

COMPREHENSIVE DEER MANAGEMENT PLAN FOR LONG BEACH, INDIANA

Submitted by

Long Beach Blue Ribbon Deer Committee

March, 2022

This report is intended to help community leaders determine best practices for management of our Long Beach deer population, as well as to provide all readers with resources and links to solutions in various areas such as landscaping, driving and general interactions with our deer wildlife.

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SECTION I

HUMAN/DEER CONFLICTS

Community tolerance of the presence of deer The Indiana DNR uses two terms to describe a community's tolerance of deer:

Biological carrying capacity: The number of deer a given piece of land or ecosystem can support and have a healthy herd. It is directly linked to the amount of food available for a population of deer. More easily stated, it is the ability of a habitat to support a deer population.

Social carrying capacity: The number of deer desired or tolerated in a community. The social carrying capacity varies greatly by person and community. The range of tolerance can vary from rage at deer eating landscaping to enjoying their presence in yards and in the community. Some people want them killed. Others like to feed them to attract them and may actually think they are helping them not starve to death.

People's tolerance of deer depends greatly on whether or not they are experiencing conflicts with them and the severity of those conflicts. It is important to understand the difference between biological and social carrying capacity and the root causes of conflicts with deer (Urban Deer Technical Guide, Solving Problems with Deer).

Source of Human/Deer Conflicts

There are four major sources of human/deer conflicts 1) Deer eating landscaping (trees, shrubs, and flowers), 2) deer/vehicle incidents, 3) concerns about ticks and tick-borne diseases, and 4) aggressive deer behavior. Following is a discussion about these major conflicts and recommendations for addressing these issues in Long Beach. Detailed appendices are available at the end of this report that address how to protect landscaping and deer-resistant landscaping choices.

#1 Deer Eating Landscaping

Changing our landscaping and gardening choices to incorporate the fact that deer find some things tastier than others will help us create and maintain the kind of yard we want to enjoy and discourage deer from foraging in our yards. It is a behavior change on our part that still leaves us with a beautiful yard.

Ways to Protect Landscaping

Choose Deer Resistant Plants The old saying, "keep doing the same thing and you will get the same results" applies to landscaping choices. Hostas are beautiful and popular perennials used in gardens and landscaping. They are also popular browsing choices for deer. Residents can choose to protect hostas with fencing, scare-based devices, and/or repellents. Or, they can choose a plant such as catmint, which is a beautiful perennial with many of the positive characteristics of hostas - and deer have no interest in eating them. In addition, hummingbirds and bees are attracted to their purple flowers. Yellow finches are attracted to catmint when it goes to seed. Like hostas, catmint is easy to divide and replant. Other plant substitutes for hostas include ferns and coral bells.

Deer enjoy browsing on many of the carefully chosen and cared for ornamental plants, bushes, and trees gardeners use in their yards and gardens. A good way to minimize or prevent damage to landscaping is to replace plants deer like to eat with those they don't care to eat (See Appendix 1-A for books and online resources for deer resistant landscaping choices; See Appendix 1-B and 1-C for lists of plants deer do and do not prefer to eat). Although there are plants deer prefer not to eat, the less desirable plants may be browsed if food is scarce. At that time, additional measures may be necessary to protect landscaping.

Other Control Methods Highly desirable plants may be protected using a variety of fencing, scare-based devices and/or repellents. (See Appendix 1-A for books and online resources for fencing, repellents, and harassment/scare devices).

Fencing can be a very effective means of protecting landscaping. It is used to provide a physical barrier so deer cannot damage landscaping. It needs to be constructed and maintained properly for ongoing protection. Fencing options should never have spikes or spears on posts because deer can easily become impaled or become tangled. Fencing needs to be at least 9 feet tall to prevent deer from jumping over and should make solid contact with the ground to prevent deer from crawling under. The cost of fencing can be substantial, but can provide years of protection.

Netting is used to surround desirable plants and protect them from deer foraging. It is similar to deer fencing in that it provides a physical barrier between deer and the plants you want to protect. However, deer can become tangled in netting.

Repellents There are several repellent products that can be used by themselves, or (even better) in combination. Commercial repellents create unpleasant tastes or odors that are unpleasant to deer.

Odor-Based Repellents are considered the most effective. They produce sulfurous, rotten-egg odors that are thought to be “fear-inducing” because deer may associate sulfur smell with the presence of a predator or spoiled meat. The smell of odor-based repellents may be unpleasant to humans, so consider the closeness of the plantings you are treating to your home and that of neighbors.

Taste Repellents include bitter ingredients that are not attractive to deer. These repellents are not as effective as those that are odor-based and need to be applied more often to plants than their smelly counterparts.

Irritant/Pain Repellents contain active ingredients such as hot pepper (capsaicin), peppermint, or ammonia that can cause irritation on contact with eyes, mouth, nose, and gut.

Other Repellents that have been reported to have some effectiveness include homemade brews, hanging bars of soap around bushes and trees, human hair, predator urine, blood meal, mint oil, and rotten eggs.

Repellents Used in Combination can be more effective than by themselves. Laura Bolton at Beachside Garden Center (3725 US-12, Michigan City) said that the business uses 3 products in combination to protect the business landscaping: Repellex, Deer Out, and ShaKe Away granules (placed in 2 oz bags) around the property.

All repellents work optimally when used as directed. Tips for applying them include:

- Apply repellents before bud-break and as new growth appears.
- Reapply after rainfall. Some repellents weather better than others, so follow directions on the container.
- Deer may get used to a repellent, so you may have to alternate types of repellents to keep the deer confused and wary. New products are constantly available on the market.
- Understand that repellents reduce, but do not completely eliminate browsing. Fencing and/or netting may be necessary for plant protection in some cases.
- When food is scarce, deer may override the unpleasant taste and odor of repellents.
- Consider comparing the long-term cost of repeatedly applying repellents versus fencing.

Harassment and Scare Devices Several harassment and scare devices are available on the market. Like repellents, deer can become accustomed to a particular device. The deterrent effect of devices can be maximized by moving them around and by putting them on an alternating schedule.

Scarecrow Motion-Activated Sprinkler This device is a motion sensor that works with a sprinkler. It attaches to a spray hose. When activated by motion, a sharp burst of water is sprayed at the deer. The startling effect combined with the physical sensation of being sprayed can be more effective than devices that rely on sights and sounds alone. This device is highly effective with other mammals entering the garden, including humans.

Flashing Light Devices These solar-powered devices use constant flashes of light to scare animals from the area. They activate dusk-to-dawn to help prevent nighttime browsing.

Ultrasonic Devices These devices produce high-frequency, short-wave ultrasonic sounds that are audible to deer and are reported to deter them from staying in an area. Setting on these devices should be set so the device is not auditory (and therefore annoying) to humans (Non-lethal deer deterrents, City of Ann Arbor, MI website). Please note that since dogs and cats have superior hearing to that of humans, ultrasonic devices may be audible and disturbing to your pets and pets of your close neighbors.

Hoont Device This is the brand name of an electronic device that uses LED lights and ultrasonic sound to deter deer. Hoont offers another device that provides motion-activated water blasts to scare deer. There are many devices on the market. The Hoont device is one that seems to have consistently high reviews. (See the *Dealing with Deer - Helping you Get Rid of Deer For Good and Don't Waste Your Money* websites in Appendix 1-A for descriptions and ratings of other harassment and scare devices).

Combined Methods Since deer habituate to efforts to repel them, it may be necessary to rotate types of repellents and type and location of deterrents. New deterrents and devices become available every year, so do your research and talk to other gardeners about what they find successful. Highly prized plantings may be best protected using fencing.

Consult with Local Experts All local garden centers are aware of the damage deer can do to landscaping. They are available to provide advice, services, and products that address landscaping choices and deer deterrents that seem to be most effective in our area.

#2 - Deer/Vehicle Incidents

Many deer/vehicle incidents can be avoided by anticipating the presence of deer and understanding some basic driving tips that include undistracted driving, following the speed limit, and understanding deer behavior. See the discussion concerning the prevention of deer/vehicle incidents.

#3 - Ticks/Tick-Borne Diseases

Tick bites can be prevented by doing body and clothing checks after potential exposures. This includes checking children and pets after being outside. Deer populations are not directly responsible for tick populations. There is a discussion addressing Lyme disease elsewhere in this report.

#4 - Aggressive Deer Behavior

The white-tailed deer population extends from southern Canada to South America. Although they seem to avoid human presence when possible, they easily adapt to human development and are able to inhabit residential areas that offer adequate cover. They are able to modify their behavior and movements to take advantage of wildlife feeders, gardens, and ornamental plants (Westerfield, 2019, pp. 15-17). In general, the size of deer home ranges decrease as development and human dwellings increase, particularly around areas where deer feeding stations exist. (Methods for Managing Deer in Populated Areas, pp. 8-9). Although deer can be active any time of day, they are most active at dawn and dusk. They tend to travel in well-used feeding and breeding areas. Their diet is varied and changes with the season. It differs by location, based on what is available. They live in groups headed by a doe and her offspring from this and previous years.

Male fawns are aggressively run-off by their mother and the other does of the maternal group in March and April and tend not to stay in her home range. This story was told in an email sent to P. Baker by Joe Caudell, State Deer Research Biologist, Indiana DNR on February 28, 2022:

“Someone called me from Fort Wayne on Saturday who was witnessing this male being kicked and beaten by the does of the maternal group to get it to leave. The people observing this were very distressed and wanted us to do something about it because they believed the buck fawn was sick and the deer did not want it around. But it was just that the does’ tolerance for the buck fawn was done and they were working on getting it to leave their group. This can be distressing to observe. This is a common call from urban areas this time of year. This happens at age 9-10 months to bucks because at one year, the doe is already giving birth to her next fawn.”

Females may leave their mothers after a couple of years and may share their mother's home range. A doe's home range is typically less than a square mile; often less in urban/suburban areas. Deer travel in groups. This is particularly important information for motorists upon observing a deer on the side of the road; where there is one, there are likely to be others (Solving Problems with Deer, p. 2).

Fawns When fawns are born, they are reddish-brown with white spots on their sides and back that serve to camouflage them. This camouflage is necessary to protect them from predators. The mother "parks" her young fawns while she is foraging. When does leave their fawns alone, it is for protection. Fawns are born without a scent. Without the mother around, there is no scent to attract predators. Does visit their fawns two to three times daily to nurse them - usually at dawn and dusk. Fawns begin following their mother and imitating her behavior at around one month of age. They are weaned at about ten weeks after birth (Solving Problems with Deer, (p. 2-3).

What to do Upon Finding "Abandoned" Fawns Does place their fawns in seemingly safe places while they are foraging elsewhere. This way of mothering has worked for millennia and does not need to be fixed. Fawns may be found curled up and alone in late spring/early summer. People may assume the fawn is orphaned and "rescue" them. In the fawn's absence, the mother may be frantically looking for her offspring. The fawn needs to be raised by its mother to learn important survival skills. If removed from where it was found, a fawn needs to be returned back to exactly where it was discovered so the mother can find her baby. Contrary to popular thought, the mother will not reject a fawn because of human scent. The mother won't return if people are present, so leave the fawn and leave the area.

The ONLY reasons for rescuing a fawn are: if the mother is dead, if the fawn has been crying and wandering all around all day, and if the fawn is clearly injured (bleeding, broken leg - not to be confused with their typical wobbly stage when they begin walking). An updated list of orphan rehabilitators can be found at <https://www.in.gov/dnr/fish-and-wildlife/wildlife-resources/orphaned-and-injured-animals/wildlife-rehabilitators/> Not all counties have rehabilitators who will accept orphaned deer, so it may be necessary to call rehabilitators in other in-state counties. Another resource is https://www.humanesociety.org/resources/how-find-wildlife-rehabilitator?credit=web_vanity_wildliferehab

Mothers Protecting Fawns The fawning season extends from May to early July (until fawns become more independent of their mother). By nature, deer are not aggressive animals. When given the choice of fight or flight, deer prefer flight as a survival strategy. However, a doe can become aggressive if she perceives her fawn(s) are threatened.

Most instances of deer aggression occur around fawning areas. A doe may do such an excellent job hiding her offspring that you have no idea a fawn(s) is in the vicinity. It is important to pay attention to deer reactions to human presence during late spring/early summer. Her baby may be nearby.

