Urban Deer
TECHNICAL GUIDE

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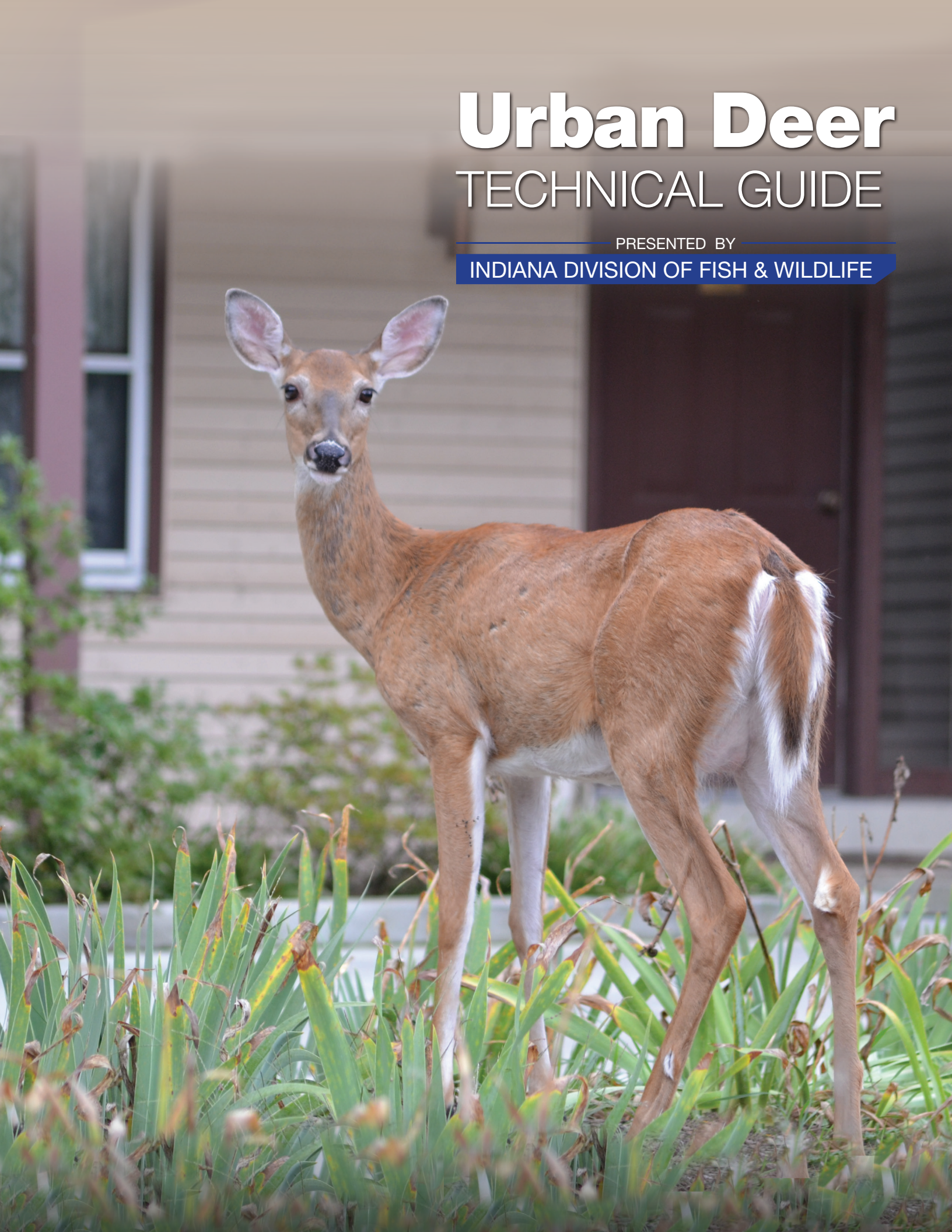
INDIANA DIVISION OF FISH & WILDLIFE



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Executive Summary

The impact of white-tailed deer within urban communities is a growing problem nationwide, and already has been experienced by several communities in Indiana.

Deer and deer management may be some of the most controversial topics city leaders encounter due to the polarizing opinions that deer raise with members of the community. Many individuals believe community residents must adapt to the presence of deer and live together peacefully. Others are vocal in their disdain for deer and want their numbers drastically decreased by any means possible. Both parties are often unrelenting in their values, and there are no management alternatives available that both parties find unanimously favorable. Furthermore, many alternatives can be expensive and could significantly impact the budgets of individual residents, homeowner associations, or municipalities.

Issues revolving around deer often stem from citizens' capacity to tolerate current deer population levels. This typically is referred to as the saturation point for social carrying capacity. At this point, deer are abundant and causing real and/or perceived problems, such as deer-vehicle collisions, damaging landscaping and gardens, destroying the understory in natural areas, and tolerating human presence much more than a rural deer, which can intimidate some people.

The social carrying capacity for deer can vary widely over a geographic area and is not easily correlated with specific deer densities. Ironically, these deer, though abundant, are generally not "suffering" since they have plentiful food. Ecologically, urban environments are able to support much higher numbers of deer beyond the limits of social carrying capacity, which will further compound the problem in the future. In the absence of a proactive deer management program, their numbers will continue to escalate to higher levels, making the inevitable response more controversial and more costly.

The Indiana Department of Natural Resources (IDNR) has put this guide together to inform local communities about general deer biology, deer management options and their pros and cons, and considerations for instituting an urban deer management plan. The IDNR believes that hunting can address most problems and is the preferred solution for communities. With the assistance of this guide, it is up to each community to identify the problem, discuss the potential solutions that are acceptable to the community, and take the appropriate actions toward solving the problem. The IDNR is always available for consultation.

Deer were reintroduced into Indiana in 1934, and have flourished since that time.

Introduction

The history of the white-tailed deer (Odocoileus virginianus) in Indiana is a classic success story of wildlife management. Common throughout the state in pre-settlement times, deer provided meat and hides to generations of American Indians living and travelling throughout the state.

Uncontrolled and unregulated hunting, along with public apathy, resulted in the extirpation of white-tailed deer. The last known deer was taken in Knox County in 1893, and deer remained absent on the Indiana landscape until 1934, when the Division of Fish and Game reintroduced deer back onto the landscape (Machan 1986).

Reintroduction efforts lasted for several years, and the deer herd grew and expanded across the state over time. This growth continued to the modern era, and deer have proved to be one of Indiana's most valued and renewable natural resources. However, overabundant herds of deer have found sanctuaries in developed communities, and, rather than providing value, are causing conflicts that threaten their reputation as a valuable resource to Indiana.

Urban deer can cause problems by browsing gardens, destroying landscape or emptying bird feeders.

extirpation
(n.) To remove entirely from an area.

Deer overabundance is often a reflection of human values rather than biological thresholds (DeNicola et al 2000). When deer numbers approach or exceed human tolerance levels and interfere with human priorities, deer numbers are considered overabundant (Decker and Purdy 1988, McCabe and McCabe 1997). Deer tend to proliferate in suburban areas due to one or a combination of any of the following factors:

- Real or perceived safety concerns with hunting deer;
- Conflicting social attitudes and perceptions about wildlife;
- Hunting and firearm-discharge restrictions;
- Liability or public relations concerns in managing deer (DeNicola et al 2000).

Because of these factors, conflicts between humans and deer have become more common in recent years, and communities struggle with the task of selecting a publicly acceptable management strategy to safely and effectively reduce deer populations (Jones and Witham 1995, Kilpatrick and Spohr 2000). Many potential solutions have been identified to resolve conflicts with deer in urban areas and are discussed throughout this guide (Appendix 1). This guide is designed to provide cities and communities with information about overabundant deer populations and facts about deer and deer management in suburban and urban areas.

Deer Biology

White-tailed deer are highly adaptable creatures. As many as 38 subspecies are defined across North and South America, with their range extending from Canada to northern South America (Smith and Rhodes 1994). Deer can live up to 12 years in non-hunted populations, although most do not live past four or five years where hunting occurs (Severinghaus and Cheatum 1956, Matschke et al 1984). Deer are capable of running as fast as 36 mph and have been documented to jump eight-foot obstacles (Sauer 1984).

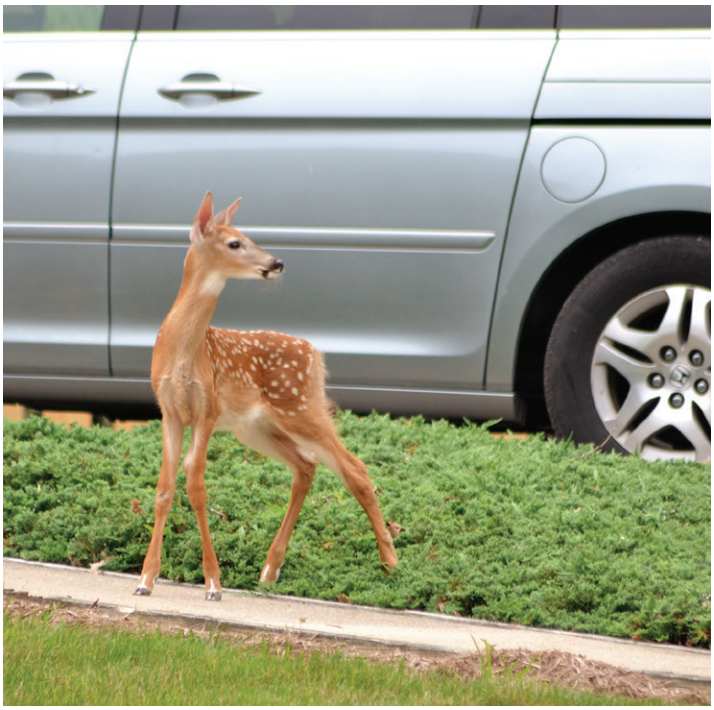
Deer are classified as an edge species, preferring transitional areas between forests, agriculture, grasslands, and suburban areas (DeNicola et al 2000). In Indiana, the interspersion of forests and suburban areas (protective cover) with agricultural fields (highly nutritious forage) offers deer an ideal setting not only to live but also thrive. Diets of deer tend to vary seasonally, focusing on forbs and agricultural growth in the spring and summer, hard and soft mast (acorns, crabapples, and persimmons) in the fall, and grasses and waste grains from agriculture in the winter.

forb (n.) Any herbaceous plant that is not a grass.

Mating behavior of deer begins in mid-October, peaks in early November, and can last through December and occasionally into January. In areas where nutritious forage is available and plentiful, fawns typically born in May or June who achieve weights of approximately 75-80 lbs. can become reproductively active in December. In Indiana, it is not uncommon for most adult does to have two and sometimes three fawns each year. Fawns normally are born in May and June and typically spend their first few weeks in hiding. The mother visits once or twice a day to nurse her fawn(s). After a few weeks of age, the fawns begin to follow their mother throughout the day (Marchinton and Hirth 1984). Female deer remain reproductive throughout their life as long as they stay physically fit and capable.

Deer populations in general have a remarkable ability to grow due to their high reproductive potential. In the fenced George Reserve in Michigan, a population of six deer grew to 222 deer in seven years (McCullough 1979, McCullough 1984).

Reproductive output is often associated with population density, often referred to as density-dependent reproduction. In general, as deer populations increase, their habitat is degraded and becomes unable to support current or growing numbers, so their reproductive output is reduced due to decreased fitness (DeNicola et al 2000). This is often referred to as a biological carrying capacity. Biological carrying capacity is defined as the number of deer that a parcel can support over an extended period of time (Ellingwood and Caturano 1988).



