their prior state and are looking at the handler and their dog.
- Stop advancing, do not put any more pressure on the subject.
- If the subject returns to its previous activity, the pressure should be put back on by slowly stepping into their safe zone once again.
- Repeat until the subject(s) have evacuated the site or until it is not safe to proceed.

It is expected that the repetition of this process will create enough stress that the deer move off. When the deer move to a new location, follow, and repeat the above process unless there is perceived risk to the technician, dog, deer or residents and their property.

In the event that the deer are not responsive to the approach of handler and dog, the pressure should be let off. The handler should watch the deer from a distance for 5 minutes. If the deer do not leave the area, the handler should approach from a new direction. If the deer are reluctant to move, they may not leave the area until the perceived threat is removed. Some deer are apprehensive and will remain in the safety of resident's yards or under vegetation cover until the pressure is relieved, and then they will make way into a safer area.

The technician that undergoes this proposed conflict reduction strategy must have a comprehensive understanding of deer behavior. This will reduce the risk of injury to the handler, dog, deer, to the surrounding residents and their property. Bardy
(2010) defines deer aggression as presented in the following forms: alarm posturing, snorting, standing on hind legs while flailing the front, charging, and charging with contact. To decrease the risk of predation, mule deer utilize their detection skills and rely on outrunning their predators (Schmidt & Kuijper 2015). Mule deer are known to exhibit auditory vigilance to avoid predation behaviors (Lynch et al., 2015). One indication a mule deer is becoming wary is when a deer pauses during rumination-based mastication/foraging. This is a sign that there is perceived risk (Lynch et al., 2015).

Proposed Routes of Safe Egress for Each Zone

Zone 1

Figure 1. Map displaying Zone 1's areas of concern for deer management Satellite image of Okotoks Cimarron area from google earth pro.

In zone 1, it is optimal to expand on the proposed zone area to the south-east where the grassy stretch intersects Cimarron Blvd. The handler and canine should begin here and walk along the east edge of the zone toward the north end where on the other side of Cimarron Dr is connected habitat along the Sheep River. The goal for Zone 1 is to make deer uncomfortable in their safe zones. They may chose to move toward the river valley, and so it is important to always be aware of the movements of people and vehicles in the area, though the objective is merely to make the deer wary around people with dogs and less comfortable in town limits.

Zone 2

Figure 2. Map displaying Zone 2's areas of concern for urban deer management Satellite image of Okotoks Tucker area from google earth pro

Zone 2 is bordered by two very active highway features immediately to the south and to the east. The proposed area to work the deer in behind the shopping centre, the pathway between Tucker residential and the ponds would best be started at the intersection of Westland St and Westmount Road. The handler and the dog would begin to walk the pathway leading toward SE to the ponds. The goal of this section of the route is to rouse any deer that are bedding behind the houses and Tucker Close in the minimal tree cover present. The technician must move at a cautious pace so as not to spook the deer into any flight scenario where they may run off into the shopping centre or crossing Highway Seven to the south.

The proposed expansion of the zone is represented in figure 2 in orange polygon. The expansion includes the area just to the south of the ponds as well as extending to the west the pathway continues bordered by Highway 7 to the south and Eighth Street East to the west. Utilizing more of this area will allow a better swath to include the deer that inhabit the communities of Westmount/Tucker. It can also be observed the expansion will allow for the deer to cross Eighth Street East westward with a greatly reduced risk of collision. Additionally, it is proposed that the

technician walk the natural space that occurs behind the residents of Westmount Place as it had deer sign and scat, though no deer were present during this assessment.

Zone 3

Figure 3 Map displaying Zone 3's areas of concern for urban deer management satellite image of Okotoks Tucker area from google earth pro.

Zone 3 is situated just south of the Sheep River, which offers a large portion to the south and north of connected deer habitat. The northern border of zone 3 is the Sheep River; the east is bordered by Highway 2A. The northeast portion of this is a cottonwood-dominated woodland that has a paved walkway going through the middle and several other well used paths used by both human and deer. Moving west from the woodland along the path the elevation increases, and the slope of the bank increases to a very steep aspect with a drop of more than 30ft in places. To the south of the path is Hunters Crescent. The far east end of Hunters Crescent transitions north-south. At this elbow of Hunters Crescent, there is a bottleneck on the walkway. The bottle neck occurs at the path immediately north of Hunters Crescent where exists a small, fenced-in playground that forces deer to move through the walkway or to traverse the steep embankment. On July 26th, one doe was met at this bottle neck. The doe moved behind the playground and proceeded down the bank into the cover of saskatoon shrubs in the river valley. This observation reinforces the recommendation that it could be the goal here to pressure deer to move into the valley where the deer are already established and likely to move. This is optimal, as the valley is immediately connected to

deer habitat. Expanding this zone from the elbow and Hunters Crescent to the pathway access on Sheep River Crescent would allow for an increased chance to come across more groups of deer that are associated with this zone.