Dog/Doe confrontations The presence of dogs can spark aggression in does whose fawns are nearby. Does may see dogs as predators or threats to their babies. Dogs are members of the canid family, whose members are natural predators of fawns. Even if a fawn has not been discovered in its hiding place, a doe may become aggressive and attack a dog if the dog comes too close to a fawn. Keeping your dog controlled on a leash can prevent dog-deer confrontations. As a reminder, Long Beach has an ordinance that says that all dogs must be on a leash.

Rut Rut occurs late fall, early winter. During this time, hormone-crazed bucks are nearly constantly on the move as they challenge competitors and pursue females. As with females protecting fawns in the spring, males may become aggressive toward people and their pets during rut.

How to Avoid Deer Aggression Be observant. Deer use different parts of their body to warn that they are ready to become aggressive. One or more of these behaviors may be observed: the head is held flat or slightly above the shoulders, ears are dropped, their gaze is laser-focused at you and stern, the nose is held upward to smell a potential threat, the tail is tucked tightly across the rump. It is always important to give deer a wide berth, but especially important when a deer is focusing that kind of attention on you. When a deer stomps with its front leg, that may be a warning or an indication that the deer is trying to determine if you are friend or foe.

<https://worlddeer.org/do-deer-attack-humans/>

In the event a deer is challenging your (and/or your dog's) presence, keep your eye on the animal, back away and keep retreating. Go the opposite direction or move in a wide arc around her/him. If the deer doesn't leave you alone, wave your arms, yell, wave a jacket or take your shirt off and wave it above your head.

<https://goneoutdoors.com/hunt-deer-knife-6873215.html>

“People can live in very close proximity with deer, as long as they are tolerant of deer and the damage they can cause to our plants, landscaping, gardens, etc. There is a minimum space that we have to give all wildlife (otherwise, a flight or fight response can be triggered), but in general, people who don't mind the quirky nature of deer can live in close proximity to them with little or no conflict. Conflict is based more on the individual tolerances of people rather than an issue with deer” (P. Baker [email communication with J. Caudell, State Deer Research Biologist, Indiana DNR]) (February 10, 2022).

Feeding Deer: A Major Cause of Human-Deer Conflicts

Many interactions between humans and deer are pleasant. Being able to see and photograph them up close can be fascinating. People may inadvertently feed them by placing bird feeders within easy reach. Once intended for birds, squirrels and deer can become frequent visitors of bird feeders. Some people intentionally set up feeding stations for deer on their property. They may think they are helping deer survive during winter when food sources seem to be sparse or covered by snow. However, by providing unnatural foods, well-intentioned people may be “killing with kindness” (Deer in the capital region pdf).

By feeding deer, these seemingly good intentions actually attract and encourage deer to also browse heavily on expensive landscaping, including trees, bushes, and flowers. This easy access to food can encourage deer and their offspring to become habituated to an area and thus result in them becoming permanent Long Beach residents.

The negative impact of intentionally or unintentionally attracting deer to Long Beach has several negative consequences, including: deer becoming habituated to handouts, increasing the likelihood of deer//vehicle incidents, disrupting their natural biology and seasonal browsing patterns that keep them healthy, becoming a source of spreading disease within the herd because of close congregation near feeding stations, and making them sick because their digestive systems are not able to handle corn, pellets, or bird seed. The town of Long Beach has an article posted (on May 19, 2021) from the DNR Division of Fish and Wildlife, “Feeding Deer: Just Say No.”

https://www.longbeachin.org/sites/g/files/vyhlf4621/f/news/fw-feeding_deer.pdf

Educating people about “why it is not good for deer to feed them” and “if you really cared about them, you wouldn’t feed them” will be key in raising awareness and hopefully changing feeding behaviors.

“The most effective and natural way to prevent conflicts with wildlife in urban areas is to put garbage, birdseed, compost and pet food away, and to keep fruit from trees off the ground. Communities where attractants are managed properly have less human-wildlife conflicts” (British Columbia official website).

When residents who are feeding deer decide to stop doing so, it is recommended that they decrease the amount of food over a period of weeks so that deer can adjust their browsing habits and focus on more healthy, natural foods that support their health (North Carolina Wildlife Resources Commission website). For their best long-term health, the optimal management approach for deer is to keep them dependent on their natural food choices.

Researcher warns that artificially feeding of deer is a major cause of human-deer conflicts in an urban setting

Erin McCance, Ph.D is a wildlife biologist and Professor in the Environmental Science Department of Manitoba University (Manitoba, Canada). For her Ph.D research, she put GPS collars on deer in Winnipeg, Canada and followed their movement every 2 hours throughout the community. In her findings, she reported that most human-deer conflicts centered around artificial feeding of deer. Here is a 2014 video that explains her findings: . <https://www.youtube.com/watch?v=jChucXn4H6c>

Dr. McCance responded to an email asking for an update on her experience with artificial feeding of urban deer since her 2014 doctoral thesis. Here is her response: :

“Without question, artificial supplies of food to our wild and friendly neighbors come with a plethora of issues that span biological, ecological, social and economic considerations. Often, people engage in this practice with a kind heart and the best of intentions but inevitably, the outcome can be troublesome. To name but a few biological considerations (which I suspect you are already aware of), deer did not evolve to eat the grain-based feed that is often supplied. Their physiological design is based on forage. The grain diet can lead to acidosis and bloat, in some cases mortality. Disease transfer among shared food stuffs is also a significant concern, especially among deer carrying *P. tenuis*, chronic wasting disease (CWD), and even covid-19. Socially, subordinate animals are often excluded by dominant animals and as such, they end up in poor health/starving. These young deer need to learn from mom how and where to access food, find protective cover, etc. When supplemental fed, the herd adopts atypical behavior and movement, modifying habitat use, and home range size. Ecologically, this has implications. Deer going into winter or those that are immunocompromised now do not succumb to mortality as nature may have intended, but survive based on higher body fat content. Moms that would perhaps only support a single offspring or twins are now birthing triplets, further ballooning the population. With their natural predator/prey cycles modified in urban/exurban areas, there is no check and balance in this system. Our research identified human behavior (artificial feeding) as a major contributing factor to modified deer biology and ecology as well as the root cause for much of the human-deer conflict our community was experiencing. Our findings indicate that a structural fix (increasing hefty fines) for those feeding deer as the most effective way to curb the behavior. While this approach will not immediately reduce deer population size in our community, it will allow for deer dispersal and shifts in their habitat use (such that they are not concentrated in high densities in artificial feed areas). Further, over time, mother nature will have more opportunity to balance herd size naturally (overwintering mortality, mortality of animals sick, weak, injured, and lower offspring numbers). In the end, in my humble opinion, it is our management of human behavior that is critical. Our ability to appreciate their beauty within our communities while not feeling the need to intervene in the natural process (as natural a process as possible in high-human

populated areas) is crucial to minimizing human-deer conflicts” (P. Baker (email communication with E. McCance (February 2, 2022).

Working Together as a Community

White-tailed deer have adapted to living around us because their protective wooded natural habitat has been disappearing over time as a result of urban development in this highly desirable area along Lake Michigan. We have made food easily available to them with our landscaping choices. Bird feeders are an easy food source for them. Some residents have established feeding stations for deer. Deer can't change the way they behave. Their job is to spend their day eating vegetation. The real issue here is people – our impact on them, our not understanding their behaviors or the warning cues they give us when females protect their fawns or when males chase females during rut. What we can do is make it less attractive to be around us by taking away sources of food we inadvertently provide.

People's perceptions about the density of the deer population in Long Beach vary. Deer can be a source of pleasure or displeasure, depending on subjective attitudes, preferences, ecological perspective, and personal experiences with them. Deer are part of the Long Beach ecosystem. This is their habitat. As a community, we need to work together to educate ourselves so we can learn to coexist with our wildlife neighbors and live in ways that do not attract them to our living spaces.

Here are a few ideas about how to lower the incidence of unwanted human-deer interactions:

Recommendations for Community Education

Post this deer report on the Town of Long Beach Indiana website after the March 14 town council meeting, at which time the deer report will be presented to the community.

- Prioritize initial educational efforts on the importance of not feeding deer and landscaping choices. This should be soon because people will begin making spring and summer choices for new plants to add to their gardens.
- Create local campaigns, such as “If you really cared about them, you wouldn't feed them,” “Just say no to feeding deer” and “Don't kill them with kindness.”
- Provide information to residents about landscaping choices of flowers, trees and bushes deer seldom like to eat (and those they prefer). Make Appendix 1-A, 1-B and 1-C from this report available as handouts and post them on a designated “Long Beach Deer page on the Long Beach website.

- Provide information to residents about deterrent, fencing, and scare devices. Make Appendix 1-A of this report available as handouts and post them on a designated “Long Beach Deer page on the Long Beach website.
- Find ways for educational efforts to reach full-time residents, part-time residents, and visitors.
- Recruit volunteers to create small side-by-side gardens in a Long Beach park. Residents would be invited to visit the gardens through the growing season and observe the effects of the interventions used to deter deer. Picture updates of each garden could be posted on the Long Beach (Indiana) Parks & Recreation Facebook page. The proposed 2 gardens would be:
 - 1 garden with plants deer prefer
 - 1 garden with plants they seldom eat
- Invite experts in landscaping and ways to deter deer from eating plants to give presentations for Long Beach residents (either Zoom meetings or in-person meetings when Covid numbers allow).
- Keep the public informed of decisions, progress, and issues regarding the presence of deer in the community.
- Establish a volunteer group of interested citizens whose purpose is to work together on education, research, and solutions concerning the presence of deer in Long Beach.
- Create a deer page for the town website that focuses on education regarding human/deer conflicts. Much of the content is contained in this deer report. Here are some suggested links:
 - The 4 major human/deer conflicts
 - Deer eating landscaping
 - Plants deer prefer to eat; plants deer prefer not to eat
 - Repellents
 - Scare devices
 - Fencing, netting
 - Deer-vehicle incidents
 - What to do if you hit a deer with your vehicle
 - What to do if you find a dead deer on your property
 - Driving suggestions for lessening the likelihood of a deer/vehicle accident
 - How to prevent tick bites and Lyme disease
 - Deer behaviors
 - Mothers protecting fawns
 - “Abandoned Fawns”
 - Males during rut
 - How to avoid aggressive deer behavior

- Why feeding deer is not good for them or the community
- Long Beach news/updates about deet
- 2021 proposed deer hunt
- 2021 moratorium on deer hunt
- 2022 deer report

References

Balogh, A. (2020, November 18). The Best Deer-Resistant Plants and Flowers for Your Garden. *Garden Design*. <https://www.gardendesign.com/plants/deer-resistant.html>

Blandel, D. 20 Ways to Keep Deer Out of Your Yard: prevent bambi from doing lasting damage to your yard. *This Old House*.
<https://www.thisoldhouse.com/pest-control/21018819/20-ways-to-keep-deer-out-of-your-yard>

Boman, G & Etri, C. (December 23, 2013). Oh, deer! White-tailed deer biology. *Dr. Linda Raynor's Naturalist Outreach, Cornell University*. YouTube video.
<https://www.youtube.com/watch?v=q4UjWTNeTdU>

Campbell, L. (August 30, 2020). The Deer Question. *Focus on Victoria website*.
<https://www.focusonvictoria.ca/investigations/the-deer-question-r56/>

City of Ann Arbor Deer Management. Non-Lethal Deer Deterrents, Deer Resistant Gardening, Long-term Objectives. *City Services: City of Ann Arbor website*.
<https://www.a2gov.org/departments/community-services/Pages/Deer-Management-Project.aspx>

City of East Lansing Deer Management. *City of East Lansing website*.
<https://www.cityofeastlansing.com/QuickLinks.aspx?CID=23>,

Clauses, R (2011) *50. Beautiful Deer-Resistant Plants: The Prettiest Annuals*. Portland, OR: Timber Press.

Chapman, K (2019). *Deer-Resistant Design: Fence-Free Gardens that Thrive Despite the Deer*. Portland, OR: Timber Press.

Coexisting with Deer;; An Advocate Guide for Preventing Deer Culls in Your Community. Humane Society of the United States. *Deer in the Garden: When Your Backyard Serves as an Unintentional Buffet for Deer*. (pp. 20-21).
https://www.humanesociety.org/sites/default/files/docs/HSUS_Deer-Advocate-Toolkkit.pdf

Curtis, Paul. (2020). After Decades of Suburban Deer Research and Management in the Eastern United States, Here's Where We Stand. *Human-Wildlife Interactions*.