Urban areas have shown higher survival rates of fawns, indicating a increased capacity for the local deer herd to grow more rapidly.

Similarly, when the population is in a habitat that is able to support more deer, their reproductive output is maximized. In Indiana, deer are rarely, if ever, limited to their natural biological carrying capacity, due to the mild winter climates and abundant summer forage, even when densities become excessively high in suburban and urban areas.

The home range, or area a deer occupies, varies seasonally and by individual. In general, males occupy a larger home range than females. Females typically have the smallest home ranges while giving birth and during the early weeks of fawn rearing (Nixon et al 1991, Storm et al 2006).

The size of a seasonal home range varies according to habitat composition and deer density (Nixon et al 1991). In heavily fragmented areas, home range size for males can extend up to 38 square miles in the fall and 4 square miles in the summer (Sparrowe and Springer 1970). In the Midwest, typical home range size in suburban and exurban areas (residential areas outside of city limits that complete a gradient between suburbs and rural areas) can fall between 120 acres and 220 acres, depending on location and season (Grund et al 2002, Storm et al 2006).

Impacts of Overabundant White-tailed Deer Populations

Deer-human interactions

Nationwide, deer-vehicle collisions have been estimated to cause 29,000 injuries, 200 human fatalities, and over $1 billion dollars in property damage annually (Conover et al 1995, Conover 1997).

A 2009 survey of Indiana residents in three major cities found that 39 percent of individuals or immediate family members had been involved previously in a deer-vehicle accident (Stewart 2011). The Indiana Department of Transportation has reported an average of approximately 16,700 deer killed per year in Indiana between 2006-2010, though many accidents are not reported and actual numbers struck in Indiana likely exceed 30,000 (State Farm Insurance, 2011). The estimated average cost of repair from reported collisions with deer was $3,171 during this time period, which amounts to $98 million dollars worth of damage done annually from deer-vehicle collisions in Indiana (State Farm Insurance, Bloomington, Illinois, 2011).

Additionally, deer in urban and suburban areas can become acclimated to human presence, and do not exhibit the typical flight behavior seen in rural areas. This is often referred to as habituation, and has proved problematic in suburban and urban settings. There have been several documented cases in Bloomington, Indiana, where adult does have attacked dogs, especially during the fawning season. Habituated does have been documented to attack humans on the campus of Southern Illinois University (Hubbard and Nielsen 2009). Urban deer accustomed to human presence essentially have lost fear of humans and no longer view them as a threat, which increases the probability that a negative human-deer interaction will occur.

Ecological damage

Individual deer have the ability to consume 5-10 pounds of forage per day, depending on the season. Deer numbers not balanced within their environment can have negative impacts on native plant communities, potentially eliminating certain species and alternating successional pathways within forest communities (Stromayer and Warren 1997, Waller and Alverson 1997, Augustine and Frelich 1998). These changes within the forest can dramatically reduce or alter the composition of many other species, including songbirds and small mammals (DeCalesta 1994, McShea and Rappole 2000).

> “Urban deer accustomed to human presence essentially have lost fear of humans and no longer view them as a threat...”

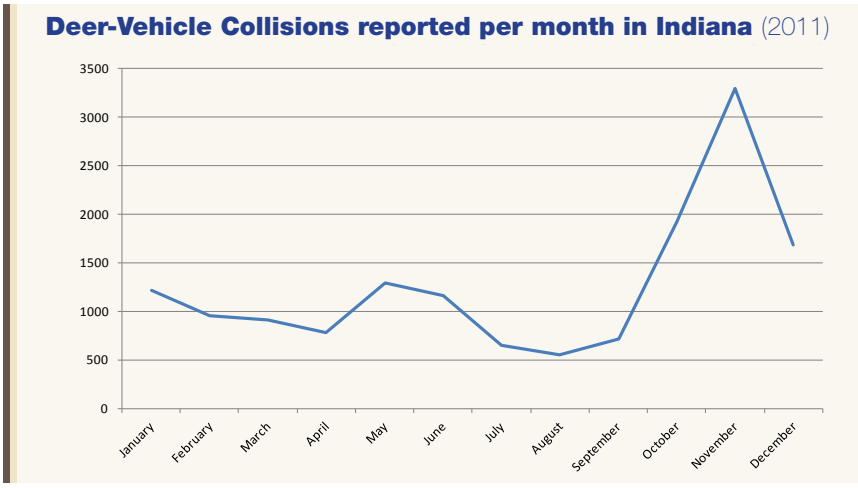
For example, a study in Pennsylvania found that several bird species, including Eastern Wood- pewee *(Contopus virens)*, Indigo Bunting *(Passerina cyanea)*, Least Flycatcher *(Empidonax minimus)*, Yellow-billed Cuckoo *(Coccyzus americanus)*, and Cerulean Warbler *(Setophaga cerulea)* generally are not observed in areas with over 20 deer/square mile (DeCalesta 1994).

In residential areas, deer can impact flower and vegetable gardens, defoliate landscape plantings, and take advantage of bird feeders (Kilpatrick and LaBonte 2007, Kilpatrick and Spohr 2000). Supplemental feeding may cause deer to congregate and stay in small areas, which can increase damage to adjacent vegetation and initiate neighbor conflicts.

Lyme disease

Lyme disease is a tick-borne disease in humans caused by the bacterium Borrelia burgdorferi that is transmitted by the bite of an infected black-legged tick (Ixodes scapularis). Black-legged ticks become infected by feeding on white-footed mice (Peromyscus spp.), which harbor the bacterium. Deer are the preferred host for adult black-legged ticks and key to the reproductive success of the tick (Stafford 2004). Other mammals such as raccoons, skunks and opossums may also serve as hosts. In most cases, the tick must be attached for at least 36 hours before the bacterium is transmitted.

According to the Center for Disease Control, Indiana's cases have increased recently, averaging 55 cases per year since 2007, while the average from 2000-2006 was approximately 26 cases per year. Our understanding of the relationship between deer densities and Lyme disease is incomplete; numerous studies indicate that abundance and distribution of ticks are correlated with deer densities (Rand et al 2004, Stafford 2004, Walter et al 2002, Wilson et al 1990), while others indicate Lyme disease incidence is not related to deer densities (Ostfeld et al 2006).



Deer-vehicle collisions are a major hazard to residents in urban areas.

Hunting is the most accepted form of management in the public's eyes, and the most common technique used to manage the deer herd in Indiana.

Deer Management in Indiana

State law (IC 14-22-1) stipulates that wildlife belong to the people of Indiana and charges the Indiana Department of Natural Resources (IDNR) with managing wildlife (including deer) on their behalf (IC 14-22-1-1). To that end, the IDNR provides for a regulated hunting season in Indiana according to IC 14-22-2-6 in an effort to manage the deer population.

Indiana's liberal deer hunting seasons and bag limits are designed to maximize hunter opportunity and to provide land managers (landowners) a wider variety of options for managing hunting opportunities and hunting efforts to manipulate deer densities on their property.

Moreover, the IDNR has worked to alleviate conflicts with deer in urban areas through the creation of urban deer zones (UDZ). These UDZ are designed to target deer reduction efforts in portions of the state that experience increased deer conflicts and are densely populated.

Whether in an UDZ or not, the IDNR recommends hunting as the most practical, safe, and cost effective lethal deer management option where it can be conducted legally (local ordinances sometimes prohibit such activity). In Indiana, it is legal to hunt deer with multiple equipment types, including archery, crossbows, shotguns, handguns, center-fire rifles, and muzzle loading firearms. For more information on equipment types legal during the Indiana deer hunting seasons, visit www.in.gov/dnr/fishwild and click on the Hunting & Trapping link.

Below are descriptions and outlines of the deer hunting seasons in Indiana:

Urban Deer Zone Season: Some metropolitan areas of the state have been designated as UDZ. These zones provide an incentive for archery hunters, using archery equipment only, to harvest additional deer above and outside of normal deer bag limits. The urban zone hunting season is continuous and extends from Sept. 15 through Jan. 31. The bag limit for the urban deer zone (four antlerless, or three antlerless and one antlered deer) is in addition to statewide bag limits for deer. UDZ boundaries typically focus on the urban and exurban portions of a county. These zones are specifically designed to reduce deer densities. Hunters in an UDZ are required to take an antlerless deer prior to shooting an antlered deer, ensuring the likelihood that reproducing females are removed from the population at an increased rate.

Youth Season: Youths under the age of 18 are afforded an opportunity (the weekend prior to Oct. 1) in advance of the regular deer hunting seasons to hunt deer in Indiana. All weapons legal for deer hunting, excluding handguns, may be used. Deer harvested during this special season count toward statewide bag limits.

Archery Season: Oct. 1 marks the beginning of the archery season, which runs through the first weekend in January. Equipment is restricted to long bows, recurve bows, compound bows and crossbows. Archery hunting is considered safe since arrows are limited in how far they travel, thus requiring deer to be shot at close range. In addition, most archery hunters hunt from an elevated stand, which further reduces the distance arrows might travel. The other advantage to using archery equipment is it doesn't produce noise levels that might disturb or frighten neighbors or domestic animals in the area. However, there is an increased tendency for deer shot with an arrow or crossbow bolt to travel greater distances than deer shot with a bullet. This may present a problem in urban areas where small individual lot sizes may result in deer unintentionally traveling onto neighboring properties. This can cause problems when retrieving the deer carcass from properties where the hunter does not have access or permission.

Firearms Season: Firearms season, or "gun season" as it is often called, always begins the first Saturday following Nov. 11 (range: Nov. 12-18) and continues for 15 additional days. Legal equipment includes shotguns (loaded with slugs or saboted bullets), handguns and rifles that meet specific caliber and shell case requirements, muzzleloading long guns (.44 caliber or greater), and muzzleloading

handguns (.50 caliber or greater). Most deer hunters participate in firearms season, the season in which the most deer are harvested. Firearms have a greater effective range, and studies have shown that deer removed per hunter or effort is greater for firearms hunting than archery hunting. However, firearms may not be the ideal equipment to use in urban situations. Slugs or bullets travel greater distances than arrows, representing an increased safety risk if a hunter misses the intended target. This issue can be mitigated by encouraging or requiring hunters to shoot from elevated stands. Furthermore, bullets exceed the sound barrier, producing a loud noise that many residents may find offensive or threatening.

Muzzleloader Season: Muzzleloaders are types of firearms that are loaded through the barrel of a gun, rather than through a breech. In doing so, this type gun is limited to only one shot per loading, rather than the ability to fire multiple shots sequentially. Although muzzleloaders may be used during the firearms season, they are the only firearm permitted during the dedicated muzzleloader deer hunting period. The season opens the first Saturday following the conclusion of firearms season and continues for 15 additional days. Muzzleloaders have the same pros and cons as other firearms when compared to archery equipment.

Special Antlerless Firearms Season: For select counties in Indiana, a special antlerless-deer-only firearms season begins Dec. 26 each year and continues through the first Sunday in January. Firearms permitted for use in the regular firearms season are permitted during this season. This season is designed to further increase antlerless deer harvests, which in turn helps lower present and future deer densities on the landscape.

Deer Licenses

Resident Indiana landowners, spouses, and dependent children are exempt from possessing a license to hunt (or fish or trap) on the land they own; however, all other hunting regulations, including bag limits, equipment regulations, and tagging and checking of harvested deer, must be observed. In general, all others (not hunting on their owned land) must possess an appropriate license for that particular hunting activity. Deer hunters are required to purchase a separate deer license for each deer taken. Discounts are available for additional antlerless licenses or if a hunter chooses to purchase a license bundle, which reduces the cost per license while providing expanded hunting opportunities. More information is available at www.in.gov/dnr/fishwild/6486.htm.