Zone 4

Figure 4 Map displaying Zone 4's areas of concern for urban deer management. Satellite image of Okotoks Tucker area from google earth pro.

Zone 4 offers a complex assessment regarding solutions for urban deer conflict. Since zone 4 offers no reasonable way to oversee the entire area from an obvious lookout point, it is imperative that there is communication from residents, business owners, civic centre patrons and traffic passersby to facilitate an open data platform (reporting hotline) to submit dear observations within the area. If successfully implemented, an open data submission forum could be useful to understand the behaviors of deer that associate in this zone. This would provide information about the habits of deer in this zone improving the technician's ability to work the deer effectively in this area. Here, instead of zone expansion, I have highlighted internal areas that offer some desirable characteristic to the deer. The

map shown in Figure 4 represents zone 4 in its entirety. There are linear features marked by a teal line, some are arranged in a polygon shape. Until there is a better understanding of the behaviours of the deer that associate themselves in zone 4, it is proposed that the technician walk the areas highlighted by the teal lines (figure 4) in effort to disrupt their comfort in these natural areas. Central to zone 4 is Milligan drive. It is encouraged to use Milligan Dr as a landmark to section the zone into upper/lower sections. This will allow the technician to work the deer away from Milligan Dr either moving north or south.

Conclusion

Prey respond to perceived risk of predation according to the level of fear they experience (Laundre et al., 2010). Mule deer are known to resort to fight more often than flight due to their historical habitat in open areas whereas white-tailed deer are inclined to take evasive measures when a perceived risk of predation occurs (Lingle et al 2005). The inclination of mule deer to defend territory and protect their young elevates the need for technicians to be well versed not only in the behaviors of the deer but also the way dogs communicate fear, aggression and/ or apprehension. If a technician cannot correctly identify the dog's status (how the dog itself is feeling in the moment), the effectiveness of the program is lessened. Mule deer utilize their detection skills and rely on outrunning their predators to decrease the risk of predation (Schmidt & Kuijper 2015). In areas where residents have fencing in place incentives would be beneficial to enhance the height of existing fences. This is especially desirable in areas that shoulder the natural areas to extend existing fences to 8ft on level ground and 10ft on rolling terrain (VerCauteren et al., 2006). The implementation of the conflict reduction strategy outlined in this report will not supply a short-term solution to the legacy of mule deer habituation in the town of Okotoks. The effectiveness of any program aimed at reducing the aggression of the resident mule deer population within town limits is hinged on good communication amongst all groups involved.

Technician Assessment #2 – Alternative Means for Mule Deer Stressing

Technician Assessment #2 was a generalized approach to understanding and exploring possible alternative means of stressing deer in situations where the use of a dog may not be reasonable or possible for whatever reason. Our expertise in wildlife management has helped us to understand that there are often multiple means by which an end can be accomplished, and in the case of low-level wildlife stressing, we believe that a multi-pronged approach is generally the most effective. We are firmly convinced that the use of a dog over a long period of time is the *most likely* means to achieve the desired results; however, we also believe that the use of scent and sound deterrents along with the canine-stressing approach will add another dimension to the program, and improve the likelihood the deer will see humans and dogs as a presence to be avoided.

The sound and scent deterrent approach involves the use of scents such as wolf and cougar urine added to a scent post and placed in a strategic location where stressing a deer is desirable. This approach is often most effective when it is combined with a sound deterrent such as a cougar on the hunt call or a wolf call. Other such sounds may include a bear on the hunt call or a deer or fawn in distress call. Since cougars are a mule deer's most common predator in this area and cougars have been known to hunt in and around Okotoks, the use of cougar urine and cougar calls as well as the use of a fawn in distress will likely provoke the strongest response.