Dealing with Deer - Helping you Get Rid of Deer For Good. This website has several articles that address what they consider the best ways to keep deer from eating landscaping, including their ratings of: electronic deer deterrents, natural deer deterrents, and deer fencing and netting. <https://dealingwithdeer.com/>

Deer in the capital region (pdf). *Capital Regional District (Canada)*. https://www.crd.bc.ca/docs/default-source/regional-planning-pdf/Regional-Deer-Management/deerinthecapitalregion-web.pdf?sfvrsn=11a764ca_6

"Deer Resistant" Plants for Homeowners. (2008, July). *Michigan State University*. https://www.canr.msu.edu/ipm/uploads/files/deer_resistant_plants.pdf

Don't Waste Your Money. (August 27, 2021). *Outdoors and Gardens: The Best Deer Repellent 2022*. <https://www.dontwasteyourmoney.com/best-deer-repellent/>

Derano, P (2015) *Creating a Deer & Rabbit Proof Garden*. Self-Published (4th Edition).

Feeding Deer: Just Say No. *DNR Division of Fish and Wildlife*. https://www.longbeachin.org/sites/g/files/vyhlf4621/f/news/fw-feeding_deer.pdf/

"Five Plants to Avoid if you have Deer and What to Plant Instead" Blog. (2021, May 6). *Great Garden Plants*. <https://www.greatgardenplants.com/blogs/content/five-plants-to-avoid-if-you-have-deer-and-what-to-plant-instead>

Gardening with Perennials. *University of Illinois Extension Division*. <https://web.extension.illinois.edu/perennials/specific.cfm?NodeID=3884> (Scroll down to Deer Resistant Perennials)

Hesse, G. (March, 2010). British Columbia urban ungulate conflict analysis. *British Columbia Ministry of Environment*. <https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/wildlife-wildlife-habitat/staying-safe-around-wildlife/urbanungulatesconflictanalysisfinaljuly5-2010.pdf>

Hesse, G. (March, 2010). British Columbia urban ungulate conflict analysis: Summary report for municipalities. *British Columbia Ministry of Environment*. <https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/wildlife-wildlife-habitat/staying-safe-around-wildlife/urbanungulatessummaryreportfinaljune21-2010.pdf>

Staying safe around wildlife. *Government of British Columbia official website*.
<https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/wildlife/human-wildlife-conflict/staying-safe-around-wildlife>

Great Garden Plants - Website <https://www.greatgardenplants.com/>

Hart, R (2005). *Deerproofing Your Yard & Garden*. Adams, MA: Storey Publishing, LLC.

Iannotti, M. (2020, September 17). A State-by-State Guide to Deer Resistant Plants. *The Spruce: Make Your Best Home*.
<https://www.thespruce.com/deer-resistant-gardens-1402490>

Is feeding deer harmful? *North Carolina Wildlife Resources Commission. Wildlife Management Division*.
<https://www.ncwildlife.org/Portals/0/Learning/documents/Profiles/Mammals/Is-Feeding-Deer-Harmful.pdf>

Landscape Plants Rated by Deer Resistance. *Rutgers Cooperative Division*.
<https://njaes.rutgers.edu/pubs/publication.php?pid=e271> (Download the PDF).
(4/25/2003).

Living with Wildlife. Website, *Bow River Valley, Alberta, Canada*.
<https://livingwtwildlife.ca/>

McCance, E. (2014). YouTube video from the Living with Wildlife Conference: Toronto, 2014: Understanding white-tailed deer and management. *Association for the Protection of Fur-Bearing Animals*. <https://www.youtube.com/watch?v=jChucXn4H6c>

McCance, E. (2014). Ph.D Dissertation: A Thesis submitted to the Faculty of Graduate Studies of The University of Manitoba. Understanding Urban White-Tailed Deer (*Odocoileus virginianus*) Movement and Related Social and Ecological Considerations for Management.

McCance, E. (August, 2015). Identifying how human behavior influences urban white-tailed deer movement patterns in a Canadian metropolitan area. *Human Dimensions of Wildlife: An International Journal*.

McCance, E, et al. (Spring 2015). Spatial and temporal analysis of factors associated with urban deer-vehicle collisions. *Human Wildlife Interactions* 9(1).

McCance, E, et al. (2017). Importance of urban wildlife management in the United States and Canada. *Mammal Study* 42.

McCance, E, et al. (February 20, 2018). Complexities of species coexistence within modern, urbanized landscapes. *Environmental Analysis & Ecological Studies*. 1(2).

McIntosh, J, (2021, June 17). 10 Best Flowering Plants that Deer will Not Eat. *The Spruce: Make Your Best Home*.

<https://www.thespruce.com/flowers-deer-wont-eat-1316114>

Meyhoff, S. (2017, January 23). The Urban Deer Problem in Magrath, Alberta. *AgSpectra Whole Earth Science and Technology*.

Methods for Managing Deer in Populated Areas: A Product of the Human Wildlife Conflicts Working Group. Association of Fish & Wildlife Agencies.

https://www.fishwildlife.org/application/files/7315/3745/9637/AFWA_Deer_Mngmt_Pop_Areas_August_31_2018_version.pdf

Reducing deer-human conflicts (pdf). *Capital Regional District (Canada)*.

https://www.crd.bc.ca/docs/default-source/regional-planning-pdf/Regional-Deer-Management/conflict-reduction-webo.pdf?sfvrsn=f78067ca_2

Regional deer management strategy. *Capital Regional District (Canada) website*.

<https://www.crd.bc.ca/project/past-capital-projects-and-initiatives/regional-deer-management-strategy>

Shelby, J (2020). *The Deer Resistant Design Book Guide: The Ultimate Guide to Fence-Free Gardens that Thrive Despite the Deer*. Independently Published.

Soderson, N (2020). *The Ultimate Guide to Deer-Proofing Your Yard and Garden: Proven Advice and Strategies for Outwitting Deer and 20 Other Pesky Animals*. NY: Skyhorse Publishing.

Solving Problems with Deer: A Template Conflict Management and Coexistence Plan for White-Tailed Deer. Humane Society of the United States.

https://www.humanesociety.org/sites/default/files/docs/HSUS%20Deer%20Conflict%20Mgt%20Plan_FINAL.pdf

Urban Deer Technical Guide - Indiana Division of Fish & Wildlife

<https://www.in.gov/dnr/fish-and-wildlife/files/fw-UrbanDeerTechnicalGuide.pdf>

Westerfield, G. (2019). Managing Human-Deer Conflicts in Urban, Suburban, and Exurban Areas. *Utah State University - Digital Commons@USU*.

https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1001&context=hwi_monographs

Appendix 1-A

Protecting Your Landscaping (Website/Book Resources)

Website Links for Deer Resistant Planting Choices

Balogh, A. (2020, November 18). **The Best Deer-Resistant Plants and Flowers for Your**

Birds and Mammals Around the Home. *Government of British Columbia website.* (pp 20, 4-7).. <https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/animal-and-crops/plant-health/gardenguide-20-wildlife.pdf>

The Best Deer-Resistant Plants & Flowers for Your Garden. *Garden Design.* <https://www.gardendesign.com/plants/deer-resistant.html>

Blandel, D. **20 Ways to Keep Deer Out of Your Yard: prevent bambi from doing lasting damage to your yard.** *This Old House.* <https://www.thisoldhouse.com/pest-control/21018819/20-ways-to-keep-deer-out-of-your-yard>

“Deer Resistant” Plants for Homeowners. (2008, July). *Michigan State University.* https://www.canr.msu.edu/ipm/uploads/files/deer_resistant_plants.pdf

“Five Plants to Avoid if you have Deer and What to Plant Instead” Blog. (2021, May 6). *Great Garden Plants (website).* <https://www.greatgardenplants.com/blogs/content/five-plants-to-avoid-if-you-have-deer-and-what-to-plant-instead>

Gardening with Perennials. *University of Illinois Extension Division.* <https://web.extension.illinois.edu/perennials/specific.cfm?NodeID=3884> (Scroll down to Deer Resistant Perennials)

Great Garden Plants - Website Enter your zip code on the homepage of the “Great Growing Plants website. It will give you the growing zone for your location. When you “Enter Site,” search for “deer resistant plants” in the “Search Results” box. You will then get hundreds of choices of deer resistant plant photos and descriptions. You can purchase the plants online or take the information to your local garden center and pick out the plants yourself. <https://www.greatgardenplants.com/>

Iannotti, M. (2020, September 17). **A State-by-State Guide to Deer Resistant Plants.** *The Spruce: Make Your Best Home.* <https://www.thespruce.com/deer-resistant-gardens-1402490>

Landscape Plants Rated by Deer Resistance. *Rutgers Cooperative Division.* <https://njaes.rutgers.edu/pubs/publication.php?pid=e271> (Download the PDF). (4/25/2003).

McIntosh, J. (2021, June 17). **10 Best Flowering Plants that Deer will Not Eat.** *The Spruce: Make Your Best Home.* <https://www.thespruce.com/flowers-deer-wont-eat-1316114>

Urban Deer Technical Guide. Appendix 3:(There are 3 lists to help gardeners/landscapers choose deer-resistant plantings)“Trees Shrubs and vines that are preferred and frequently damaged by deer.”“Trees Shrubs and vines that are seldom damaged by deer.”“Plants (flowers) that are seldom damaged by deer.” Indiana Division of Fish & Wildlife. (pp. 25-26). <https://www.in.gov/dnr/fish-and-wildlife/files/fw-UrbanDeerTechnicalGuide.pdf>

Website Links for Fencing, Repellents, Deterrents, Scare Devices

Coexisting with Deer;; An Advocate Guide for Preventing Deer Culls in Your Community. Humane Society of the United States. *Deer in the Garden: When Your Backyard Serves as an Unintentional Buffet for Deer.* (pp. 20-21). https://www.humanesociety.org/sites/default/files/docs/HSUS_Deer-Advocate-Toolkkit.pdf

Dealing with Deer - Helping you Get Rid of Deer For Good. This website has several articles that address what they consider the best ways to keep deer from eating landscaping, including their ratings of: electronic deer deterrents, natural deer deterrents, and deer fencing and netting. <https://dealingwithdeer.com/>

Don't Waste Your Money. (August 27, 2021). *Outdoors and Gardens: The Best Deer Repellent 2022.* <https://www.dontwasteyourmoney.com/best-deer-repellent/>

Methods for Managing Deer in Populated Areas: A Product of the Human Wildlife Conflicts Working Group. Association of Fish & Wildlife Agencies. *Damage Control Methods: Fencing* (pp. 29-31). *Repellents* (pp. 31-32). *Landscape Plants* (pp. 32-33). *Harassment and Scare Devices* (pp. 33). https://www.fishwildlife.org/application/files/7315/3745/9637/AFWA_Deer_Mngmt_Pop_Areas_August_31_2018_version.pdf

Solving Problems with Deer: A Template Conflict Management and Coexistence Plan for White-Tailed Deer. Humane Society of the United States. *Appendix E: Repellents & Scare Devices.* (pp. 23-25).
https://www.humanesociety.org/sites/default/files/docs/HSUS%20Deer%20Conflict%20Mgt%20Plan_FINAL.pdf

Urban Deer Technical Guide - Indiana Division of Fish & Wildlife *Non-Lethal Management Options: Fencing:* (pp. 11-12). *Repellents and Deterrents.* (pp. 12).
<https://www.in.gov/dnr/fish-and-wildlife/files/fw-UrbanDeerTechnicalGuide.pdf>

Books that Address Way to Protect Landscaping

Chapman, K (2019). ***Deer-Resistant Design: Fence-Free Gardens that Thrive Despite the Deer.*** Portland, OR: Timber Press.

Clauses, R. (2011) **50. Beautiful Deer-Resistant Plants: The Prettiest Annuals.** Portland, OR: Timber Press.

Derano, P (2015) ***Creating a Deer & Rabbit Proof Garden.*** Self-Published (4th Edition).

Hart, R (2005). ***Deerproofing Your Yard & Garden.*** Adams, MA: Storey Publishing, LLC.

Shelby, J (2020). ***The Deer Resistant Design Book Guide: The Ultimate Guide to Fence-Free Gardens that Thrive Despite the Deer.*** Independently Published.

Soderson, N (2020). ***The Ultimate Guide to Deer-Proofing Your Yard and Garden: Proven Advice and Strategies for Outwitting Deer and 20 Other Pesky Animals.*** NY: Skyhorse Publishing.