Restrictions

The following activities are illegal:

- Using bait, salt, snares, dogs or other domesticated animals to take deer. Bait is considered any product that is transferred into a hunting area and placed there for animal consumption. Baits can be in the form of salt, mineral blocks, piles of corn or apples or other food, or a prepared solid or liquid intended for the animal to eat. An area is considered to be baited for 10 days after the removal of the bait and any affected soil. (NOTE: dogs may be used while on a leash only to track or trail wounded deer. Artificial deer decoys are legal for deer hunting.)
- Hunting, trapping, chasing or retrieving game on private land without the consent of the landowner or tenant.
- Hunting, shooting at or killing any animal or shooting at any object from within, into, upon or across any public road.
- Shooting across a body of water, except in the lawful pursuit of wildlife.
- Using infrared sensors to locate, take or retrieve deer.
- Using electronic deer calls to locate or take deer, or to possess an electronic deer call while hunting.
- Party hunting is illegal. Party hunting is an arrangement in which a hunter not only shoots to fill his/her license but also shoots additional deer to fill the licenses of other hunting party members.

Special Permits

Occasionally, if a deer conflict cannot be resolved through the use of non-lethal means or regular deer hunting, the landowner or governing entity may apply for an out-of-season control permit. These Special Purpose Deer Control Permits are used in situations involving the presence of deer on airports or other potentially hazardous human safety situations within specific land use boundaries. The IDNR District Wildlife Biologist must be contacted for a field inspection, and upon an assessment of the impending hazard(s) or damage(s), a Special Purpose Deer Control Permit may be warranted. Special Purpose Deer Control Permits may allow the use of otherwise prohibited items such as spotlights (IC 14-22-6-7) to aid in taking deer.

Agritourism Limited Liability Law

Sometimes referred to as the landowner liability law (Appendix 2), IC 34-31-9 was created to protect landowners from liability associated with allowing sportsmen and sportswomen to recreate on their land. The law states that landowners who provide access to their land for natural resource-based activities (including hunting, fishing, hiking, and trail riding) shall not be liable for the injury or death of a participant resulting from the inherent risks of such activities. Inherent risks include conditions, dangers or hazards that are an integral part of the activity, including surface and subsurface conditions and natural conditions of the land, vegetation and waters, the behavior of wild or domestic animals on the land, ordinary dangers of structures or equipment on the land, and negligent acts of a participant that may contribute to the injury of that participant or others.

Lethal Management Options

While non-lethal abatement techniques are frequently employed with varied levels of success, long-term and permanent solutions to human/deer conflicts usually require lethal management options. Many variations exist for different lethal options, but the basic four options include: regulated hunting, controlled/managed hunting, sharpshooting, and trap and euthanasia.

Regulated Hunting

As previously mentioned, hunting is the most practical and cost-effective form of deer management, and money spent by sportsmen on hunting recreation contributes significant revenue to support wildlife habitat improvement. Hunting results in the immediate removal of animals from the population, is cost effective, and is the principal management tool used by all state wildlife agencies to manage free ranging deer. While 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. Both equipment types discharge an arrow or bolt that limits the distance they travel compared with what might occur with a discharged bullet or slug. It should be noted that, as of 2011, no hunter accidents have been documented with archery equipment in the UDZs in Indiana.

Does, or female deer, are often targeted in both lethal and nonlethal urban deer strategies.

The low cost of regulated hunting is one of the more attractive features of this solution to deer conflicts. The cost involves the hunter purchasing a hunting license for each deer harvested. This cost is incurred by the hunter and not by the landowner/municipality experiencing the conflict. 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.

> “ long-term and permanent solutions to human/deer conflicts usually require lethal management options... ”

The success of any hunting program will hinge on the extent to which hunters can access private or community properties in which to hunt. The more that hunting opportunities are available for prospective hunters, the more successful a regulated hunting program will be. The success of regulated hunting also can be limited by local ordinances that prevent it, or where human density and/or small property size minimize its effectiveness.

Controlled/Managed Hunting

Controlled or managed deer hunts are specialized hunts that incorporate the benefits of regulated hunting but add restrictions designed to meet the needs and objectives of landowners experiencing conflicts with deer. According to the Home Rule Act (IC 36-1-3-8, section 7), units of local government cannot enact local rules that are contrary to rules regulated by a state agency; this includes setting up community specific hunting seasons. It is possible to create some restrictions to a hunting program, though restrictions will serve more as a condition to the management program rather than an enforceable law. These restrictions typically are imposed by the landowner/municipality during controlled hunts and specifically are designed to improve safety precautions or accelerate the reduction of present and future deer numbers, and include: limiting hunter numbers, restricting days or times to hunt, requiring shooting proficiency tests, requiring hunting from an elevated stand, requiring hunters to harvest an antlerless deer before an antlered deer (i.e., earn-a-buck), strategically disbursing hunters on property experiencing deer conflicts, etc. In other states, controlled hunts often use baited areas for leverage to increase hunter success rates. Baiting is not legal in Indiana during the regulated deer hunting seasons, but can be allowed under a special permit if a controlled hunting program occurs outside of the regulated deer hunting season. The IDNR can provide technical assistance to landowners/municipalities in efforts to develop controlled hunt programs (Appendix 4).

Like regulated hunting, controlled hunts can be done with many equipment types, though archery equipment is typically used in urban areas where discharge of firearms is problematic or illegal. Like regulated hunting, maintenance is required with annual/periodic hunts to achieve the desired goals. The success of a controlled hunt is dependent upon the amount of available access to land for prospective hunters. Costs of controlled hunts are similar to those of regulated hunts (both require purchase of license(s) by hunters), although controlled hunts can have increased administrative costs from those who administer and oversee control of the operation. Some

communities can recover these additional costs by incorporating an administrative fee that is covered by hunters through the application or training process. Like regulated hunting, controlled hunts are considered safe, particularly because of the further restriction placed on hunters and the use of archery equipment.

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). Sharpshooting often requires the service of trained professionals, which increases the cost significantly over regular hunting options. Like regulated and controlled hunts, the success of sharpshooting hinges upon access to property to target the greatest number of deer. Further, like virtually all forms of deer management options, sharpshooting requires year-to-year repetition to be successful.

Sharpshooting is completed by using center-fire rifles to remove deer as quickly as possible. The deer typically are lured to an area using bait and removed by a marksman positioned in elevated stands. Marksmen remove deer by employing brain or neck shots to ensure quick and humane death. Sharpshooting is often completed outside of the regulated deer hunting seasons in association with a special purpose permit issued by the IDNR. Such permits are issued for relief of deer/human conflicts on a community-wide scale (no permits are issued to individuals). The IDNR has compiled a list of considerations for communities contemplating initiating a sharpshooting program (Appendix 5).

Deer removed by a successful herd reduction program can provide nutritious lean protein to people in need.

Safety is often a concern of the public when considering sharpshooting. Any community considering sharpshooting should thoroughly assess the experience level and program design of any sharpshooting regime. Due to the restrictive nature of sharpshooting (marksmen shooting from a pre-determined location and at a specific site), the shot limitations make sharpshooting a relatively safe activity.

Trap and Euthanasia

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. Trap and euthanasia is labor intensive, can be stressful to the deer, and is relatively expensive with costs often exceeding $300 per deer (DeNicola et al 2000). This option of nuisance deer removal requires the service of trained professionals and a special permit issued by the IDNR. Trap and euthanasia programs require additional trapping efforts in successive years to maintain optimum deer densities. Since trap and euthanasia can be implemented without the discharge of a firearm, it can be used in situations where safety concerns or local ordinances prohibit the use of other lethal management options. However, it may best be used as a supplement to another deer removal or management technique.

Venison Donation Programs

An obvious by-product of any deer reduction program is the availability of venison (deer meat). Venison is a lean meat that is low in fat and high in protein, comparing favorably with the nutritional qualities in chicken breasts. Such meat is in desperate need by many. Additionally, an increasing number of people are looking to organically produced, free-range sources of meat, such as from free-ranging game species (including deer) as an alternative to supporting practices typically associated with existing livestock husbandry and processing. It is recommended that any deer reduction effort encourage and promote venison donation as a valuable public service. Several donation programs exist to disburse available venison to those in need. The following programs include:

Give IN Game Program
www.in.gov/dnr/fishwild/7240.htm

Hoosiers Feeding the Hungry
www.hoosiersfeedingthehungry.org

Farmers and Hunters Feeding the Hungry www.fhfh.org/Home.asp

Donations also can be made to the Sportsman's Benevolence Fund. Proceeds pay for venison donation processing fees.
www.in.gov/dnr/lawenfor/3987.htm

Non-Lethal Management Options

There are several non-lethal management options frequently discussed to help reduce deer damage in urban communities. Some of these options may reduce the number of deer in an area over time, yet are often classified as expensive and/or labor intensive. Following are the most common non-lethal management options and a discussion of each one.

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.

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. Some examples would be electric wire, visible poly tape, woven wire, chain-link, PVC or snow fence, chicken wire, netting, stockade/livestock panels, multi-strand high tensile electric fence and slanted seven-wire fence.

A modification of the electric wire fence is the "peanut-butter fence.". The "peanut-butter fence" is a baited fencing system developed in Minnesota in the late 1970s (Kinsey 1976) and has been shown to be an inexpensive and effective deer fence under a number of field conditions (Figure 1). This type of fence system is most effective in small to medium sized areas that have low to moderate deer pressure. The "peanut-butter fence" consists of a single strand of electrified #17 gauge wire, suspended about 30 inches above the ground by 4-foot fiberglass rods at 60-foot intervals. Heavy gauge aluminum foil "flags" (4 inches x 4 inches) are folded and attached to the wire at approximately 10- to 15-foot intervals using double-sided adhesive tape or paper clips. The underside of these flags and the wire are then baited with peanut butter, encouraging nose-to-fence contact by deer.

The visible poly tape fence system consists of an electrified single strand of brightly colored poly tape suspended about 30 inches above the ground in the same manner as the peanut-butter fence (Figure 2). The poly tape is a unique blend of strong plastic fibers with interwoven strands of stainless steel wire. The plastic carries the tension and the wires carry the electric current. Out of curiosity, deer are attracted to the strand of bright yellow or orange plastic and make contact while investigating it. Peanut-butter can also be applied directly to the tape to increase its attractiveness to deer. Because of its high visibility, deer can see this fence even at night and do not render it ineffective by breaking it down, as can happen with the peanut-butter fence. The visible poly tape fence is effective for small to medium size areas that have low to moderate deer pressure.

High tensile fence systems have been developed to take advantage of a deer's limited ability to judge three-dimensional barriers. One example is the slanted seven-wire fence developed by Cary Arboretum in Millbrook, N.Y. (McAninch et at 1983). It resembles a vertical fence but is slanted at a 30- to 35-degree angle (Figure 3). Deer have poor depth perception and will be hesitant to jump over slanted-wire fences. This type of fence can also be electrified to make it more effective and is a good barrier for protecting large areas (up to 50 acres) that have moderate to high deer pressure.

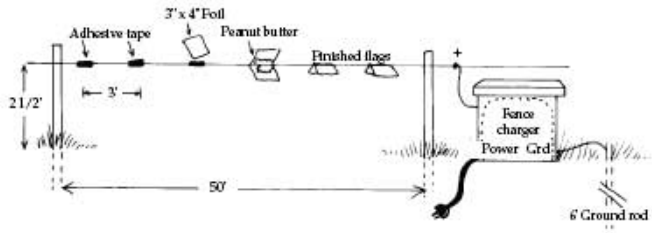


Figure 1. Peanut butter fence.