Our technician visited Okotoks on six separate occasions in July and August. His informal assessment indicated that there were several locations where the use of scent and sound deterrents would be ideal and where he found deer to be gathered and feeding or loafing. These locations include those where the terrain was difficult to walk for a dog with a handler and where deer might retreat to safety when stressed. By using scent deterrents and the occasional predator call in such locations, we may be able to decrease the deer's sense of security in town. We believe that the occasional use of scent and sound deterrents, especially in areas where the use of a dog may be more difficult, such as in dense brush or on steep slopes, will add an extra level of effectiveness to the overall program.

Options for Control

The town of Okotoks has undertaken a comprehensive review of most of the options available to it for the mitigation of mule deer damage and conflict. This report will not revisit all those options as most have already been established as impractical or unsuitable to this situation. This report will focus on the option for mitigation that we believe is the most acceptable to the Town and it's residents. This program is outlined below.

The Predator-Prey Mule Deer Stressing Program

Procedure

Prior to initiating a control program of any kind, the town must seek the advice of Alberta Environment and Parks – Fish and Wildlife Division regarding the legal issues surrounding deer reconditioning. The Town must also inform Okotoks citizens and notify Bylaw and the RCMP or whichever police service/s is/are responsible for law enforcement in the town. A research and collection licence will most likely have to be granted to the Town and the Contractor to enable interactions with urban deer. We also recommend establishing a citizen reporting hotline to help track deer movements and to help establish program effectiveness, and we further recommend that the Town implement a system whereby citizens can indicate that they are interested in the Contractor stressing deer on their property and to access their property for that purpose. Such a means might include the posting of a notification such as a flyer in the window indicating this authorization. Staff of Eagle Creek Wildlife Control will be available for all levels of consultation should our services be engaged.

Eagle Creek Wildlife Control will dispatch a trained field technician in easily identifiable company uniform and accompanied by a large dog on a secure lead into areas of the town where deer frequent or have been recently sighted. The technician and dog will wear high-visibility service vests. The dog’s vest will be sprayed with predator scent to increase it’s stressing potential.

The technician will approach the deer to within an uncomfortable range whereupon the deer respond by becoming alert, *but not immediately mobile*. The technician

will maintain that distance until the deer slowly begin to move to a new, stress-free location. The technician will permit the deer to move and become comfortable and the technician will then follow the deer and re-engage the stressing program. The deer will not be permitted to find respite for more than approximately 30 minutes at any time while this program is in place and the technician is engaged (during work hours). This process will be repeated regularly and consistently until the deer regularly see a human and/or a dog as an undesirable presence.

In addition to this gentle stressing program, and in situations where deer prove to be too difficult to stress from a safe distance, noise makers *may* also be employed to heighten deer anxiety. These noise makers will consist of blank caps or 'bear bangers', a safe-to-use pyrotechnical device that when deployed creates a loud noise designed to startle but not harm the deer.

As a further tool at our technician's disposal, Eagle Creek Wildlife Control also proposes the use of a compressed-air projectile tool. This tool will consist of a paintball gun operating on a compressed CO2 cartridge and firing a small, yellow nerf ball. This tool will only be used in the most difficult of situations, i.e., to deter a violent charge or other harmful contact with an aggressive deer. The paintball gun is a clear plastic toy that cannot be mistaken for an actual firearm. The nerf ball is small and yellow and will be collected whenever possible after discharge. Should the nerf ball prove ineffective, Eagle Creek proposes a step up to an actual paintball. Paint balls have a slightly greater range and a more effective impact potential, but it, too, is harmless to mule deer when fired from the paintball gun in our use and directed to a harmless point on the deer's body such as the hindquarters.

Along with the dog/handler stressing program, our technicians will also employ scent and sound deterrents where the use of these is most appropriate.

Eagle Creek Wildlife Control staff are always seeking new means to accomplish our goals, and to this end we will continue to research alternative means to improve the human/dog/deer dynamic in the Town of Okotoks so that all species are able to co-exist in the most peaceful manner possible. Any new methods we uncover will be approved by Town representatives before being adopted.

It is important to understand that one likely outcome of this program is that some of the Okotoks mule deer will vacate the town for the less-stressful environment of the river valley and outlying lands. For this reason, it is essential that all possible stakeholders be informed of the Town's intentions and be kept aware of the progress of the program should a program be engaged.

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