Appendix 1-B

Protecting Your Landscaping

Purdue University Cooperative Extension Service - Master Gardeners

Deer Resistant Plants*

<i>Trees and Shrubs</i>	<i>Common Name</i>
Acer palmatum	Japanese Maples
Aesculus Parviflora	Bottlebrush Buckeyes
Amelanchier spp.	Service Berries
Berberis spp	Barberries
Betula spp	Birches
Buxus spp	Boxwoods
Catalpa spp	Catalpas
Chamaecyparis pisifera	Japanese False Cypress
Cornus sericea	Red Twig Dogwood
Hibiscus syriacus	Rose of Sharon
Ilex opaco	American Hollies
Juniperus spp	Juniper
Kilkwitzia amabills	Beautybushes
Lindera benzoin	Spice Bushes
Ostrya virginiana	American Hophornbeam
Picea pungens glauca	Blue Spruce
Picea spp	Spruces
Pinus spp	Pines

Rhus aromatic

Fragrant Sumac

Sambucus spp

Elders, Elderberries

Perennials

Achillea spp.

Yarrows

Allium spp

ornamental Onions

Anemone x hybrid

Japanese Anemones

Anemonella Thalictroides

Rue Anemones

Aquilego spp

Columbines

Arisaema triphyllum

Jack-in-the-pulpit

As arum spp

Wild Ginger

Baptisia gastralis

Wild Blue Indigo

Bergenia spp

Pipsqueaks

Ceratostigma

Leadwort

Actuoea racemosa

Snakeroot

Coreopsis verticillata

Threadleaf Coreopsis

Digitalis spp

Foxglove

Echinacea purpurea

Purple Coneflowers

Epimedium spp

Banewort

Eupatorium pupureum

Joe Pye Weed

Euphorbia spp

Spurges

Gallium odoratum

Sweet Woodruff

Heleborus spp

Lenten and Christmas Roses

Hemerocallis 'Stella d'Oro'

Stella d'Oro Daylilies

Hyacinthus orientalis	Hyacinths
Iris spp	Irises
Lavendula spp	Lavender
Narcissus	Daffodils
pachysandra spp	Pachysandra
Paeonia spp	Peonies
Perovski atriciaplicfolia	Russian Sage
Phlox paniculata	Garden Phlox
Pulmonaria spp	Lungwort
Rudbeckia spp	Black-eyed Susan
Salvia spp	Sages
Stachys byzantine	Lamb's Ear
Thymus spp	Thyme
Tiarella candifolia	Foamflowers
Tradescantia spp	Spiderwort

Grasses

Panicum virgatum	Switch Grass
Calamagrostis acutiflora	Feather Reed Grass
Chasmanthium latifolium	Northern Sea Oats
Andropogon gerardii	Big Bluestem
Sorghastrum nutans	Indian Grass
Sporobolus heterolepis	Prairie Dropseed

Annuals and vegetables

Ageratum houstonianum	Ageratum
Antirrhinum majus	Snapdragons
Nicotiana spp	Flowering Tobacco
Pelargonium spp	Scented Geraniums
Tagetes spp	Marigolds
Trapaeolum majus	Nasturtiums
Anethum graveolens	Dill
Capsicum spp	Peppers and Chiles
Citrullus lanatus	Watermelons
Cucumis spp	Other Melons
cucumis sativus	Cucumbers
rheumx hybridum	Rhubarb
salanum melongena	eggplant

Sources: Extension publications from Maryland, Michigan, New Jersey, and Pennsylvania.

“Deer are less likely to eat the plants listed here – a starving deer, however, will eat almost anything. It’s important to remember that reports of deer resistance sometimes contradict each other, so you may still see feeding on these plants. This list is generally accepted in the eastern United States”. See other extension resources

Appendix 1-C

Protecting Your Landscaping

Indiana Division of Fish and Wildlife – Urban Deer Technical Guide

Flowering Plants that are SELDOM damaged by deer

<i>Latin Name</i>	<i>Common Name</i>
Achillea millefolium	Yarrow
Aconitum napellus	Monkshood
Agrimoniis supatoria	Agrimony
Aquililegia Canadensis	Wild Columbine
Asclepias spp	Milkweed
Asclepias tuberosa	Butterfly Weed
Baptisia Australis	Blue Wild Indigo
Caryopteris spp	Bluebeard
Convallaris majalis	Lily of the Valley
Coreopsis spp	Coreopsis
Crocus spp	Crocus
Delphinium spp	Larkspur
Digitalis Purpurea	Common Foxglove
Echinacea purpurea	Purple Coneflower
Erynglum yuccifolium	Rattlesnake Master
Eupatorium spp	Joe Pye Weed
Filpendularubra	Queen of the Prairie
Fritillaria spp	Fritillaria

Geranium spp	Geranium
Hemerocallis spp	Daylillies
Hyacinthoides spp	Bluebell
Hyssopus spp	Hyssop
Lamium maculatum	Spotted Deadnettle
Dicentra spp	Bleeding Heart
Lavandula spp	Lavenders
Liatris Pycnostachys	Prairie Blazing Star
Lupinus Perennis spp	Wild Lupine
Lycopus spp	Bugleweed
Monarda citriodora	Lemon Mint
Mentha spp	Mint
Mimulus spp	Monkey Flower
Monarda fistulosa	Bergamot
Monarda spp	Bee Balm
Narcissus spp	Daffodils
Nepeta Cataria	Catnip
Oenothera biennis	evening primrose
Pachysandra terminallis	Pachysandra
Partherium integrifolium	Wild Quinine
Penstemon spp	Beardtongue
Physostegia Virginians	Obedient Plant
Polystichum acrostichoides	Christmas Fern

Prunella vulgaris	Heal-All
Redebechia hirta	Black eyed Susan
Spiraea spp	Spiraea
Symphotrichum novae-angliae	New England aster
Verbascum Thapsus	Common Mullein
Yucca spp	Yucca
Zinnia spp	Zinnia

**Certain species may prove more palatable than others within a specific genus*

Trees, shrubs and vines that are SELDOM damaged by deer

<i>Latin name</i>	<i>Common Name</i>
Alnus	Alder (Gray, Hazel)
Ameianchier spp	Serviceberry
Aroniamelanocarpa	Black chokecherry
Asmina triloba	Pawpaw
Berberis spp	Barberry
Betula papyrifera	Paper Birch
Buxus	Boxwood
Carpinus caroliniana	American Hornbeam
Celestrus scandens	American Bittersweet
Cercis Canadensis	Eastern Redbud
Chamaedaphne calyculata	Leather leaf
Cornus spp	Dogwood
Crataegusspp	Hawthorns

<i>Elaeagnus angustifolia</i>	Russian Olive
<i>Fagus Grandifolia</i>	American Beech
<i>Frazinus spp</i>	Ash
<i>Ilex opaca</i>	American Holly
<i>Kalmia latifolia</i>	Mountain Laurel
<i>Larix Laricina</i>	Tamarack
<i>Leucothoe fontanesiana</i>	Drooping Leucothoe
<i>Lindera benzoin</i>	Spicebush
<i>Liriodendrio tulipifera</i>	Tulip tree
<i>Magnolia grandiflora</i>	Magnolia
<i>Myrica spp</i>	Bayberry
<i>Liquidamber straciflus</i>	Sweet gum
<i>Otrya virginiana</i>	Eastern Hop Hornbeam
<i>Picea spp</i>	Spruce
<i>Pieris Japonica</i>	Japanese Pieris
<i>Pinus spp</i>	Pine
<i>Populus spp</i>	Aspen
<i>Robinia spp</i>	Locust (Black, Honey)
<i>Sambucus Canadensis</i>	Elderberry
<i>Sassafras albidum</i>	Sassafras
<i>Ulmus spp</i>	Elm
<i>Viburnum dentatum</i>	Arrowwood (southern)
<i>Viburnum trilobum</i>	American Cranberry Bush

**Certain species may prove more palatable than others within a specific genus*

Trees, shrubs and vines that are PREFERRED and frequently damaged by deer

<i>Latin Name</i>	<i>Common Name</i>
Abies spp	Fir
Acer spp	Maple
AesculusHippocastanum	Horse chestnut
Berberis	Barberry
Campais radicans	Trumpet Creeper
Cornus	Dogwoods
Corylus Americans	American Hazelnut
Cottinus coggygris	Smokebush
Desiphora Fruticosa	Bush cinquefoil
Euonymus alatus	winged Euonymus
Forsythia spp	Forsythia
Hamamelis virginiana	Witchhazel
Hedera Helix	English Ivy
Hydrangea spp	Hydrangea
Hibiscus syriacus	Rose of Sharon
Ilex spp	Holly
Junipertus spp	Juniper
Larix decidus	European larch
Ligustrum spp	Privet
Lonicera spp	Honeysuckle

Magnolia spp	Magnolia
Melus spp	Apple
Philadelphus coronaries	Sweet Mock Orange
Pinus strobus	White Pine
Prunus spp	Cherry
Pyracantha spp	Firethorn
Pyrus calleryana	Bradford Pear
Quercus spp	Oak
Rhododendron spp	Rhodendron
pinus spp	Sumac
Salix spp	Willow
Sorbus eucuparia	European Mountain Ash
Syringa spp	Lilac
Taxus spp	Yew
Thuja spp	Cedars Arborvitae
Tilia spp	Basswood
Tauga canadiensis	Hemlock
Viburnum spp	Viburnum

**Certain species may prove more palatable than others within a specific genus*

#List is not comprehensive. Other Trees, vines, and shrubs may be frequently damaged by deer browsing.

SECTION II

DEER/VEHICLE INCIDENTS

One of the most frequently cited community concerns over living with deer is the possibility of deer/vehicle accidents.

The chance of a deer-vehicle accident is affected by location - rural, suburban or forested. Deer are edge feeders. They are found at the edge of town and forest where low lying shrubs are available for feeding. This is why deer are often seen at roadside and why caution must be exercised while driving.

Deer/vehicle incidents in Long Beach

2020 The Long Beach Police Department (LBPD) has kept statistics for the last 5 years for "Deer Involved Calls." During 2020 there were 3 deer-vehicle accidents reported to the LBPD. During the same period there were 4 reports of deer found dead, for which the cause of death was undetermined and not reported to the LBPD.

2021 During 2021 there were 3 deer-vehicle accidents reported to the LBPD. There was 1 report of a deer found dead, for which the cause of death was undetermined and not reported to LBPD.

2022 As of 3/4/22, there have been zero reported deer incidents so far - no car accidents with deer, no injured deer, no deceased deer.

There were no reported deer-golf cart incidents during any year that statistics were tracked.

Driving Tips for Avoiding Deer-Vehicle incidents:

BE VIGILANT: Watch for deer by scanning the road from side to side, especially in areas and times of low visibility and where trees, shrubs, or tall grasses are close to the edge of the road.

ASK FOR HELP

If you have children (and/or other adults) in the vehicle, ask them to help you watch for deer at the side of the road. At night, passengers can help watch for the reflection of the deer's eyes caused by the vehicle's headlights.

USE YOUR HIGH BEAMS: At night use your high beam lights, especially in heavily wooded areas to see further ahead. Watch for the eye-shine of any animal, especially deer near the edge of the road.

BE AWARE OF DEER GROUP BEHAVIOR: If you see a deer, slow down. Deer roam in small herds. Thus, if there is one deer, there's a good chance there are more nearby. Female deer tend to stay together as a "doe group." During spring and summer, they are likely to have one or more fawns close by, so please be alert. If you see one deer cross the road, assume others may follow.

BE AWARE OF THE TIME OF THE YEAR: The peak season for most deer-vehicle accidents is October through December. Mothers are likely to be traveling with fawns (May-August).

BE AWARE OF THE TIME OF THE DAY: Remember meal-time. Deer are most active at dusk and dawn, frequently moving across roads, following a path to water and food sources. The highest risk for deer-vehicle collisions is between dusk to midnight and during the hours right before and after sunrise.

USE CENTER LANE: As long as local traffic laws allow, the center lane is your safest choice for avoiding a deer collision on a multi-lane road. It will give you more time to react if a deer runs across your path.

BE AWARE OF DEER CROSSING SIGNS: Slow down. These signs are placed at locations where there has been known deer activity or a prior accident - expect deer.