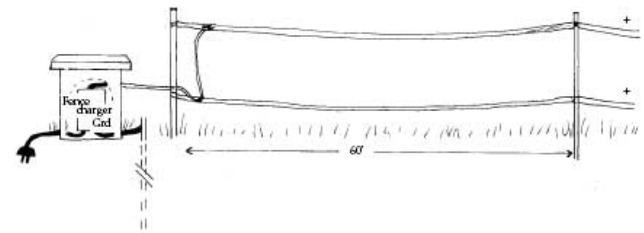


Figure 2. Poly tape fence system.

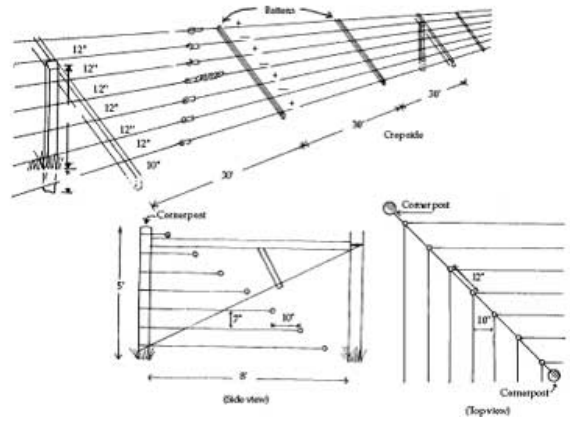
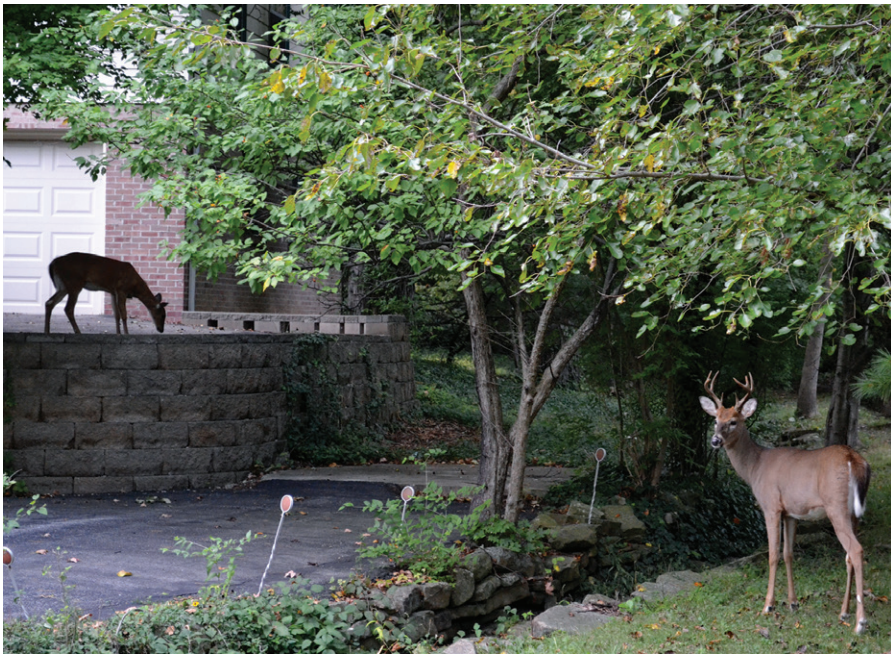


Figure 3. Slanted seven-wire fence system.



Repellents may provide short-term relief from deer browsing, but where deer densities are high, their effectiveness is often compromised.

> "...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..."

Fencing, if properly installed, and most importantly maintained, can be effective in restricting deer activity and reducing browsing or rubbing damage to landscaping, nurseries, small gardens or truck crop patches. The initial cost for fencing materials and installation can be substantial, but will provide years of protection if properly maintained.

Repellents and Deterrents

There are many different types of deer repellents available to deter deer from eating or damaging landscaping, nurseries or gardens. As with fencing, repellents and deterrents don't reduce or control deer numbers but have the potential to increase human tolerance to deer. Examples like Deer Out®, Hinder®, Deer Away®, and Deer Off® rely on either offensive taste or odor to keep deer away. Some home-made concoctions, such as human hair, soap, predator urine, blood meal, mint oil, and rotten eggs can be somewhat effective for a short time, but urban deer tend to become acclimated to human odors or scents, and these types of repellents rarely have much effect. Repellents also work by reducing the attractiveness and palatability of treated plants to a level lower than that for other available forage. Repellents are more effective on less palatable plant species than for those that are highly preferred (Swihart et al. 1991). Effectiveness also depends on the availability of alternate forage (Conover 1987, Conover and Kania 1988, Andelt et al 1991), and repellent performance seems to be negatively correlated with deer density. Repellents can be costly, labor intensive, and may require multiple applications due to being diluted or washed off by rain.

Some other deer deterrents, like motion-activated devices that use sound, light or spraying water, have been used as an alternative to fencing or repellents. One motion-activated device that is available emits ultrasonic high-frequency sound waves that are disturbing to deer but mostly inaudible to humans. Another motion-activated device on the market sprays a stream of water at the animal that triggers a sensor. Since deer usually become accustomed to repetitive sounds or sights, the frequency, intensity and location of the various deterrent devices should be changed often to nimize the habituating of deer to these devices.

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). Relocation can spread diseases and parasites, and costs range anywhere from $400 to $3,000 per deer (Drummond 1995, Ishmael et al 1995, Ishmael and Rongstad 1984). In addition, deer are abundant throughout Indiana and most adjacent states, so there is no suitable place to release/relocate trapped deer. Recent public concerns with deer-related diseases such as Chronic Wasting Disease and Bovine Tuberculosis have caused most states to ban the importation or the relocation of live wild deer. Because of the low survival of translocated deer, the high numbers of deer in Indiana, and the potential for disease transmission, the IDNR will not allow the live capture, translocation, and release of deer into a free-ranging situation.

Planting Deer Resistant Plants

Deer are herbivores (feeding on plants) and primarily browse on the leaves and twigs of trees and shrubs and the young, tender shoots of herbaceous plants. Preferences for specific plants (trees, shrubs and flowers) vary by season, region and abundance. Although their diet consists of a variety of plants, deer do show certain preferences.

Where deer densities are low and food choices are abundant, they tend to focus on browsing the more desirable plants, when readily available. As deer densities increase, preferred foods become less available, resulting in less desirable plants being browsed to a greater extent. However, it is important to remember that deer will eat almost ANY PLANT during a long, cold, severe winter or when other food is scarce. Appendix 3 shows a list of commonly used landscaping plants, ranked by deer preferences.

Though many residents cherish the sight of a deer in their yard, others have far lower tolerances, making management decisions for elected leaders extremely difficult.

Fertility Control

Immunocontraception is a birth control method that uses the body's own immune system to prevent pregnancy. Most immunocontraception options have had limited use due to the substantial costs, labor, and special requirements needed to successfully implement such programs. Currently, treated deer need to be hand injected and marked (e.g., ear tags) to facilitate their identification. Because most vaccines must be administered via a hand injection, project costs are typically high due to the need for traps, restraint equipment, specialized personnel, and possibly immobilization drugs. In addition, the Department of Natural Resources has strict permitting requirements and guidelines as to who may administer chemicals, including vaccines, to wildlife.

Two common fertility control agents/vaccines have been tested. Most of the earlier experiments with immunocontraceptives used Porcine Zona Pellucida (PZP), a vaccine extracted from pig ovaries (Turner et al 1992; Turner et al 1996; Kilpatrick et al. 1992; Naugle et al. 2002). The original PZP vaccines required two injections, delivered remotely with a dart gun the first year, followed by a booster dose each year thereafter. A three-year study (1997-99) evaluating the effectiveness of PZP was conducted by The Humane Society of the United States in cooperation with the Connecticut Wildlife Division and University of New Hampshire (Walter et al 2002). This study demonstrated that even with good access to a relatively small and isolated free-ranging deer population (approximately 30 females) like many urban situations would have, an adequate number of female deer could not be treated successfully to limit population growth (Walter et al 2002). It is believed that 70 to 90 percent of the females in a specific area need to be treated to effectively limit the population growth (Hobbs et al 2000, Rudolph et al 2000, Swihart and DeNicola 1995, Walter et al 2002). Aside from the difficulties of treating the necessary number of females, the estimated cost was over $1,000 per deer treated. A New York study (conducted on a suburban, free-ranging deer population) estimated that the minimal annual time commitment per deer for reproductive control (using PZP) was approximately 20 hours, costing in the range of $450 to $1,000 per deer (Rudolph et al 2000). Vaccine trials in Connecticut costs $1,128 per deer for 30 deer over two years, with 64 percent of the cost going to labor (Walter et al 2002).

SpayVac™, is a single-dose formulation of PZP that was developed in the early 1990s initially for seals. At a captive deer research facility at Pennsylvania State University, SpayVac™ was nearly 100 percent effective for three years and 80 percent effective for five years at preventing fertility in deer. However, failure in recent clinical trials stemming from changes in how the vaccine was manufactured, combined with limited financial resources, has slowed down the testing and development of SpayVac™ .

Recently, the U.S. Department of Agriculture's (USDA) National Wildlife Research Center developed a fertility control agent similar to SpayVac™ called GonaCon™. GonaCon™ requires only a single treatment, and initial studies have shown it to be effective in some deer for up to four years. As of 2012, GonaCon™ remains the only immunocontraceptive currently available and approved for widespread use, but showed less than 50 percent efficacy during its second year of use in trials. GonaCon™ is registered as a pesticide by the Environmental Protection Agency, and all pesticides must be registered with the Indiana State Chemist's office for registration in Indiana. As of 2012, GonaCon™ is not registered with the Indiana State Chemist's office.

Two additional methods of fertility control besides immunocontraceptives are surgical sterilization (tubal ligation, ovariectomy, or hysterectomy), and contraceptive implants. 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). Implants have been evaluated with varying success (Eagle et al. 1992, Plotka and Seal 1989); however, this approach also has significant limitations because of the effort required to capture and handle individual deer. These two methods may be practical only in small, isolated or enclosed parks, arboretums and other complexes that have a low deer density.

Fertility control has not proved effective at controlling free-ranging deer herds but has shown to limit deer populations in fenced areas and islands (Merrill et al 2006, Rutberg and Naugle 2008). Recent increases in the efficiency of birth control agents improve the prospect for limited applications of wildlife contraception in the future. However, the high cost, short-term effectiveness, need for boosters, timing of the application, and the impracticality of treating an adequate number of deer, severely reduce the practical use of birth control agents for free ranging deer. As of 2012, the Indiana Department of Natural Resources has not identified a suitable location to recommend the use of fertility control.

Bans on Deer Feeding and Enforcement

Many people living in urban and suburban areas enjoy putting out food for deer so they can view and photograph them up close. They are excited to see deer in close proximity to their homes or businesses. Many people also believe they are helping deer survive the winter by providing additional food when natural food sources are in short supply or buried under deep snow. In doing so, they unfortunately are attracting and encouraging deer to congregate in larger numbers and remain longer near supplemental feeding sites. This often results in heavy browsing oflandscaping plants (trees, shrubs and flowers) and natural vegetation in the vicinity of the supplemental feeding site. Additionally, deer and their offspring can become permanently habituated to the area, resulting in more resident deer.

Artificially feeding deer can exacerbate any localized problems

Feeding deer can have multiple negative ramifications. First, it can make them more tolerant of humans, buildings and human-related activities. This increases the likelihood of vehicle accidents and unwanted interactions with humans or pets, all of which can result in personal property damage, serious injury, or even death. Supplemental feeding also can increase the potential for transmitting diseases, such as Chronic Wasting Disease (CWD) and Tuberculosis (TB), via increased contact with one another or with contaminated body fluids or food items. Finally corn, which is commonly used to attract deer, if left out for extended periods of time, can grow molds that produce toxic chemicals called aflatoxins. These aflatoxins can prove fatal to many birds like wild turkeys, quail, songbirds, and mourning doves.

Currently, Indiana prohibits supplemental feeding only as it applies to hunting over a baited site (see earlier section entitled Restrictions). As a result, enforcement of supplemental feeding by IDNR Conservation Officers occurs only during regulated hunting seasons. Therefore, if a community wants to establish and enforce a year-long supplemental feeding ban, it must be developed through local ordinances and enforced by local authorities. Feeding bans may also be beneficial in reducing human-wildlife interactions associated with raccoons, opossums, skunks, and coyotes. It is also important to consider how supplemental feeding bans may impact other activities, such as bird feeding or animal husbandry practices. As always, obtaining public input as part of the rule formulation process can aid in crafting an effective and enforceable ban, as well as help everyone understand all sides of the situation.

Public Involvement

The term "biological carrying capacity" is commonly used to describe the maximum population size an environment can sustain, given appropriate food resources and cover availability (DeNicola et al 2000). Additionally, the term "social carrying capacity" refers to the tolerance limit that humans have for a number of individual animals within an area over time. In most cases, conflicts between deer and humans arise in urban communities because it is determined that the deer population exceeds the social carrying capacity, causing discontent with citizens, typically through vegetation destruction or becoming vehicular hazards. Once deer populations meet or exceed social carrying capacity, citizens feel a remedy must be initiated.

Social carrying capacity for deer may vary from one urban area to another. Many communities have struggled with the difficult task of selecting a publically acceptable management strategy to safely and effectively reduce overabundant deer populations (Kilpatrick and LaBonte 2007). Communities need to make their deer management decisions and discussions public and factually based. Many deer management programs in urban areas have been compromised by a lack of public knowledge and participation. Tolerances for deer vary between individuals and can be dependent on one's personal preferences, past experiences, or one's ecological perspective or land use priorities (DeNicola et al 2000). It will be impossible to achieve community consensus and agreement regarding the number of deer within the community, or for a single deer management approach.

Decision Making and Management Action

It is recommended to use a community-based task force with the guidance of a professional facilitator to establish deer management decisions. The first step of this task force should be recognizing and defining the problem at hand. After that, DeNicola et al (2000) advise that stakeholders should be involved in several steps of the decision making processes and management action, including:

- Setting goals and objectives
- Determining appropriate management techniques
- Communicating findings andconclusions to the community
- Evaluation of program results
- Revising goals and objectives

as part of an adaptive management program

Public involvement in deer management decisions at a community scale is often appropriate as deer impacts are often recognized by neighborhood groups, and the need for management becomes a local issue. In addition, the success or failure of management actions can be perceived most readily by stakeholders at the community level (DeNicola et al 2000).

Considerations for Developing a Successful Deer Management Program

Citizen task forces are often used to provide recommendations on a deer management program for government entities to implement. They require involvement from all interested stakeholders to participate in the decision making process and development of management plans. Task forces typically review pertinent deer biology, examine management options, select appropriate management techniques that are both biologically and socially acceptable, identify staff and funding to implement management activities, and coordinate dissemination of information to the community and media. It is important for the task force to know there may be important state rules and regulations for any action that requires the handling of deer (DeNicola et al 2000).

The development of an integrated management strategy by the task force, using all available and community-approved techniques should be produced. Quick-fix solutions or short-term strategies can relieve immediate problems, while long-term approaches will better maintain deer populations at an acceptable level (DeNicola et al 2000). Commonly, a multi-faceted approach has a greater degree of community acceptance rather than a single-faceted approach. The objective of most management programs is the reduction of conflicts to an acceptable level, not a complete elimination of either the problem or the deer herd (DeNicola et al 2000). Once the plan is developed, it can serve as the centerpiece of future communication efforts. At a minimum, the deer management plan should include:

- **Authority:** Specifically cite your legal authority to act on behalf of those being affected and to conduct the activities being proposed.
- **Background:** Briefly describe the history of the problem and the area being impacted. Describe the extent of damage being caused by the deer as well as any other current problems/issues associated with the deer, such as disease, vehicle accidents, or deer altercations with humans or pets.
- **Objectives:** State the long-term and short-term objectives of the deer management plan. Measures of forest health, landscape damage complaints, or deer vehicle accidents are all items that can be measured to show the impact of a deer management program. For example, one community objective could be a short-term goal of reducing deer/vehicle accidents by a certain percentage within two years, with a long-term goal of keeping deer/vehicle accidents below an even lower number of accidents in future years. Another example would be to try to maintain deer hunter success rates at or below a certain percentage. The IDNR recommends that success rates of hunters should typically average one antlerless deer killed per five antlerless firearm hunting efforts (20 percent success rate) or 10 antlerless archery hunting efforts (10 percent success rate) to maintain deer densities that are more compatible with their surroundings. High hunter success rates are generally indicative of higher deer densities. So, a long-term goal might be to maintain annual hunter success rates at or below a certain threshold, depending on which type of hunting you will allow.
- **Alternatives:** Describe all the management alternatives (lethal and non-lethal) that were reviewed, including the reasons why they were considered viable or not viable options.
- **Recommendations:** Describe the actions being proposed to address the long-term and short-term objectives of the deer management plan. Discuss any changes in local ordinances that might be needed to achieve the deer management objectives, such as implementing a ban on feeding deer, or modifying existing ordinances to allow hunting on city-owned land for the purpose of reducing wildlife threats to public health and safety or the city's natural resources, as well as measures taken to gather community input or support for the proposed action.
- **Logistics:** Describe in detail how the proposed actions will be implemented, including what methods will be used, timing, personnel involved, and safety considerations. For example, if archery hunting during the regular deer archery season is being proposed, specify how many archery hunters will be used, whether they will be hunting on property specifically owned by the local unit of government or common areas of the subdivision, whether they will be required to obtain permission from local residents, etc. Other items to include under this topic would be:
  - Who will be responsible for selecting the archery hunters and what kind of selection process will take place?
  - Are there any hunting restrictions that will be implemented, such as a requirement to harvest an antlerless deer before an antlered buck can be taken?
  - Will the hunter be required to hunt from an elevated stand?
  - Will the hunter be allowed to keep the meat or must the meat be donated to a food bank?
  - Will hunting be allowed on weekends, week days, or every day of the season? Are there any time restrictions hunters must observe?
  - Who should residents call if there is a problem?
- **Long-Term Management Plan:** Deer management is an on-going process. The plan should specify what actions will be implemented in the future to meet the long-term objectives. For example, the plan might specify that the number of archery hunters in successive years will be determined by the overall antlerless harvest success rate from the previous season. If the overall antlerless harvest success rate for archery is above 10 percent, then necessary action will need to be taken the following year to counteract this trend, such as increasing the amount of property available to hunters or increasing the number of archery hunters the following year. Likewise, if the overall antlerless harvest success rate for archery falls below 10 percent, the number of archery hunters may be decreased, or some properties in the program may be taken out of the program the following year. It is also important to specify what data will be collected and used to monitor progress in meeting the short-term and long-term objectives. Examples of data that might be collected include deer damage complaints, deer-vehicle collisions, hunter harvest

Browse lines, or areas devoid of plant growth due to overbrowsing by deer, were common in many State Parks in the 1990's.

statistics, and vegetation monitoring. Reports and complaints with the deer management program you have instituted should be observed and followed up, and minor adjustments may be needed in the future.

- **Communication Plan:** Building community support is essential. A detailed communication plan will need to be developed listing all efforts (i.e., town hall meetings, neighborhood meetings, displays, newspaper articles) that will be undertaken to inform the community at large, as well as those that might be more directly affected as the plan is implemented. It should specifically address how all the information in the deer management plan will be disseminated or made available to the community. The communication plan is also an opportunity to increase community involvement. Involving local food banks, existing venison donation programs, meat processors and community foundations can help build general support for lethal deer removal programs.

- **Lead Contact:** List the contact information for the individual(s) who will be responsible for implementing the deer management plan. People will have questions and concerns. It is important that those individuals have the opportunity to address their needs. Everyone also needs to know who to contact if problems arise during the implementation of the plan.

The IDNR firmly believes hunting can be the most practical and efficient method for managing deer populations. Furthermore, in a survey of urban Indiana residents, hunting was determined to be the most favored method for deer management (Stewart 2011). Though other techniques may need to be incorporated due to specific circumstances (i.e., densely populated housing), hunting typically can provide a sound backbone to any deer management program. The following recommendations are provided to help ensure managed deer hunts meet expectations:

- Build community support by providing residents early on with facts about hunting and the safety measures that will be implemented during the managed hunts.

- Focus deer removal efforts by targeting large blocks of undeveloped land first.

> "The IDNR firmly believes hunting can be the most practical and efficient method for managing deer populations."

- Work with adjacent landowners to encourage hunting on their property.

- Use firearms approved for deer hunting where possible to maximize deer harvest in the shortest time.

- Use archery or crossbow hunting in areas where firearm hunting is not permitted or when a more quiet method is preferred.

- Design hunts to maximize harvest opportunity. Implementing managed deer hunts during regular deer hunting seasons will often achieve greater success at the landscape level. Conversely, hunts implemented outside of the normal deer hunting seasons may not achieve desired results as quickly since deer will have greater ability to seek refuge outside the managed hunt area.

- All deer should be targeted for removal, but efforts should encourage the taking of antlerless deer (does). Initiating an earn-a-buck program, where a hunter must first take an antlerless deer before being allowed to take a buck, is one method frequently used to focus more attention on removing does.

- Collect and maintain accurate harvest data (hunter efforts, antlerless deer removed, total deer removed, etc) and let everyone know the data will be used in making future harvest recommendations.

- Conduct hunts on an annual basis, using the harvest data and other sources of data (damage complaints, vehicle accidents, etc.) from the previous year to justify and adjust hunt parameters.

- Work with local food banks, venison donation programs, venison processors to develop programs that encourage efficient venison use and community support.

Setting up a Monitoring Program to Assess Results

Management programs should be monitored to assess their impact and to accurately determine the effectiveness (DeNicola et al 2000). Once your management program has been initiated, the community will demand results (e.g., how many deer have been removed/treated, where are deer being removed/treated, how many hunters are involved, is the program working to achieve the desired results, etc.). The usual parameters such as land owner complaints, auto accidents, and visual sightings should be continuously monitored and tracked in order to gauge success. Some of this can be covered by public surveys given during different phases of the program. Early development and implementation of a monitoring program to assess the value of the program to the community will be the best tool that can be used to defend the deer management program you have chosen, and will help ensure the program is sustainable in the future. There are several methods that can be used to monitor the success of a reduction program.

> “ Early development and implementation...will help ensure the program is sustainable in the future. ”

Indiana State Parks use vegetation surveys in which they monitor the stem height and densities of specific moist woods plant species such as sweet cicely (*Osmorhiza claytoni*), Jack-in-the-pulpit (*Arisaema triphyllum*), and white baneberry (*Actaea pachypoda*), that have been proven to be good indicators for deer populations. The erection of deer exclosures (areas fenced to exclude deer) have been used both in the parks and in suburban settings to visually document the change in the amount of vegetation present over a period of time.