DO NOT SWERVE IF YOU SEE A DEER: It is instinctive to try to avoid something in the road, but swerving could potentially result in greater harm. Brake firmly, stay in your own lane and blow your horn. If you swerve, you could collide with another vehicle, telephone pole, or lose control of your vehicle. Swerving can also confuse the deer who may run into your car.

If there is a car close by, slow down, but make sure to honk your horn to signal to the other driver that there is a problem ahead.

LEAN TOWARDS A DOOR PILLAR: In the event of an unavoidable crash, leaning towards a door pillar will give an extra layer of protection between you and the approaching impact. In most instances of a severe collision between man and animal, the center of the car is crushed, so lean towards the door pillar to benefit from the added protection of the pillar.

OBEY TRAFFIC SAFETY LAWS: Observe posted Deer signs and Speed Limit signs. Don't follow the vehicle in front too closely in case that driver sees a deer and brakes suddenly. Always wear your seatbelt. Over 60% of people injured in deer-vehicle collisions were not wearing their seatbelts. Don't drive too closely behind other vehicles.

What to do if You are Involved in a Deer-Vehicle Incident:

- Drive your vehicle to the side of the road as soon as it is safe to do so.
- All occupants should stand on the side of the road and away from the car. Calm down any children or any passengers who may be traumatized by what they have seen.
- Turn on your hazard lights and be careful of other traffic.
- An injured/confused deer can be dangerous. Stay away, even if it appears dead. If it is injured, it may move quickly and there is a risk of the deer hurting you.
- Contact 911 regarding location of collision, where the injured or dead deer is on the road, and whether there are any passenger injuries.
- Follow instructions of the responding officer.
- Most insurance policies require you to report an accident to the police, regardless of the extent of any property damage.
- Take photos of the scene of the accident and the damage to your vehicle.

What to do if a Deer is Killed or Badly Injured in Long Beach

If a deer is injured or killed on a street in Long Beach, notify the Long Beach Police Department (LBPD).

If a deer carcass is found on private property, it is the property owner's responsibility to have it removed. The LBPD maintains a list of carcass removal companies. The property owner is charged a fee for callout, pickup, and disposal of deer carcasses. The LBPD business line is 219 874-4243.

At one time, the Washington Park Zoo used to pick up donations of deer carcasses. However, the zoo no longer does that. The zoo only takes donations of deer carcasses if they are cleaned and divided. For further information, contact the Washington Park Zoo at 219 083-1510.

Tags/License to Remove Deer Carcasses in Indiana

Indiana allows a driver to remove a deer carcass with the appropriate permit or tag to legally possess the deer. The tag can be issued by a local or State Police officer.

Tags/License to Remove Deer Carcasses in Long Beach

The LBPD officers carry deer tags with them when on duty and can issue them at any time. The responding officer may be able to provide contact information for someone who has a license or permit to pick up a fresh carcass.

References

Chief Marshall Mark Swistek and Renee Richardson, Administrative Assistant, LBPD.

Farmers Insurance Company

website. <https://www.foremost.com/learning-center/dont-be-a-deer-in-the-headlights.asp>

Geico Insurance website

<https://www.geico.com/living/driving/auto/car-safety-insurance/deer-safety-tips-for-avoiding-a-collision/>

Jamie LeBlanc-Huss, Zoo Director. Michigan City, Washington Park Zoo.

In.gov website. Indiana Department of Natural Resources. Wildlife Control Operators

<https://www.in.gov/dnr/fish-and-wildlife/wildlife-resources/living-with-wildlife/nuisance-wildlife-control-operators/>

Indiana State Police: Deer-vehicle crashes.

<https://www.in.gov/isp/additional-resources/links/deer-vehicle-crashes>

Insurance Information Institute website.

<https://www.iii.org/fact-statistic/facts-statistics-deer-vehicle-collisions;>

<https://www.petkeen.com/deer-accident-statistics>

Long Beach Police Department - Indiana Facebook page, November 9, 2021

www.facebook.com/Long-Beach-Police-Department-Indiana-107043421776382

State Farm Insurance website links.

<https://newsroom.statefarm.com/animal-collision/>

<https://www.statefarm.com/simple-insights/auto-and-vehicles/how-likely-are-you-to-have-an-animal-collision>.

<https://www.statefarm.com/simple-insights/auto-and-vehicles/immediate-steps-to-take-if-you-hit-a-deer-with-your-car>

The Humane Society of the United States, *Solving Problems with Deer: A template conflict management and coexistence plan for white-tailed deer*, 2018. (pdf available at

<https://www.humanesociety.org> see, Pg. 5 and Appendix C and D)

Price, R. (May 8, 2021). Free Range America.

<https://freerangeamerican.us/roadkill-for-dinner-why-harvesting-roadkill-is-actually-ethical-and-tasty/>

SECTION III

DEER POPULATION MANAGEMENT

Population History

In 1900 the world's human population totaled 1,600,000,000. By 2020 the world's human population grew to 7,794,798,739 (1) and by 2050, there will be a projected 9 billion people on Earth. (2) Land use change is one of the main ongoing drivers of terrestrial biodiversity loss and the alteration of ecosystem functions and services. (3)

Urbanisation has also increased over the last 60 years. However in the latter half of the twentieth century urban sprawl increased as richer people moved away from urban centres, which led to a greater loss of countryside (Zhang 2016). (3)

The increase in human population, the requirement for more farms to produce more food has created competition between humans and wildlife as natural habitats have dwindled to meet the demand for food and housing and the infrastructure such as highways, airports, railroads and shopping centers to support the needs of society. Human activity not only increases demand on natural systems but by it's very presence disrupts the calm predictable places wildlife graze, nest, rear their young, mate and sleep.

The competition for resources and habitat and conflicting goals has played out over the decades by the extinction or near extinction of a number of species such as buffalo, wolves, beaver and white tailed deer.

In 2010, an estimated 30 million White-tailed deer occupied the United States. 100 years ago, deer were on the verge of complete eradication with extinction in states such as Kansas and Indiana (Rooney, 2010). (3)

Current populations, however, are being threatened across the United States (Edmunds, 2016). Natural ecosystems for these animals are being destroyed at rapid levels. As land is converted into agriculture, nesting sites feeding grounds, and socialization areas for deer diminish (Grovenburg et al., 2011). (3)

Hunting

One of the most significant threats to the status of White-tailed deer relates to human expansion and over-hunting. The early 20th century saw unregulated hunting nearly wipe-out populations of deer entirely in states such as Wisconsin (Rooney, et al.,2001). The success of regulated hunting and conservation practice has allowed for deer populations to stabilize and even grow; historical deer densities have even surpassed pre-settlement figures in Northern Wisconsin (Rooney, et al., 2001). (3)

Deer numbers can double every two years under optimal conditions (Rooney, 2013). State resource departments have been able to work with biologists to develop and implement hunting programs supportive of deer populations. Bag limits and gender-based tags have allowed for selective culling of deer herds (Williams et al., 2012), reducing the impact modern hunting has towards the long-term stability of deer populations. (3)

Loss of Natural Predators

Coyote Removal

Landowners may take coyotes year-round on their private property by trapping or shooting without possessing a wild animal control permit from the DNR and without having a hunting or trapping license. Additionally, a landowner does not need to possess a wild animal control permit from DNR to give another individual written permission to shoot or trap coyotes on the landowner's property.

<https://www.in.gov/dnr/fish-and-wildlife/wildlife-resources/living-with-wildlife/>

Disease in Deer

In addition to loss of habitat, the white-tailed deer shows susceptibility to pathogens that can be transmitted through prion disease or insect vectors. (3)

Although it has been associated with captive deer and elk in the past, CWD is also found in free-ranging white-tailed deer in several Midwestern states close to Indiana, including Michigan, Illinois, Ohio and Wisconsin.

Each year, Indiana DNR staff collect tissue samples from wild deer (hunter-harvested or reported sick/dead) for CWD testing. Samples are collected from across the state to monitor the presence of CWD in Indiana. To date, CWD has not been detected in deer tested from Indiana. (4)

<https://www.in.gov/dnr/fish-and-wildlife/wildlife-resources/wildlife-diseases-in-indiana/chronic-wasting-disease-cwd/>

Bovine tuberculosis (bTB) is a chronic disease caused by the bacterium *Mycobacterium bovis*. Bovine TB primarily affects cattle; however, other animals may become infected. The disease is spread through animal-to-animal contact with infected mucus or through directly eating the bacteria.

Each year DNR staff inspect carcasses for lesions and/or collect tissue samples from suspect wild deer (hunter-harvested or reported sick/dead) statewide to monitor for the presence of bTB in Indiana. To date, bTB has not been detected in Indiana's wild deer population.

<https://www.in.gov/dnr/fish-and-wildlife/wildlife-resources/wildlife-diseases-in-indiana/bovine-tuberculosis-btb/>

Epizootic hemorrhagic disease (EHD) and bluetongue virus (BTV) are viruses that can infect deer. EHD is more commonly found in white-tailed deer. Neither EHD nor BTV affects humans.

EHD occurs naturally in the deer population and affects small numbers of deer every year.

<https://www.in.gov/dnr/fish-and-wildlife/wildlife-resources/wildlife-diseases-in-indiana/epizootic-hemorrhagic-disease-ehd/>

Nasal bots are not a public health concern. They do not pose a risk of disease or parasitism to humans. Venison from deer with nasal bots is safe to eat.

<https://www.in.gov/dnr/fish-and-wildlife/wildlife-resources/wildlife-diseases-in-indiana/nasal-bots/>

Damage to Ecology (Trees, Undergrowth, Native Flora)

Deer often get blamed for declines in forest structure, particularly oak hardwood and pine forests of the Eastern United States, mainly because of their propensity to munch on tree seedlings.

However, scientists Brice Hanberry, of the USDA Forest Service's Rocky Mountain Research Station and Marc Abrams, from Pennsylvania State University, decided to explore whether white-tailed deer populations are a key driver in changing eastern forests. Based on their research, it appears that deer are not the culprits.

Ecologists recognize that eastern forests are changing from historic conditions and are becoming more densely packed with trees. Increased deer densities are often blamed for forest declines, while studies show trees are capturing more growing space and replacing grasses, herbs, and forbs. This conundrum piqued the interest of researchers.

Rather than focusing on seedling survival, Brice and Marc used stocking – which measures how many trees are in an area, the diameter of trees, and the space a tree uses – to help assess impacts of browsing by white-tail deer on forest structure.

Researchers found white-tail deer have not reduced tree densities at landscape scales across the Eastern U.S. In fact, they propose other management influences and fire exclusion have had bigger impacts.

This research prompts us to ask new questions about hunting management and forest wildlife habitats. Eastern pine and oak forests used to be more open with herbaceous plants in the understory. These understory vegetation layers provided habitat for birds and pollinators. Increased stocking can change this habitat, leaving less room for these creatures to make their home.

Additional research may help find answers to what is driving forest change and offer new ways of looking at forest health. Also, further research can propel scientists and land managers to look for new solutions for managing healthy forests--getting Bambi off the proverbial hook.

Don't Blame Bambi Zoe Clemmons, Rocky Mountain Research Station

April 28, 2020

<https://www.fs.usda.gov/features/dont-blame-bambi>

Ultimately, our data highlight the role of herbivores in structuring forest communities [6,41] and more generally contribute to a growing literature about how consumers alter and often enhance diversity effects [7–10,13,14]. These studies derive from widely varying systems. For example, in old fields, deer enhanced the positive effects of genotypic diversity on seed production in an herbaceous forb [10]. Positive interactions between herbivores and plant diversity shape forest regeneration

Susan C. Cook-Patton, Marina LaForgia and John D. Parker

Published:22 May 2014<https://doi.org/10.1098/rspb.2014.0261>

<https://royalsocietypublishing.org/doi/10.1098/rspb.2014.0261>

Ticks and Lyme Disease

Lyme disease is the most reported vector-borne disease in the United States (Pennsylvania Game Commission). Although deer provide the host blood for nymph ticks to develop into adults, they do not host Lyme disease. (3)

As a misconception, humans have directly targeted White-tailed deer and specifically aimed to reduce populations in urban zones (Sandberg et al., 1992). The stigma as being a disease carrier has negatively impacted the White-tailed deer.

Populations, particularly in the Northeastern United States, have been most directly impacted by campaigns to reduce deer presence and the perception of risk for human contact with Lyme Disease. While white-tailed deer are needed to continue the life cycle of the tick, they do not carry the bacteria; reducing deer numbers does not reduce the risk of Lyme Disease (Tamara Awebuch, Department of Global Health and Population at Harvard School of Public Health) (Johnson, Rachel, 2010).