One of the more expensive means of documenting results is the use of aerial surveys. This technique tracks the population of deer in an area over time, and usually entails hiring a helicopter, pilot, and sometimes an infrared operator and GPS data specialist, depending on the technique used. Individuals conducting this survey have specialized skills and experience in doing wildlife counts. It can be an expensive technique to incorporate, and is only practical for small areas that can be covered in a short amount of time. The aerial census provides the most benefit when conducted annually to document change in the deer population density. A less expensive visual survey that provides the same general trend information is a spotlight survey. This is done by driving a specific route after dark, spotlighting and counting the visible deer. Most individuals can conduct a scientifically based spotlight count with the appropriate training from a wildlife biologist, who should be consulted before performing these counts to ensure proper protocols are followed.

Many urban deer management plans are geared toward reducing deer-vehicle collisions, and may incorporate this into their monitoring program

Other sources of data that should be monitored include the number of deer vehicle accidents that occur within the community, the relative hunter success and impact, and the number of landscape damage complaints. Of utmost importance is to develop some means of measuring the plan's defined goals and objectives as it pertains to the social carrying capacity of the community, such as an annual survey of residents opinions. The community should also be able to provide input throughout the monitoring program to determine if the current management techniques and intensity is still being favored and applicable, or if changes need to be made. Human attitudes and tolerances will be overwhelming factors at the onset of your deer management program, but your monitoring program will help sustain your program and provide the information you need to make appropriate decisions for your community.

Examples of Special Deer Reduction Programs in Indiana

State Parks

White-tailed deer have thrived in Indiana State Parks since their reintroduction in the mid-twentieth century, due to mild winters, the absence of predators and lack of hunting. Because of this, by the late 1980s, distinct browse lines and small, malnourished deer were a common sight within most state parks. In March of 1992, a deer study committee was appointed to make recommendations to Brown County State Park. In 1993, the committee sent a report to the Natural Resources Commission recommending a six-day reduction program through hunting and the initiation of a vegetation study to assess the damage. In September 1993 the Natural Resources Commission issued an emergency rule for a one-day hunt. On Dec. 4, 1993, 466 hunters removed 392 deer from Brown County State Park.

In 1995, legislation was passed that required the IDNR to take action whenever a given species was causing ecological damage, and vegetation studies were initiated in several other state parks. As of 2011, 21 state parks have implemented reduction hunts, with a cumulative harvest of 28,654 deer. Gone are the abrupt browse lines and the emaciated deer of the past, but less obvious damage still persists throughout the parks. Most of Indiana's state parks now implement routine maintenance hunts to keep deer densities in check.

Dune Acres

Dune Acres in Chesterton, Ind., is a small gated community nestled within the Indiana Dunes National Lakeshore along Lake Michigan. Hunting is not allowed in the community or on the surrounding National Lakeshore. In April 1991, an attorney for the community of Dune Acres requested an IDNR biologist attend a public meeting to discuss initiating a deer control program to address the "significant biological, ecological and public safety problems" caused by deer. At that time, the biologist recommended the community notify and get approval from the majority of the residents for the planned action. In 1993, the town attorney again requested assistance from the IDNR in developing a deer control program. At this time the IDNR formed a deer advisory committee and developed the state's first urban deer policy.

In February 1997, a permit for a commercial sharpshooter to take deer over bait was issued to remove 80 deer between March 17 and April 1, 1997. However, due to weather conditions and other issues, only a small number of deer were taken. A permit was again requested and issued for Jan. 1 through March 1, 1998. This time the sharpshooter reported 50 deer taken. In 1999-2000, due mostly to cost, the sharpshooting duties were taken over by a few residents of the community with a special use permit to shoot deer over bait. From 2006-2011, over 200 deer have been taken, averaging over 36 deer per year. A survey of the residents in 2010 found the majority pleased with the results and encouraged the program to continue. Vegetation quality has improved significantly and deer no longer appear emaciated. However, due to being completely surrounded by Dunes National Lakeshore, which acts as a refuge to the local deer population, there will be an ever present reservoir of deer that overflow into the community.

Beverly Shores

Although not a gated community like Dune Acres, the town of Beverly Shores, is bordered by Lake Michigan along the north, the Dunes National Lakeshore on the west and south sides and Indiana Dunes State Park along the east side. Over the years, Beverly Shores had seen an increase in the amount of vegetation damage caused by deer browsing. In 1999, the town council began the process of addressing the "deer problem" by conducting an aerial survey to determine just how many deer might be using the area. The survey counted 194 deer within the one square mile of the town limits on March 26, 1999. In April of that year, the council president addressed the residents through the town newsletter regarding the deer problem and possible solutions. The newsletter provided information on the newly formed Dunes Region Deer Study Committee and asked questions that he hoped could be answered by the committee and the community.

In the fall of 2001, Beverly Shores changed the town's weapons ordinance to allow the discharge of bows to permit hunting within the town limits. It then created specific regulations to control the hunting. These consisted of allowing hunting during legal shooting hours only on weekdays during a specific calendar period within the normal state urban deer archery season. It required that selected bow hunters have a current hunting license, complete a hunter or archery education certification, pass a proficiency test, and hunt from elevated stands only in areas designated by the town as safe to hunt, along with written permission from the landowner. Up to 20 successful applicants were then given permits allowing them to archery hunt within the town limits. In 2001, the first year, archery hunters were able to harvest 78 deer. In 2002, Beverly Shores requested a special use permit to allow the taking of additional deer beyond the normal urban deer season as few deer were taken during the hunting season. Since then, Beverly Shores have used a combination of regulated hunting and special permits to help reduce the deer density within their community. As of 2011, 701 deer have been taken within the town limits, and the spring aerial survey counts have dropped from over 190 down to 25 in March 2012. Native vegetation is returning, and damage to gardens and landscaping has dropped significantly.

Warsaw

In 2003, after seeing several articles complaining about the growing number of deer eating landscaping, destroying property, and causing vehicle accidents in the city of Warsaw, some local deer archery hunters got together and created some guidelines on how they could help the city with its deer problem. They met with a local IDNR wildlife biologist and IDNR law enforcement for some advice on the law and biological issues that would support their plan. They even handdelivered a survey to residents of a subdivision who were having significant

problems to help build support for their proposal. The majority of those residents believed they had a serious problem with deer and would support hunting to correct it.

By late 2005 the Warsaw Deer Task Force, consisting of city council members, the mayor, police chief and the local deer archery hunters, was formed to address the issue and the first meeting was held Jan. 23, 2006. At that time, it was illegal to discharge a projectile within the city limits, so the first step in pursuing a deer hunt was to change the law. Warsaw City Code 54: 54-64 was created to allow bow hunting as a means to manage deer within the city, an exemption to the previous discharge rule. It also was decided that no hunting would occur on weekends. The second step was to establish safe areas to hunt where deer densities were highest. The city had incorporated a great deal of agricultural land and had several parks that were prime deer habitat. These areas became management zones. Initially, there were just four zones, two were crop fields adjacent to the subdivision with the serious deer problem and two were in city parks. The third step was to obtain archery hunters. Initially, only residents of Warsaw were permitted to apply. They had to pass a police background check, an archery proficiency test, and attend a training session, which were all provided by the city police department.

Due to the amount of initial planning that was required, the first training and selection of archers was not completed until Dec. 2, 2006, with hunting not beginning until Dec. 20. Hunting was allowed only on weekdays. Through the 13-day season, 18 deer were taken. With the first year's planning and hunting experiences as background, Warsaw's 2007 hunting program began on Oct. 1, 2007, the opening day of Indiana's archery season. Over the next three months, with no hunting taking place on weekends or holidays, 39 deer were taken. Since then, Warsaw has added three more deer management zones. In addition, 22 privately-owned properties now allow archery hunting, which increased the harvest to 62 deer in 2011. From 2006-2011, 367 deer have been removed within Warsaw's city limits. The city has moved into a maintenance stage, reducing the number of archers to only those who have been successful in the past and are dedicated to herd reduction. Fewer deer are seen, no damage complaints from property owners have been submitted, and the number of deer/vehicle collisions has dropped dramatically.

Hidden Valley

Hidden Valley Lake (HVL) Community is a 2.7-square-mile, privately owned community with public recreational opportunities located in Dearborn County, Indiana. There are more than 1,800 homes in HVL, with an average lot size of a quarter acre. Approximately 5,000 residents live in the community, which is built around a 150-acre lake. The community is adjacent to a golf course and is surrounded by deciduous forest and pasture on all sides, with wooded steep slopes that run throughout the community. Hunting had been prohibited within the community since it was chartered in 1972.

In the winter of 2009, a helicopter survey was conducted and 314 deer were counted within the limits of HVL, resulting in an estimated density of approximately 130 deer per square mile. Later that year, HVL residents were surveyed and asked if a lethal deer management program should be implemented within the community. A total of 622 respondents (83.4 percent) voted in favor of a cull. In February 2010, a "no feed" rule was instituted by the HVL Board of Directors as part of a deer management program.

The first managed archery hunt began in the fall of 2010. Hidden Valley followed IDNR guidelines regarding season and bag limits, but instituted additional restrictions, requiring hunters to take five antlerless deer prior to attempting to remove an antlered deer. Since several residents were sensitive to the killing of deer, Hidden Valley hunters did not conduct removal efforts on weekends, holidays, and other selected dates. All archers were required to pass a community-organized proficiency test, attend an orientation meeting, and complete a hunter's liability waiver prior to hunting within the HVL community. Archers could not exceed the season bag limit set forth by IDNR regulations (nine antlerless deer and one antlered deer) for the given archery season. Hidden Valley opened up its community greenspaces for hunting, and 122 residents (approximately 30 acres) volunteered their properties for hunting (private property had to be adjacent to community greenspace).

A total of 38 hunters qualified to hunt in Hidden Valley the first year and a total of 103 deer were killed. Of the deer removed, 89 of 95 (93 percent) were antlerless. The same hunters were eligible to hunt under a special permit that allowed further deer removal after the regular archery hunting season ended. An additional 122 deer were removed via archery under this permit. In March 2011, after all deer hunting efforts had ceased, another helicopter survey using thermal imagery counted 174 deer in approximately a six-mile-square area (HVL boundaries and adjacent areas), indicating a density of 29 deer per square mile. Road kills, picked up within the community by maintenance personnel, dropped from 15 to 8 after the initial removal year.

The second year (2011) resulted in minor changes based on community feedback. Regulated hunting within HVL was limited to a three-week period in December (rather than from October through December), and hunters were restricted from taking an antlered deer. Only successful hunters from the previous year were invited to qualify and participate the second year, thus limiting the number of potential hunters within the community. A total of 34 deer were removed. Similar to 2010, a special permit was issued after the regular hunting season, resulting in 37 additional deer being removed. In just two years of archery hunting in HVL, a total of 302 deer were removed.

Common Questions Regarding Deer Management

Will killing deer result in increased reproduction in the remaining deer?

Removing deer from healthy populations will not increase reproductive rates of the remaining deer. Each year, healthy adult females typically produce two fawns and occasionally will produce three. Female deer do reduce their reproductive output when they are in poor health, and reproduction in a recovering deer herd may increase to normal levels if a significant number of deer are removed and the habitat improves. Most suburban deer are still in optimal health when a community's tolerance to deer numbers becomes saturated. However, deer reproduction physiologically cannot increase to supernormal levels to compensate for reduced deer densities.

How can I get hunters on my property?

Indiana's Limited Liability law (Appendix 2), along with the IDNR's Hunters Helping Farmers program can help landowners control deer on their property. The Limited Liability law limits liability associated with agritourism-related activities, including hunting. The Hunters Helping Farmers program connects willing hunters with landowners wanting to control deer numbers on their property. Willing hunters assist these landowners by harvesting deer during regular deer hunting seasons. Landowners may also inquire through neighbors about potential hunters willing to harvest deer. A copy of the Hunters Helping Farmers list can be obtained by contacting your District Wildlife Biologist after the hunter registration period ends Aug. 31.

How much land is needed to allow hunting?

There is no minimum property size required for hunting. Safety concerns can determine the number of participating hunters, however many issues can be resolved by early planning and discussions with neighboring landowners. Safety issues can often be resolved by limiting the number of hunters, requiring hunters to shoot from elevated stands, prohibiting certain hunting methods/equipment, or restricting hunting to specific hours or days.

Can spotlights, bait, and suppressed rifles be used to remove deer?

The state of Indiana prohibits the use of spotlights and bait to remove deer during the hunting season. Bait may be used when specified in a Special Purpose Deer Control Permit under Indiana law (IC 14-22-28-1). State and federal wildlife management agencies, and individuals granted permission by permit under Indiana law (IC 14-22-6-7) are permitted to use spotlights to take wild animals for disease control or nuisance situations. Suppressed rifles are legal to remove deer in Indiana.

What is done with all of the deer that are removed?

Most deer removal programs require hunters to retrieve, field dress and properly care for the venison to ensure it is fit for human consumption. Some removal programs allow hunters to keep the deer they shoot, while other programs require the deer to be donated to a local venison donation or food bank program.

There are several organizations that distribute donated game meat.

The IDNR's GiveIN Game Program connects hunters who harvest deer with people who could use venison to feed their families. Program participants contact each other though the GiveIN Game Program and arrange for the transfer of meat on their own. This includes donating venison during the hunting season, as well as the exchange of frozen packages of venison or deer taken on special permits outside of the hunting season. A person cannot sell, trade or barter venison per IC-14-22-6-8. Venison can be gifted.

Hoosiers Feeding the Hungry is a free program that delivers harvested surplus deer to participating meat processors in each county. Donations from churches, clubs, businesses and individuals cover the cost of processing, packaging and freezing the meat. The frozen meat is then available free of cost for pick-up by a nearby food bank or feeding program. All donated meat is inspected by a qualified meat processor that is contracted by HFH.

The Sportsman's Benevolence Fund (IC 14-9-5-4) offers another opportunity for individuals to donate funds which go directly to processors of donated deer. This fund was established within the IDNR's Division of Law Enforcement to encourage citizen participation in feeding the state's hungry through donations of wild game that has been lawfully hunted. The money in the account is appropriated annually to cover the expense of processed game by hunters donating their game to eligible meat processors.

What happens if we do nothing? Will the deer plateau at a certain point?

The number of deer that can be sustained in a given area of land is a function of food resources and the availability of winter cover. Biological carrying capacity (BCC) is defined as the number of deer that a parcel can support over an extended period of time (Ellingwood and Caturano 1988). When deer numbers approach BCC, habitat quality (plant diversity and abundance) decreases and physical condition (health) of the herd declines (Swihart et al. 1998). Well before a deer herd approaches BCC, the increase in deer-vehicle accidents, frequency of unwanted human and domestic pet interactions, severity of landscape damage, and the denuding of the natural landscape, often bring communities to the realization that allowing the herd to reach BCC is not good for the deer or for the community. Neither herd health nor habitat quality will improve unless deer densities are reduced.

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Appendix 1
Deer Management Solutions Matrix

Control Method	Estimated Cost/Deer	Method Removes Deer Immediately	Method Reduces/ Eliminates Births	Method Requires Maintenance	Control Method Is Safe	Pros	Cons
Fencing	Variable	NO	NO	YES	YES	Restricts access of deer to problem area	Does not address deer population problem
Repellants	Variable	NO	NO	YES	YES	Limits exposure of deer to problem area	Does not address deer population problem, frequent reapplication is required
Fertility Control	$300-$500	NO	YES	YES	YES	Temporarily reduces future births in individual deer	Not likely effective at controlling population in free ranging animals, requires trained specialist to administer the drug, public concern for drugs in deer
Trap & Relocate	$400-$3,000	YES	NO	YES	YES	Removes problem deer from immediate area experiencing conflict	Restricted by IDNR policy, locations to move deer are often limited, high chance for deer myopathy, requires trained specialists
Trap & Euthanize	$300-$500	YES	YES	YES	YES	Lethally removes deer where safety is a concern, potential for venison donation	Perceived or may be stressful to deer, intensive work by trained specialists, public disdain toward the procedure
Sterilization	$800-$1000	NO	YES	YES	YES	Permanently reduces future births in individual deer	Not likely effective at controlling population in free ranging animals, requires trained specialist to capture and sterilize the deer
Sharpshooting	$200-$350	YES	YES	YES	YES Perceived danger	Rapid reduction of deer population, potential for venison donation	Perceived safety concern, requires trained specialist, public disdain toward the procedure
Hunting *(Regular and Managed)*	Minor admin. costs by city/ Hunting license	YES	YES	YES	YES Perceived danger	Cost effective, onus on the landowner to participate, potential for venison donation	Perception can be controversial, difficult in communities with dense housing, requires access and participation by landowners, may take time to achieve goals

Appendix 2

SOURCE: IC 34-31-9

SECTION 1. IC 34-31-9 IS ADDED TO THE INDIANA CODE AS A NEW CHAPTER TO READ AS FOLLOWS [EFFECTIVE JULY 1, 2011]:

Chapter 9. Limited Liability Arising From Agritourism Activities

Definitions

(1-1) "Land" means all real property, land and water, and all structures, fixtures, equipment and machinery thereon.

(1-2) "Agritourism activity" means any activity carried out on land in which the general public is allowed or invited to participate for recreational, entertainment or educational purposes; to view or enjoy rural activities, including farming, ranching, historic, cultural, u-pick or farmers' market activities; or to engage in natural resource based activities and attractions such as hunting, fishing, hiking, boating, winter sports, spelunking, camping and trail riding. An activity may be an agritourism activity whether or not a participant provides monetary or other valuable compensation to participate in the activity. An activity is not an agritourism activity if the participant is paid to participate in the activity. Agritourism activity includes an activity involving any animal exhibition at an agricultural fair.

(1-3) "Agritourism professional" means any person who is engaged in the business of providing one or more agritourism activities whether or not the participant paid to participate in the activity. The term includes employees or authorized agents who offer or conduct agritourism activities on behalf of an agritourism professional.

(1-4) "Inherent risks of agritourism activity" means those conditions, dangers, or hazards that are an integral part of an agritourism activity, including but not limited to, surface and subsurface conditions; natural conditions of land, vegetation, and waters; the behavior of wild or domestic animals; the ordinary dangers of structures or equipment ordinarily used on a working farm, ranch, or other commercial agricultural, aquaculture, horticultural, forestry, or educational operation; and the negligent acts of a participant that may contribute to injury to the participant themselves or others, including failing to follow instructions given by the agritourism professional, failing to exercise reasonable caution while engaging in the agritourism activity or failing to obey written warnings or postings on the premise of the agritourism operation.

(1-5) "Participant" means any person, other than the agritourism professional, who engages in an agritourism activity.

(1-6) "Person" means an individual, fiduciary, firm, association, partnership, Limited Liability Company, corporation, unit of government, or any other group acting as a unit.

Liability Limitation Requirements

(2-1) Except as provided in sections 3 and subject to the requirements of section 5 of this chapter:

(a) an agritourism professional shall not be liable for injury to or death of a participant resulting from inherent risks of agritourism activities; and

(b) no participant or participant's representative may maintain an action against or recover from an agritourism professional for injury, loss, damage, or death of the participant resulting exclusively from any of the inherent risk of agritourism activities.

(2-2) In any action for damages arising out of an agritourism activity against an agritourism professional, the agritourism professional shall plead the provisions of IC 2-1 as an affirmative defense.

(2-3) Nothing contained in section 1 of this chapter prevents or limits the liability of an agritourism professional if the agritourism professional does any one or more of the following:

(a) Commits an act or omission that constitutes willful or wanton disregard for the safety of the participant and that act or omission caused injury, damage, or death to the participant;

(b) Intentionally injuries the participant;

(c) Has actual knowledge of a dangerous condition on the land, facilities, or equipment used in the activity or the dangerous propensity of a particular animal used in such activity and does not make the danger known to the participant and the danger proximately causes injury, damage, or death to the participant; or

(d) Fails to properly train, or improperly or inadequately trains, employees who are actively involved in agritourism activities and an act or omission of the employee proximately causes injury, damage, or death to the participant.

(2-4) Nothing in section 1 shall be construed to negate the affirmative defense of assumption of the risk.

(2-5) (a) Every agritourism professional shall post and maintain a sign that contains the warning notice specified in subsection (b). The sign shall be placed in a clearly visible location at the main point of entrance for the agritourism activity.

(b) Every written contract entered into by an agritourism professional for the providing of professional services, instruction, or the rental of equipment to a participant for purposes of engaging in or participating in an agritourism activity, whether or not the contract involves agritourism activities on or off the site of the agritourism activity, shall contain in clearly readable print the warning notice specified in subsection (c).

(c) The sign and contracts described in subsections (a) and (b) shall contain the following notice:

Warning

"Under Indiana Law, there is no liability for an injury to or death of a participant in an agritourism activity conducted at this agritourism location or by this agritourism professional if such injury or death results from the inherent risks of the agritourism activity. Inherent risks of agritourism activities include, among others, risks of injury inherent to land, equipment, and animals as well as the potential for you to act in a negligent manner that many contribute to your injury or death, or for other participants to act in a manner which may cause you injury. You are assuming the risk of participating in this agritourism activity."

(d) Failure to comply with the requirements concerning warning signs and notice provided in this section shall prevent an agritourism professional from invoking the limitation of liability provided by this article

Appendix 3

Trees, shrubs and vines that are preferred and frequently damaged by deer.*#

Common Name	Latin Name	Common Name	Latin Name
Fir	*(Abies spp.)*	Honeysuckle	*(Lonicera spp.)*
Maple	*(Acer spp.)*	Magnolia	*(Magnolia spp.)*
Horse-chestnut	*(Aesculus hippocastanum)*	Apple	*(Malus spp.)*
Barberry	*(Berberis spp.)*	Sweet Mock Orange	*(Philadelphus coronarius)*
Trumpet Creeper	*(Campsis radicans)*	White pine	*(Pinus strobus)*
Dogwoods	*(Cornus spp.)*	Cherry	*(Prunus spp.)*
American Hazelnut	*(Corylus americana)*	Firethorn	*(Pyracantha spp.)*
Smokebush	*(Cottinus coggygria)*	Bradford/Callery Pear	*(Pyrus calleryana)*
Bush Cinquefoil	*(Dasiphora fruticosa)*	Oak	*(Quercus spp.)*
Winged Euonymus	*(Euonymus alatus)*	Rhododendron	*(Rhododendron spp.)*
Forsythia	*(Forsythia spp.)*	Sumac	*(Rhus spp.)*
Witchhazel	*(Hamamelis virginiana)*	Willow	*(Salix spp.)*
English Ivy	*(Hedera helix)*	Eurpean Mountain Ash	*(Sorbus aucuparia)*
Hydrangea	*(Hydrangea spp.)*	Lilac	*(Syringa spp.)*
Rose of Sharon	*(Hibiscus syriacus)*	Yew	*(Taxus spp.)*
Holly	*(Ilex spp.)*	Cedars/Arborvitae	*(Thuja spp.)*
Juniper	*(Juniperus spp.)*	Basswood	*(Tilia spp.)*
European larch	*(Larix decidua)*	Hemlock	*(Tsuga canadensis)*
Privet	*(Ligustrum spp.)*	Viburnums	*(Viburnum spp.)*

*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.