The deer do not carry the bacteria. They are needed to continue the life cycle of the tick, but they are not infected. So as you killed deer, you would simply have more ticks per deer because the surface area of each is enough to support many ticks. Just killing deer won't do the job.

<https://www.hsph.harvard.edu/news/features/kiling-deer-not-answer-reducing-lyme-disease-html/>

Scientists say white-footed mice, which are primary carriers of the Lyme bacterium *Borrelia burgdorferi*, are a highly popular host of black-legged ticks — which consequently makes them a key culprit in the spread of Lyme disease, “where the mice go, so too go the infected ticks.” There are areas in the United States where Lyme disease is rare and, in those places, few or none of the white-footed mice are infected. But in an endemic area such as one that extends from Virginia to Maine, at least half and sometimes up to 90 percent of the mice are infected with Lyme bacteria.

Why this adorable mouse is to blame for the spread of Lyme disease.

<https://www.washingtonpost.com/news/to-your-health/wp/2017/07/17/why-this-adorable-mouse-is-to-blame-for-the-spread-of-lyme-disease/>

While the white-footed mouse is known to carry the bacterium that causes Lyme Disease, they are not the only rodent, nor critter, to be infested by ticks.

Here are the top animals that carry ticks in North America:

- White-tailed deer
- Dogs
- Horses
- Cattle
- Raccoons
- Gray squirrels and chipmunks
- Birds

“Birds don't spread Lyme directly to people, but they can carry infected ticks to new locations with no history of Lyme occurrence. A tick could drop off a bird and into a

garden or yard, where it could later bite and infect a person.

<https://www.lymedisease.org/which-birds-spread-lyme-disease/>

Which Animals Rid Ticks?

Some animals, including opossums and backyard chickens, eat ticks and can be used to control the spread of ticks in yards!

<https://www.deerbusterscanada.ca/blogs/news/top-animals-carrying-ticks>

Clinical trials - Research: Vaccines for Lyme Disease

Clinical trials of new vaccines for Lyme disease are currently underway. Valneva and Pfizer have developed a Lyme disease vaccine candidate, VLA15, that is currently in Phase 2 human trials. VLA15 is a multivalent, protein subunit vaccine that targets the outer surface protein A (OspA) of *Borrelia*. This vaccine is designed to protect people against North American and European strains of the Lyme disease bacterium.

The University of Massachusetts Medical School's MassBiologics has developed a human monoclonal antibody designed to be used as pre-exposure prophylaxis (PrEP) for Lyme disease. Human trials are expected to begin soon. This approach would provide seasonal protection against Lyme disease. It would likely consist of a single shot that people would get each year at the beginning of tick season.

<https://www.cdc.gov/lyme/prev/vaccine.html>

Avoiding Tick Bites - CDC

- Before You Go Outdoors
- Know where to expect ticks. Ticks live in grassy, brushy, or wooded areas, or even on animals.
- Treat clothing and gear with products containing 0.5% permethrin.
- Use Environmental Protection Agency (EPA)-registered insect repellents.
- Avoid Contact with Ticks
- Avoid wooded and brushy areas with high grass and leaf litter.
- Walk in the center of trails.

After You Come Indoors

- Check your clothing for ticks.
- Tumble dry clothes in a dryer on high heat for 10 minutes to kill ticks on dry clothing after you come indoors.
- Examine gear and pets.
- Shower soon after being outdoors.
- **Showering within two hours** of coming indoors has been shown to reduce your risk of getting Lyme disease and may be effective in reducing the risk of other

tickborne diseases. Showering may help wash off unattached ticks and it is a good opportunity to do a tick check.

- Check your body for ticks after being outdoors. Conduct a full body check upon return from potentially tick-infested areas, including your own backyard.
- Check these parts of your body and your child's body for ticks:
 - Under the arms
 - In and around the ears
 - Inside belly button
 - Back of the knees
 - In and around the hair
 - Between the legs
 - Around the waist

https://www.cdc.gov/ticks/avoid/on_people.html

In most cases, to transmit Lyme disease, a deer tick must be attached for 36 to 48 hours. If you find an attached tick that looks swollen, it may have fed long enough to transmit bacteria. Removing the tick as soon as possible might prevent infection.

<https://www.mayoclinic.org/diseases-conditions/lyme-disease/symptoms-causes/syc-20374651>

Controlling Deer Populations

History

Deer were hunted to extinction in Indiana by the early 1900's. The last deer reported killed in 1893 in Knox County. No deer were reported until a 1934 restocking effort, trapping and transporting 400 deer from other states such as Michigan, Pennsylvania, Wisconsin and North Carolina. By 1943, there were an estimated 900 deer. In 1951 with an estimated 5,000 deer, Indiana opened selected areas to regulated hunting. <http://www.deerfriendly.com/deer/indiana>

A state estimate of 680,000 deer in 2020, about the same in 2017 estimated from harvest data, down from about 730,000 deer in 2015.

As deer have gone from extinction to reintroduction and rebounding with increasing numbers so has growth in human population, along with loss of habitat due to farming, development of former forest habitats, sprawling towns, cities and suburbs.

In this setting there has been increased contact between humans and wildlife and predictably instances of increased deer-human conflict.

The question is often asked: are there too many deer in our community? How does society and how do scientists answer that question?

The answer lies in two broad categories, one which reflects science and one which reflects societal attitudes toward deer.

The biological carrying capacity of an ecosystem versus the social carrying capacity of a community. Both are site specific.

The biological carrying capacity is assessed by the natural resources of an area. Is there enough food, water and shelter for deer to remain healthy and to reproduce or not?

The social carrying capacity is the tolerance of the community towards expected aspects of having deer co-exist in close proximity. Intolerance is often a reflection of certain events such as deer versus car collisions, damage to decorative flowers and gardens or damage to crops.

These concepts are *site* specific as each community will have it's own unique size and topography and natural resources and each community will have varying public attitudes either supportive of deer presence or opposed to it.

It therefore becomes the duty of each community, leaders and citizens alike, to formulate a plan specific to their community characteristics on how best to manage deer populations.

One of the factors affecting deer reproduction and therefore, population size, is the availability of natural food sources such as acorns. In 2021-2022 members of the Long Beach community noted and commented on social media about the unusual bounty of acorns. This was presumed to be a "mast" year.

Mast Year

In mast years, acorns fall by the thousands increasing food availability for squirrels, mice, birds, and other forest frugivores. During mast events, dependent wildlife populations increase. The following year, the trees will bear little to no fruit due to the abundance of energy required to produce the previous year's bountiful harvest. In subsequent low to no yield years, wildlife populations decrease as food becomes scarce. Then in a mast year, the overflowing harvest will more than feed the forest critters and ensure some seeds left to grow into future oak trees.

<https://thebotanicaljourney.com/blogs/the-botanical-journey/oaks-acorns-and-the-mystery-of-the-mast#:~:text=What%20is%20a%20Mast%20Year%3F%20Mast%20is%20a,particular%20woodland%20species%20produces%20more%20fruit%20than%20normal.>

If a community perceives an over- population of deer then what are some of the options for managing deer populations? There are two broad categories to consider, lethal and non-lethal options.

The first step is to clearly define the issues and if the deer population has not reached biological carrying capacity then the social carrying capacity may need to be addressed and strategies to mitigate the social deer-human conflict developed.

Any deer reduction program needs justification and needs to have measurable outcomes.

There are a Number of Options for Reducing Deer Populations:

Trap and Euthanize

Trap and euthanasia of nuisance deer involves the live capture of deer using box traps, clover traps, drop nets, or rocket nets. The deer are then euthanized by gunshot, penetrative captive bolt, or by pharmacological agent. Euthanasia by gunshot or captive bolt is preferred as it allows the meat to be used for human consumption.

Regulated Hunting

According to the IDNR, regulated hunting is the preferred method of dealing with deer conflicts in urban environments, it should be noted that it may not be ideal for every situation. The primary hunting methods used to safely harvest deer during regulated hunting in urban environments typically includes archery and crossbows.

While the cost of regulated hunting is significantly cheaper than many other options, it should be noted that regulated hunting, like all lethal removal techniques, is not a one-time solution. To maximize its efficacy, regulated hunting should be incorporated annually in a management program.

<https://www.in.gov/dnr/fish-and-wildlife/files/fw-UrbanDeerTechnicalGuide.pdf>

Trap and Relocate

Studies show that about half of all deer trapped and relocated die from capture-related stress, injuries or from wandering extensive distances after release, resulting in

increased highway mortality (Jones and Witham 1990). -

<https://www.in.gov/dnr/fish-and-wildlife/files/fw-UrbanDeerTechnicalGuide.pdf>

Sharpshooting

Sharpshooting is the deployment of experienced marksmen with specific equipment used to quickly and effectively remove deer from an area. Sharpshooting is an intensive form of management, often employed where other methods are ineffective or simply cannot be employed safely. Sharpshooting is a relatively expensive solution to nuisance deer problems but can be completed in a timely fashion. The cost of sharpshooting can be variable based upon a number of factors (size and scope of the project, approachability of deer, seasonal or timing restrictions, level of involvement of professionals in processing of culled deer, etc.), with a typical range being from \$91 to \$310/deer (DeNicola et al 2000).

<https://www.in.gov/dnr/fish-and-wildlife/files/fw-UrbanDeerTechnicalGuide.pdf>

Reintroduction of Predators

Many scholars point to the elimination of efficient deer predators such as the wolf or mountain lion across their historical range as reasons for the recent explosion of deer populations across much of the United States. Though this may be a minor contributing factor, it does not constitute the sole reason for the growth of the deer herd. In today's world, the ecological and social constraint of reintroducing predators to urban areas is impossible to achieve. Reintroducing predators is accompanied by additional human safety concerns, and urban areas in Indiana cannot meet their habitat requirements. Other species present in Indiana, such as the coyote and bobcat, are opportunists that capitalize on periods of deer vulnerability and generally are unproven at controlling the deer herd. The IDNR will not entertain the option of reintroducing large predators.

<https://www.in.gov/dnr/fish-and-wildlife/files/fw-UrbanDeerTechnicalGuide.pdf>

Fencing

Many different types of fencing can be used to exclude deer from specific areas, but fencing does not directly reduce deer numbers. Rather, it can prevent damage, which in turn has the potential to some extent to increase tolerance to deer by those directly impacted.

<https://www.in.gov/dnr/fish-and-wildlife/files/fw-UrbanDeerTechnicalGuide.pdf>

Surgical Sterilization

Surgical sterilization can be effective in certain situations, but it requires animal restraint and can be stressful to the treated animal, time consuming, and expensive (Boulanger et al 2012).

<https://www.in.gov/dnr/fish-and-wildlife/files/fw-UrbanDeerTechnicalGuide.pdf>

Humane - non-lethal population control - Immunocontraception

Faced with the question of deer population management in urban and suburban areas, communities have sought practical non-lethal alternatives and one concept that arose in the “late 20th century, in response to human health and safety, animal welfare and environmental concerns associated with these traditional wildlife management practices, researchers began exploring the possibility of mitigating conflicts by using fertility control to manage wildlife populations.”

<https://www.wildlifefertilitycontrol.org/about-botstiber-institute-for-wildlife-fertility-control/>

What is Wildlife Fertility Control?

A nonlethal method of population management which focuses on reducing the birth rates of wildlife rather than increasing the mortality rates.¹

¹ Fagerstone, K. A., Miller, L. A., Killian, G., & Yoder, C. A. (2010). Review of issues concerning the use of reproductive inhibitors, with particular emphasis on resolving human-wildlife conflicts in North America. *Integrative Zoology*, 1: 15-30.

doi:10.1111/j.1749-4877.2010.00185.x

The study of wildlife contraception dates to the 1960s when synthetic steroids were being investigated for their contraceptive use.² Surgical contraception research has been ongoing since the 1970s.¹⁷ During the mid-1980s research into the use of immunocontraception emerged.³

³ Delsink, A., Kirkpatrick, J., Berkschinger, H., Van Altena, J., Telecky, T., & Rowan, A. (2012). Free-ranging African Elephant Immunocontraception: a new paradigm for elephant management (Rep.)

An immunocontraceptive vaccine induces antibodies against proteins or hormones essential for reproduction.¹⁴

¹⁴ Massei, G. (2017, July 18). An overview of fertility control to mitigate human-wildlife conflicts in an overcrowded world. Lecture presented at 8th International Conference on Wildlife Fertility Control, Washington D.C.

Immunocontraceptives Registered in the US

Ovocontrol® was registered by Innolytics LLC as a reproductive inhibitor for use in Canada geese in 2005 and for use in pigeons in 2007.¹

GonaCon™ was registered in 2010 for use with white-tailed deer, feral horses, and feral donkeys.⁴

ZonaStat-H was registered by The HSUS in 2012 as vaccine for horses and wild burros.⁷

ContraPest was registered in 2016 by SenesTech, Inc. as an oral fertility inhibitor for Norway Rats and Roof Rats.⁸

ZonaStat-D was registered by The HSUS in 2017 as a vaccine for white-tailed deer.⁹

<https://www.wildlifefertilitycontrol.org/faq/>

SpayVac® is registered in Canada by Immunovaccine Technologies, Inc. as a vaccine for animal contraception. 11 1

<https://www.wildlifefertilitycontrol.org/wp-content/uploads/2019/08/FAQ-FLYER-final-5-21.pdf>

An immunocontraceptive vaccine induces antibodies against proteins or hormones essential for reproduction. 14 Porcine zona pellucida (PZP) vaccine and gonadotropin-releasing hormones (GnRH) vaccine are both examples of immunocontraceptive vaccines.

<https://www.wildlifefertilitycontrol.org/wp-content/uploads/2019/08/FAQ-FLYER-final-5-21.pdf>

WHITE TAIL DEER POPULATION MANAGEMENT IN SUBURBAN AND URBAN SETTINGS

If a community determines that their deer population requires management, because it is nearing or has exceeded biological carrying capacity or social carrying capacity, and the community has opted not to engage in lethal control the choices narrow down to the selection of a humane method.

One of the more common and established methods that has been utilized by the federal government to control population in wild, free ranging horses (1) and wild burrows is the immunocontraceptive porcine zona pellucida (PZP). (1) This product has also been used on elephants in Africa and in captive situations such as zoos in the US.

What is PZP?

- Porcine Zona Pellucida (PZP)
- immunocontraceptive vaccine
- Protein extracted from pig ovaries

- Highly Targeted: PZP-vaccinated females produce
- antibodies that block fertilization.
- Biodegrades quickly: If eaten, PZP is destroyed in
- digestion.
- No harm to health; treated mares live longer.
- Very modest effects on natural behavior (1)
- (Does not enter the food chain).

How PZP Immunocontraception Works

Immunocontraceptive vaccines activate the immune system to block a crucial aspect of reproduction. When administered to a female deer, the porcine zona pellucida (PZP) vaccine causes her to produce antibodies that bind to the protein envelope surrounding the egg, blocking fertilization.(2)

History of PZP Field Research

PZP was first recognized as an effective contraceptive in the 1970's. Since we first began treating free-roaming deer with dart-delivered PZP on Fire Island, New York, in 1993, more than 2000 deer have been treated at field sites in seven states. PZP is also widely used in wild horses, African elephants, and about 100 species of animals in zoos. (2)

PZP in Deer

PZP (porcine zona pellucida) is an immunocontraception vaccine that can be used to control fertility in adult female deer and other mammals. Unlike some fertility control vaccines and methods that can cause undesirable behavior changes, PZP simply prevents fertilization from occurring. Most importantly, because PZP is a natural protein, like all other proteins found in animals, it is safe to use and will not harm animals. PZP can be delivered to adult female deer by hand or remotely using darts shot from a dart gun. (3)

Recent improvements in the PZP vaccine now prevent deer from having fawns for up to three years with just one treatment. These vaccines significantly reduce the time needed to dart animals and, more importantly, reduce the costs of treating deer. (3)

Effectiveness and Longevity

PZP comes in two forms, which can be administered by hand-injection or dart. "Native PZP" must be administered annually to maintain effectiveness. "PZP-22" (consisting of native PZP plus controlled-release PZP pellets) yields two or more years of contraception after a single initial treatment. In wild horses, single boosters of native PZP administered 2-3 years after initial PZP-22 treatments yield at least 3-4 years of

additional effectiveness; similar results are indicated for deer. Treating deer with PZP typically reduces pregnancy rates by 80-90%. (2)

Side Effects and Safety

PZP is a naturally occurring protein that must be injected to be effective. If eaten, PZP is digested like any other protein. In deer, the only known side effect of PZP treatment is extension of the mating season. Current evidence indicates that this mating season extension does not increase the risk of deer vehicle collisions or cause any harm to the deer themselves. (2)

Population Control

Suburban deer populations have been stabilized and modestly reduced (20-50%) at three field sites. Typically, population stabilization is rapid, but population reduction is gradual (5-10% per year). Although high rates of female immigration could overwhelm efforts to control populations, multiple studies have shown that ~90% of adult female deer in suburbs stay close to their birthplace throughout their lives. Population effects of contraception are site-specific. (2)

Costs and Efforts

Costs and effort vary from site to site, depending mostly on how much time it takes to administer PZP to deer and whether the deer need to be captured. For example, at Fripp Island, SC, where deer were relatively approachable, deer were captured, ear-tagged and treated with PZP-22 at a cost of ~\$500/deer. At Fripp, dart-delivered native PZP treatments cost ~\$100/deer. (2)

Regulatory Status

Use of PZP on deer must be approved by the state wildlife agency. Federally, the EPA regulates wildlife contraceptives, and native PZP is registered with EPA for use on deer under the trade name "ZonaStat-D." Approval of state pesticide agencies may also be needed for management use. (2)

Contraceptive Status

Native porcine zona pellucida (PZP)-based contraceptive vaccines have shown their utility in the management of the population of both captive and free-ranging wild horses and white-tailed deer. Long-term use of the PZP-based contraceptive vaccines has also demonstrated their safety. Ideally single injection of the contraceptive vaccine should elicit long lasting immune response and desired contraceptive efficacy, which will require development of novel vaccine delivery platforms and more potent adjuvants. (4)

Current Population Management Programs

The Village of Hastings-on-Hudson

The Results of recent multi-year studies.

In 2017 The Village of Hastings-on-Hudson, New York published a document describing the results of the Hastings-on-Hudson Deer Immunocontraception Study as of 2017, the fourth year of a five-year viability study. (5)

Below is the list of accomplishments since the 2016 report.

- On 11 field days from March 10-29, 2017, two to three HSUS teams captured 25 deer and immunized 21 does, bringing the total of immunized does to 69. (5)
- A full population census has not been completed but observations of tagged and un-tagged does suggest that approximately 75% of does are immunized. (5)
- 191 properties were flagged after homeowners gave permission for darting to occur on their property. (5)
- From September 27-29, 2017, seven does received one of the two vaccine re-treatments via dart injection without being immobilized with anesthesia. (5)
- Pregnancy and/or birthing of fawns from 2014-2016 by does prior to immunization was between 77-90%, while after immunization fawning by does that were sighted was between 10-20% from 2015-2017. (5)
- Sightings of tagged does indicates that most remain in the same social groups and in the same territories, with limited migration. (5)
- Hosta survival after three months increased from 12% in 2015 to 24% in 2017. (5)
- Deer-Vehicle Collisions (DVCs) have declined over the five years of the study. (5)
Pending results from the fifth year of the study, a plan for sustaining and expanding the effort will be needed.
There will be no more does added to the study, and only re-immunizations will be carried out in 2018 and 2019. (5)
- The net project cost to the village to date has been \$74,112. (5)

EPA approval of the PZP-22 use in the field, and DEC approval of its use for deer population management will be needed in order to move from the research phase to the management phase. (5)

Bottom line: study data thus far indicate that the vaccine is effective at reducing fawning rates. (5)

Pending completion of a population count, the population effect will not be known for certain. Field observations during the summer and fall of 2018 will improve the reliability of estimates of the project's outcomes. In the next year a sustainable management plan will need to be developed (5)

The Village of Hastings-on-Hudson - Follow Up Report June 2, 2021

Over the course of the study, fawning rates among females receiving a single hand-injection of PZP-22 have averaged 14.7% over the first two years (with limited evidence, based on a small sample, that reduction in fawning continues after two years; Table 1). (6)

Fawning rates among females receiving boosters 2.5 years after initial treatment averaged 9.8% over three years, with no evidence of decreasing effectiveness over that period (Table 2). No difference in fawning rates was observed between females boosted with native PZP emulsion and those boosted with PZP-22. (6)

Population Dynamics

Reproduction, Mortality and Disappearances.

Up to 15 fawns were observed on a given day within HoH during the fall observation session. Most accompanied untagged females. (6)

Of the 69 females captured and ear-tagged since 2014, we are aware of 10 documented mortalities (no tagged deer were reported as deceased to us this year). (6)

During September observations, we located 15 of the 69 does captured during 2014-17, Thus at least 22 ear-tagged does remained on site late in 2020.

These included 2 of 8 females tagged in 2014 (plus #8);

6 of the 20 females tagged in 2015;

6 of the 20 females tagged in 2016 (plus #43);

and 7 of the 21 females tagged in 2017 (6)

Between 2016, when sufficient numbers of females had been marked to justify use of this method, and 2020, deer population size estimates obtained using this method declined by about 36% (Fig. 1). (6)

Using this method, deer populations at Hastings-on-Hudson declined approximately 62% between 2014 (the year the study began) and 2019.

Broadly speaking, the two different methods (mark-resight and camera-trap) yielded similar population trends and (for 2018-19 especially) similar absolute population estimates (Fig. 3).(6)

Deer Impacts: Deer-Vehicle Collisions

Deer-vehicle collisions reported by the Village of Hastings-on-Hudson declined during the period of the study (Figure 4). The number of collisions reported 2017-2020 was significantly lower than then number reported 2013-2016 ($\chi^2 = 7.08$, $df = 1$, $p = 0.008$).(6)

DISCUSSION

No darting was planned or carried out in 2020.

Because of COVID-19, observations and camera trap placement were both subject to travel constraints, and on-the-ground observations were not carried out in March or August. Thus we might have missed tagged does and fawns that were present onsite only during those times, and not counted fawns that were born but died before September-October observations. We also relied on local volunteer assistance to monitor and remove cameras, so image collection and timelines differed from previous years. Tampering with trail cameras also increased in 2020. (6)

Vaccine Effectiveness

Within our observation limits, fawning continued at very low rates among treated females in 2020, with only two fawns observed among 15 treated females observed. Again, we commonly saw fawns associated with untagged females, especially at the northern and southern edges of the village where does often crossed into areas to which we did not have access for the capture, tagging, and treatment of deer during the study. (6)

Observations from this and previous years confirmed that hand injections of PZP emulsion plus controlled release pellets (PZP-22) delivered in March are effective for at least two years, approximately replicating the efficacy and longevity results from the study conducted on Fripp Island, SC (Rutberg et al. 2013). Very limited data hint there may be some lingering effectiveness of the initial treatment beyond Year Two (2 fawns in 6 fawning opportunities in years 3-5); this may be worth further investigation. (6)

Our evidence is now strong that boosters of either PZP-22 or native PZP delivered 2.5 years after hand injection with PZP-22 add at least three years of contraceptive effectiveness, with only 4 fawns produced in 43 fawning opportunities.

We saw no indication that effectiveness declined across three years, suggesting that booster effectiveness may extend past three years. There was also no indication of differences in effectiveness between PZP-22 and native PZP boosters. These results parallel or improve upon those reported on PZP booster effectiveness in wild horses (Rutberg et al. 2017).(6)

- Two practical conclusions emerge. The most important conclusion is that a single hand delivered PZP-22 primer and a single PZP booster administered several years later may suffice to effectively contracept most adult does for the remainder of their lifespans. (6)
- The second is that, because PZP-22 boosters carry no effectiveness advantage and are more difficult to handle and costly than native PZP, future protocols should use native PZP to boost PZP-22-primed deer.(6)

Population Dynamics

Although both methods of population estimation used here are imperfect, the camera-trapping and mark-resight estimates largely corroborate one another (Fig. 3). (6)

Both point towards a deer population decline of 50% or more between the start of the study in 2014 and 2018, when the full effect of contraception would have first been experienced in the population. The inferred deer population reduction is paralleled by the reduction in deer- vehicle collisions across the study period (Fig. 4). Although fawn numbers are rising slowly as of 2020, they are still only about half of what they were in 2014, and the reduced deer population levels appear to have persisted into 2020. (6)

More than three years after we stopped tagging new does, our observations suggest **that tagged females still comprise nearly half of the adult females** present onsite. Despite the reduction in deer density, **there is no evidence of a large-scale migration of untagged females into the site**. This observation is consistent with earlier work on removals of local deer populations (McNulty et al. 1997; Porter et al. 2004). (6)

Deer Impacts on the Community

The most important impact of this study on the Village was the significant reduction in

deer-vehicle collisions during the study period. The number of reported collisions declined from an average of almost 9 per year from 2013-2016 to 4 per year in 2017-2020. (6)

The Host-a-Hasta program, like so much else, was canceled due to COVID-19.(6)

Community Involvement

Although Covid-19 has impacted field activity and participation from residents, the Village deer website is still being updated in an effort to keep the community informed.