Trees, shrubs and vines that are seldom damaged by deer. *

Common Name	Latin Name	Common Name	Latin Name
Alder (Gray, Hazel)	*(Alnus spp.)*	Tamarack	*(Larix laricina)*
Serviceberry	*(Amelanchier spp.)*	Drooping Leucothoe	*(Leucothoe fontanesiana)*
Black Chokeberry	*(Aronia melanocarpa)*	Spicebush	*(Lindera benzoin)*
Pawpaw	*(Asimina triloba)*	Tulip Tree	*(Liriodendron tulipifera)*
Barberry	*(Berberis spp.)*	Magnolia	*(Magnolia grandiflora)*
Paper Birch	*(Betula papyrifera)*	Bayberry	*(Myrica spp.)*
Boxwood	*(Buxus spp.)*	Sweetgum	*(Liquidambar styraciflua)*
American Hornbeam	*(Carpinus caroliniana)*	Eastern Hop Hornbeam	*(Ostrya virginiana)*
American Bittersweet	*(Celastrus scandens)*	Spruce	*(Picea spp.)*
Eastern Redbud	*(Cercis canadensis)*	Japanese Pieris	*(Pieris japonica)*
Leatherleaf	*(Chamaedaphne calyculata)*	Pine	*(Pinus spp.)*
Dogwood	*(Cornus spp.)*	Aspen	*(Populus spp.)*
Hawthorns	*(Crataegus spp.)*	Locust (Black, Honey)	*(Robinia spp.)*
Russian Olive	*(Elaeagnus angustifolia)*	Elderberry	*(Sambucus canadensis)*
American Beech	*(Fagus grandifolia)*	Sassafras	*(Sassafras albidum)*
Ash	*(Fraxinus spp.)*	Elm	*(Ulmus spp.)*
American Holly	*(Ilex opaca)*	Arrowwood (Southern)	*(Viburnum dentatum)*
Mountain Laurel	*(Kalmia latifolia)*	American Cranberry Bush	*(Viburnum trilobum)*

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

Plants (flowers) that are seldom damaged by deer. *

Common Name	Latin Name	Common Name	Latin Name
Yarrow	*(Achillea millefolium)*	Lavenders	*(Lavandula spp.)*
Monkshood	*(Aconitum napellus)*	Prairie Blazing Star	*(Liatris pycnostachya)*
Agrimony	*(Agrimonia eupatoria)*	Wild Lupine	*(Lupinus perennis)*
Wild Columbine	*(Aquilegia canadensis)*	Bugleweed	*(Lycopus spp.)*
Milkweed	*(Asclepias spp.)*	Lemon Mint	*(Monarda citriodora)*
Butterfly Weed	*(Asclepias tuberosa)*	Mint	*(Mentha spp.)*
Blue Wild Indigo	*(Baptisia australis)*	Monkey Flower	*(Mimulus spp.)*
Bluebeard	*(Caryopteris spp.)*	Bergamot	*(Monarda fistulosa)*
Lily of the Valley	*(Convallaria majalis)*	Bee Balm	*(Monarda spp.)*
Coreopsis	*(Coreopsis spp.)*	Daffodils	*(Narcissus spp.)*
Crocus	*(Crocus spp.)*	Catnip	*(Nepeta cataria)*
Larkspur	*(Delphinium spp.)*	Evening Primrose	*(Oenothera biennis)*
Common Foxglove	*(Digitalis purpurea)*	Pachysandra	*(Pachysandra terminalis)*
Purple Coneflower	*(Echinacea purpurea)*	Wild Quinine	*(Parthenium integrifolium)*
Rattlesnake Master	*(Eryngium yuccifolium)*	Beardtongue	*(Penstemon spp.)*
Joe Pye Weed	*(Eupatorium spp.)*	Obedient Plant	*(Physostegia virginiana)*
Queen of the Prairie	*(Filipendula rubra)*	Christmas Fern	*(Polystichum acrostichoides)*
Fritillaria	*(Fritillaria spp.)*	Heal-all	*(Prunella vulgaris)*
Geranium	*(Geranium spp.)*	Black-eyed Susan	*(Rudbeckia hirta)*
Daylilies	*(Hemerocallis spp.)*	Spiraea	*(Spiraea spp.)*
Bluebell	*(Hyacinthoides spp.)*	New England Aster	*(Symphyotrichum novae-angliae)*
Hyssop	*(Hyssopus spp.)*	Common Mullein	*(Verbascum thapsus)*
Spotted Deadnettle	*(Lamium maculatum)*	Yucca	*(Yucca spp.)*
Bleeding Heart	*(Dicentra spp.)*	Zinnia	*(Zinnia spp.)*

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

Appendix 4

Controlled/Managed hunt considerations

Managed hunts integrate the benefits of public hunting with conditions and restrictions that meet the objectives of landowners and communities. Such conditions often restrict equipment use, season availability, and sex of the deer harvested to best manage the deer herd in the available time and location that is most effective. Below is a brief outline to help guide communities in setting up and managing their hunts.

- A review of local ordinances and authority to conduct hunting, and allowances for the discharge of projectiles on the particular properties being considered, should be conducted. Any misalignments of authority need to be corrected.
- To increase efficiency and timeliness, managed hunts should be timed to coincide with statewide deer hunting seasons whenever possible. Managed hunts conducted outside of the statewide deer hunting season framework require a special permit from the IDNR. The permitting process can be rather lengthy and has the potential to be denied through a judiciary appeals process.
- A hunt manager should be assigned to oversee the details of the hunt. This person will serve as point person and liaison between hunters, community members, and the IDNR.
- The No. 1 priority for an urban managed hunt is safety. Whether perceived or real, safety is of utmost importance to most urban residents. To address this, most communities will want to limit equipment available for hunting to short ranged projectiles, such as arrows. Archery equipment and crossbows are the preferred equipment to use. In larger areas (more than 100 acres) that are typically managed at the city or county level, a muzzleloader hunt may be acceptable. Incorporating the use of tree stands so the trajectory of the bullet is downward is an additional safety precaution. If tree stands are required, hunters are typically required to wear a safety belt or harness.
- The DNR recommends a hunter density of one hunter per 10 acres per day if archery or crossbow equipment is used, or one hunter per 20 acres per day if firearm equipment is used. These numbers have shown to be effective at removing deer efficiently and safely. Hunt managers may consider reducing this density if visibility of a hunting program is a concern.
- All hunters should be registered with the hunt manager and it is recommended that some sort of proficiency exam be passed to verify the competency of the hunters participating in the hunt. An example of a proficiency exam would be placing three of four arrows in an 8-inch circle from 20 yards away.
- Hunt managers are encouraged to create their own proficiency test. In addition, all hunters should participate in a brief informative session that outlines the conditions or restrictions of participating in the hunt, the safety and visibility concerns of hunting within the community, overall conduct and appearance, etc.
- Hunt managers may want to add restrictions to hunters that favor the taking of antlerless deer. Antlerless deer drive deer populations, and placing restrictions on antlered deer often leads to added pressure on antlerless deer, which in turn increases the efficacy of the hunt program. Restrictions such as antler point restrictions, spread restrictions, earn-a-buck, and one-buck limits all promote the taking of antlerless deer by restricting the take of antlered deer. It should be noted that any restrictions, other than those regulated by IDNR administrative rule or Indiana Code are not enforceable by IDNR conservation officers.
- Hunt managers may want to develop their own liability waiver form or use the wording or signage noted in the Agritourism Liability Law (IC 34-31-9).
- Hunters need to be assigned hunt locations or dates, depending on the hunt manager's restrictions and hunt program structure. If private lands are involved, it may be prudent to inform participating landowners of the hunters and/or dates where hunters will be accessing their property.
- The hunt manager is encouraged to compile all harvest data and other relevant supporting data (e.g., deer/vehicle collisions) and evaluate the success of the program at season's end. This information will be important in addressing follow-up communications with media, elected officials, and concerned citizens. The hunt manager may be required to complete a final report to the IDNR if the hunt is done under a special permit or under exceptions provided by the IDNR through a special permit.
- The hunt manager is encouraged to use the harvest data to determine if additional hunter efforts or access is needed in future years. Based on data from Indiana State Parks, a 20 percent success rate for firearms hunting and a 10 percent success rate for archery hunting, while using the aforementioned hunter densities, are deemed to be a general cutoff for transitioning from a herd reduction to a herd management phase. Success rates over these numbers indicate further need for reduction, while success rates under these numbers indicate that the hunt program is likely meeting the goals set forth by the hunt manager.

Appendix 5

Considerations for Sharp Shooting

Sharp shooting is an intensive method of deer removal by competent marksmen that maximizes safety, humaneness, and efficiency. To accomplish this, the methodology, aids, and equipment used in a sharp shooting plan must be selected with consideration for the specific situation. The IDNR Division of Fish and Wildlife offers the following recommendations as general guidance for preparing a sharp shooting plan:

- The IDNR will not conduct or participate in any sharpshooting activities within any community.
- The definition of sharpshooting requires that the shooters must be competent marksmen, so the sharpshooting plan should include a means of evaluating marksmanship proficiency.
- Sharpshooting may be costly. Those costs are the responsibility of the permittee.
- There could be inherent risks and unforeseen liabilities when conducting sharpshooting efforts. The total liability and safety of all sharpshooting efforts and its associated activities is the responsibility of the permittee.
- Sharpshooting can be an extremely divisive technique within the community. The applicant should consider the potential ramifications that go along with implementing a sharpshooting program.
- To maximize community acceptance of the sharpshooting operation, human consumption should be the preferred method of disposal of removed deer during the sharpshooting operation.
- Baiting to attract deer to a specific location for removal has been proved efficient in sharpshooting situations and may be incorporated into a special permit.
- Conducting sharpshooting efforts in the winter using bait will likely increase the efficiency of the deer removal program.
- The use of elevated stands has proved to be efficient in deer removal and is often necessary in areas with higher human densities for safety issues (people and buildings).
- Shooting from a motorized vehicle may be allowed under a specialized permit if conditions are appropriate.
- As sharpshooting is an intensive method of removal, and in the interest of humaneness and efficiency, center-fire rifles are the preferred equipment to provide a precise killing method, but in situations where use of rifles is prohibitive, shotguns, bows, and crossbows can be used.
- The use of suppressed rifles can be effective in deer removal and may be considered for some sharpshooting details. Legal requirements for the possession of silencers are the responsibility of the sharpshooters. Suppressed rifles are currently only allowed by Indiana law (IC 14-22-6-11) for use by state and federal wildlife management agencies, or under special permit issued at the discretion of the DNR director.
- Shooting times should be one-half hour before sunrise to one-half hour after sunset to maximize efficiency.
- Spotlights can be used after sunset to increase the opportunity and efficiency of taking deer. Currently, spotlights can only be used under Indiana law (IC 14-22-6-7) by state and federal wildlife management agencies, or under special permit issued at the discretion of the IDNR director.
- Sharpshooting is likely not a one-time solution and must generally be followed up by annual population maintenance.