Although the Deer Hotline was not activated this year due to cancellation of field sessions in which that reporting is requested, it remains a productive tool for the research team that aids in opening lines of communication between the community and the research team and will be reinitiated in future field sessions. It was also suggested by a Village Trustee, to re-institute electronic reporting from residents via email or village-hosted website to increase engagement and continue community level data collection and oversight beyond the study timeline. (6)

Work Planned for the Remainder of 2021

During late August 2021, the team will return to HoH for approximately 4 days to observe and locate previously tagged animals, match tagged and untagged females with fawns, and estimate the proportion of females in the population that are tagged. The 2021 data should provide us with additional insight on estimating the efficacy and longevity of the two types of PZP boosters. (6)

Photographs from the camera traps in place in October and November 2020 have been cataloged in the Excel database. Because of inconsistencies with methodology from previous years, and relatively smaller numbers of deer recorded on camera, population estimates from 2020 are still being refined. Analysis of the spatial relationship of tagging and darting efforts to the presence of fawns and more complete descriptions and analysis of survivorship of tagged deer will also be carried out in 2021.(6)

Oak Bay Urban Deer Management

In 2016, the Oak Bay Council, along with Urban Wildlife Stewardship Society signed onto the provincial urban deer cost-share research program. (7)

2016-2018

The first phase consisted of public education, data collection and analysis with the goal of better understanding population numbers, deer ecology and migration patterns of the deer population.

Phase one fitted a control group of 20 does with GPS collars. (7)

2019

Phase two, undertaken in Fall 2019, consisted of administering immuno-contraception to Oak Bay deer. In phase two, 60 does were administered immuno-contraceptive. The deer who received immuno-contraception were marked with coloured tags in both ears and a coloured collar to allow for individual identification. The 20 deer in the control group did not receive immuno-contraception. During phase two, over 650 Oak Bay property owners granted property access to the UWSS to administer immuno-contraceptive on their property.

About Immuno-Contraception

Immuno-contraception (IC) is non-lethal and allows the deer population to be gradually reduced in a stable and sustainable way.

Immuno-contraception involves giving does several doses of contraception so that they do not conceive. (7)

2020

The third phase will consist of re-marking the control group and re-boosting deer vaccinated in 2019 as well as administering further primary vaccinations and boosters and collecting and further analyzing data to measure the efficiency of the contraception and impacts of the program on deer population. (7)

The Following Work was Undertaken in 2021:

Analysis of a full-year pre-treatment dataset:

Analysis of post-treatment data and quantification of the reduction in fawning rates and the overall urban deer population following two years of immuno-contraception treatment; Re-boosting of as many of the does treated in 2019 & 2020 as possible, and evaluation of the need for further primary treatment; and continuation with public education, building on the citizen engagement undertaken in previous years. (7)

Data analysis from the 2020/2021 camera data enabled UWSS to quantify the reduction in fawning rates and the overall urban deer population following two years of immuno-contraception treatment. In 2021. (7)

Oak Bay's Birth-Control Program is Working

An interim report posted online by the municipality this week shows a **60 per cent** decrease in the number of fawns born in 2020, **one year** after the start of an immunocontraceptive vaccine pilot project. (8)

"I find it really heartening that this seems to be an effective alternative to a cull as a means of population reduction," wildlife biologist Alina Fisher said Tuesday. "It's got the potential to help with urban deer management across the entire province. It's fantastic. I'm pretty excited about the results." (8)

In September **2019**, 60 does were inoculated with an immunocontraceptive by veterinarian Dr. Adam Hering and a group of volunteers. The does were darted with a sedative before a dose of the vaccine was injected by hand. Two to six weeks later, the deer were given a booster. The study also included a control group of 20 does that were given collars, but not vaccinated.

In **2020**, the 60 does were given booster shots. The vaccines are administered in the fall and researchers don't see the results until spring or summer, said Fisher, who described the delay "excruciating." (8)

Esquimalt is also participating in the study. In June, the province granted the township a permit, and it began its immunocontraceptive program in September. The research is being done by the University of Victoria Applied Conservation Macro Ecology Lab, which will use the same methods to inoculate up to 100 female deer. (8)

The Township of Esquimalt

In July of 2021 The Township of Esquimalt began the work of vaccinating does with immunocontraceptives. This was the next step in the community's efforts to balance urban wildlife and their interaction with residents. The initiative followed several years of initial research, exploring local deer numbers. (9)

How the Program Works

In the summer of 2021, a wildlife veterinarian, working with field technicians, planned to tag 20 female control deer in Esquimalt. Then, in September and October, up to 100 female deer were to be captured and marked to be vaccinated with an immunocontraceptive. Those deer would later receive a booster vaccine. (9)

The study was to help determine how many deer need to be given contraceptives to manage the urban population and how often they need to receive booster vaccines.

The planned immunocontraceptive program was to build on the township's previous three-year population study, which found an average of 130 to 140 deer in the area each year, not including those at CFB Esquimalt. Before the study, a survey was sent to local households, inviting residents to weigh in about their own experiences and location of deer interactions. Together, these steps helped inform the immunocontraceptive plan. (9)

After the prescribed three-year deer survey and in consultation with local First Nations, the Ministry of Forests, Lands, Natural Resource Operations, and Rural Development has granted the permit required to participate in studying the efficacy of immunocontraception (IC) on deer in the Township of Esquimalt. (10)

In September-October 2021, up to 100 female deer will be captured and marked to treat with an immunocontraception (IC) vaccination. In fall 2023, previously treated deer will be given an IC booster vaccine.

More information about the progress of the study can be found at acmelab.ca/esquimaltdeer. (11)

The research is being done by the University of Victoria Applied Conservation Macro Ecology (ACME) Lab in partnership with the township. (11)

The Esquimalt Deer Research Project builds upon continuing research of the Oak Bay Deer Project. It looks to research Columbia black-tailed deer populations, densities, space use, habitat selection, distribution and movement patterns in urban landscapes. (12)

What We Have Learned

- A successful plan must include the support of the citizens and local government.
- To be successful a multiyear plan should be anticipated.
- No one plan fits all communities and they are, in fact, site specific. A small suburban community with a high human population density will have different strategies than communities with wide open spaces such as farmlands or large forests.
- The first step is educating all stakeholders about ways to mitigate human-deer conflict.
- Safe driving around deer.
- Planting deer resistant gardens.
- Not feeding deer.
- If at some point in time the community perceives an over abundance of deer that requires population control, then one site specific non-lethal option that is well

suited for small (1 square mile) densely populated (1,200 residents/sq mile) urban settings is immunocontraception with PZP.

- The technique for administering PZP involves a trained team using a dart gun to tranquilize the deer, then hand inject the PZP and ear tag the deer and release. Two to six weeks later, the ear tagged deer are given a booster.
- There are multiple steps to be taken before a pilot project can be initiated, not the least of which is recruiting a university level partner to assist in research design.
- Further, currently, the State of Indiana controls our public deer and are responsible for their welfare and permission would be required from the State and probably the Federal government before darting deer with the immunocontraceptive PZP could be initiated.
- The rationale is that while regulated hunting has been successful, popular and well run, one more option specifically for small but highly populated communities would be welcome and would avoid the often divisive “to hunt or not to hunt in our town” stress among citizens. Such a program would cast regulatory agencies as forward looking while at the same time have little to no impact on the currently approved regulated hunting program.

PZP: Quick Review

- Primer. Booster. Dart, sedate, ear tag and release
- Staffing - Certified darter, DVM, deer biologist, student volunteer trackers.
- Find a university to partner with the Town of Long Beach
- Cost
 - Look for grants.
 - “Adopt a deer” public program, possibly work with the Humane Society on this.
- Regulatory Issues - Will need the town government’s support as we reach out to State and Federal regulators.
- Safety Issues
- Environmental - PZP does not get in food chain.
- Consumption of the meat is safe.
- The deer are not permanently sterilized.
- Human risks - not a hormone; not a pesticide. It’s simply a protein that breaks down quickly on the ground or in the gut and is EPA approved.
- Studies have shown that female deer stay within one mile of their bedding, food source, and their fawn. They do not disperse the same way as bucks.
- Long Beach is not an open four sided habitat. Deer immigration is blocked from the north by Lake Michigan and blocked from the south by the four lane highway US12 and railroad tracks.

- Gradually lowering the population number does not invite deer from adjacent communities in the same way as a sudden drop from culling would likely. Culling results in more available nourishment due to a sudden drop in population.

Citations for Current Population Management Programs

(1) Managing Wild Horses with PZP

ALLEN RUTBERG

TUFTS CENTER FOR ANIMALS AND PUBLIC POLICY

BOTSTIBER INSTITUTE FOR WILDLIFE FERTILITY CONTROL

NOVEMBER 8, 2018

<https://www.wildlifefertilitycontrol.org/wp-content/uploads/2018/11/2.-ALLEN-RUTBERG-presentation.pdf>

(2) FACT SHEET: PZP IMMUNOCONTRACEPTION for DEER

Dr. Allen Rutberg, Director, Tufts Center for Animals and Public Policy

Cummings School of Veterinary Medicine at Tufts University, North Grafton, MA

<https://avalonnaturepreserve.org/wp-content/uploads/2020/01/Deer-PZP-Fact-Sheet-4-19.pdf>

(3) Controlling deer populations humanely

Wildlife fertility control

© 2022 The Humane Society of the United States

<https://www.humanesociety.org/resources/controlling-deer-populations-humanely>

(4) Front Biosci (Schol Ed)

2017 Jun 1;9(3):357-374.

Wildlife population management: are contraceptive vaccines a feasible proposition?

Satish Kumar Gupta 1 , Vidisha Minhas 2

<https://pubmed.ncbi.nlm.nih.gov/28410124/>

(5) Village of Hastings-on-Hudson, New York

STATUS REPORT ON THE

HASTINGS-ON-HUDSON DEER IMMUNOCONTRACEPTION STUDY

2017

https://www.hastingsgov.org/sites/g/files/vyhliif7561/f/uploads/deer_project_report_to_the_village_2017.pdf

<https://www.hastingsgov.org/sites/g/files/vyhliif7561/f/uploads/nysdec>

(6) Report to the New York State Department of Environmental Conservation

License to Collect or Possess: Scientific #2670

White-tailed Deer Contraception and Impact Study
Village of Hastings-on-Hudson, New York
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Kali Pereira, M.S.
The Humane Society of the United States
700 Professional Drive, Gaithersburg, MD 20879
June 2, 2021

<https://www.hastingsgov.org/sites/g/files/vyhliif7561/f/uploads/nysdec>

(7) Deer in Oak Bay

<https://www.oakbay.ca/our-community/pets-animals/deer>

(8) Oak Bay deer birth-control project shows 60 per cent decrease in fawns

Louise Dickson

Nov 24, 2021 10:10 AM

<https://www.timescolonist.com/local-news/oak-bay-deer-birth-control-project-shows-60-per-cent-decrease-in-fawns-4791670>

(9) Esquimalt

Esquimalt launches birth control study for urban deer

July 19, 2021

<https://www.vicnews.com/marketplace/esquimalt-launches-birth-control-study-for-urban-deer/>

(10) How to take part in the Esquimalt urban deer research project

<https://www.esquimalt.ca/government-bylaws/animal-control/deer/how-take-part-esquimalt-urban-deer-research-project>

(11) Esquimalt

New phase of deer management begins in Esquimalt

June 24, 2021

(12) The Esquimalt Deer Research Project

<http://www.acmelab.ca/esquimaltdeer.html>