Managing Overabundant White-Tailed Deer

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Photo by: Matt Cook


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Introduction

White-tailed deer (*Odocoileus virginianus*) are one of the most recognizable and charismatic species of wildlife, but they are the cause of a growing urban wildlife management problem in many metropolitan areas throughout the United States. As urban sprawl increases, the natural habitat required by many wildlife species disappears, but white-tailed deer are able to adapt to urban environments and human activity. White-tailed deer populations grow rapidly in these areas due to the lack of natural predators, patchy habitats, abundant food resources, and increased offspring survival.

When humans and wildlife live close to one another, an increase in human-wildlife conflict occurs. Although white-tailed deer are often viewed as an aesthetically pleasing addition to many homeowners in urban communities, they can cause several problems when they become overabundant and unmanaged. For example, white-tailed deer in urban communities can cause economic losses through consuming landscape and garden plants, and automobile repairs from deer-vehicle collisions.

A recent national survey, which included 204 respondents from State Departments of Natural Resources, representing 40 states and the District of Columbia was conducted to assess the extent of human/white-tailed deer conflicts throughout the United States. Eighty percent of the respondents reported that some of the communities in their state were experiencing human/white-tailed deer conflicts.

Over the past ten years, most respondents (71%) reported an increase in the number of citizen and community complaints concerning human/white-tailed deer conflicts. However, less than half (42%) of the respondents could identify who was in charge of urban white-tailed deer management in their state. A respondent in Ohio suggested that any urban center in the state that had deer has human/white-tailed deer conflicts. As human populations continue to grow and communities expand, such sentiments are likely to be expressed across the United States. The overarching conclusion from this study was that any urban community within the zoogeographic range of white-tailed deer in America will, in time, probably have issues with overabundant urban deer herds (**Figure 1**). Dilemmas associated with high deer numbers can become the burden of individual residents, property owner associations, and city governments. However, few are equipped with the biological and regulatory knowledge to manage the problem. The goal of this

Figure 1. Zoogeographic range of white-tailed deer and states reporting white-tailed deer conflicts.

publication is to educate readers on the biology and ecology of urban white-tailed deer and to provide fundamental considerations required to develop an effective management plan.

History of Deer Abundance

White-tailed deer have an important place in our nation's history. Venison and other products from deer provided sustenance, clothing, and even served as currency for early Americans. White-tailed deer were once overhunted to the point where their very existence was threatened. In the early 1900s, deer populations were at their lowest which coincided with early conservation work and the development of ideas that established wildlife management as a profession.

In Texas, deer populations have been influenced through an evolving process ranging from a hands-off approach to intensive habitat and population management. Today management efforts are largely centered around producing quality deer found on farms and ranches in rural Texas. Managing deer at or just below the land's biological carrying capacity is a common goal. Biological carrying capacity was naturally regulated by disease, predators, and scarcity of food. In rural areas, deer numbers can be managed by harvest to maintain balance with available resources, but in urban locales this task is more difficult.

In addition to deer, Texas also has an increasing urban human population that is predicted to swell from 23 million to 33 million by 2030. Consequently, as our population grows, habitat for white-tailed deer is converted, or lost completely through urbanization. Often, white-tailed deer habitat is inadvertently created. For instance, dramatically altered landscapes like urban yards are alternative habitats for white-tailed deer and their populations often become quite large (Figure 2).

Human Values Placed On Deer

The general public may view high deer numbers differently depending on a variety of factors. Some considerations include health and safety risks, fear of disease transmissions, concerns about animal health, and economic costs.

People attach dramatically different emotions and value systems to white-tailed deer. Some people view deer as an innocent, natural part of an unnatural setting that does not require intervention by people. Others view deer as ravenous ecological forces that must be removed from the landscape. Both opinions are to be respected, yet each is imperfect.

Many urban communities are experiencing overabundant deer populations, urban sprawl, and limited natural resources.

The fact remains that many urban communities are experiencing overabundant deer populations, urban sprawl, and limited natural resources. These scenarios are not completely natural. Consequently, some form of deer management becomes an absolute requirement, not an option.

Biological Carrying Capacity

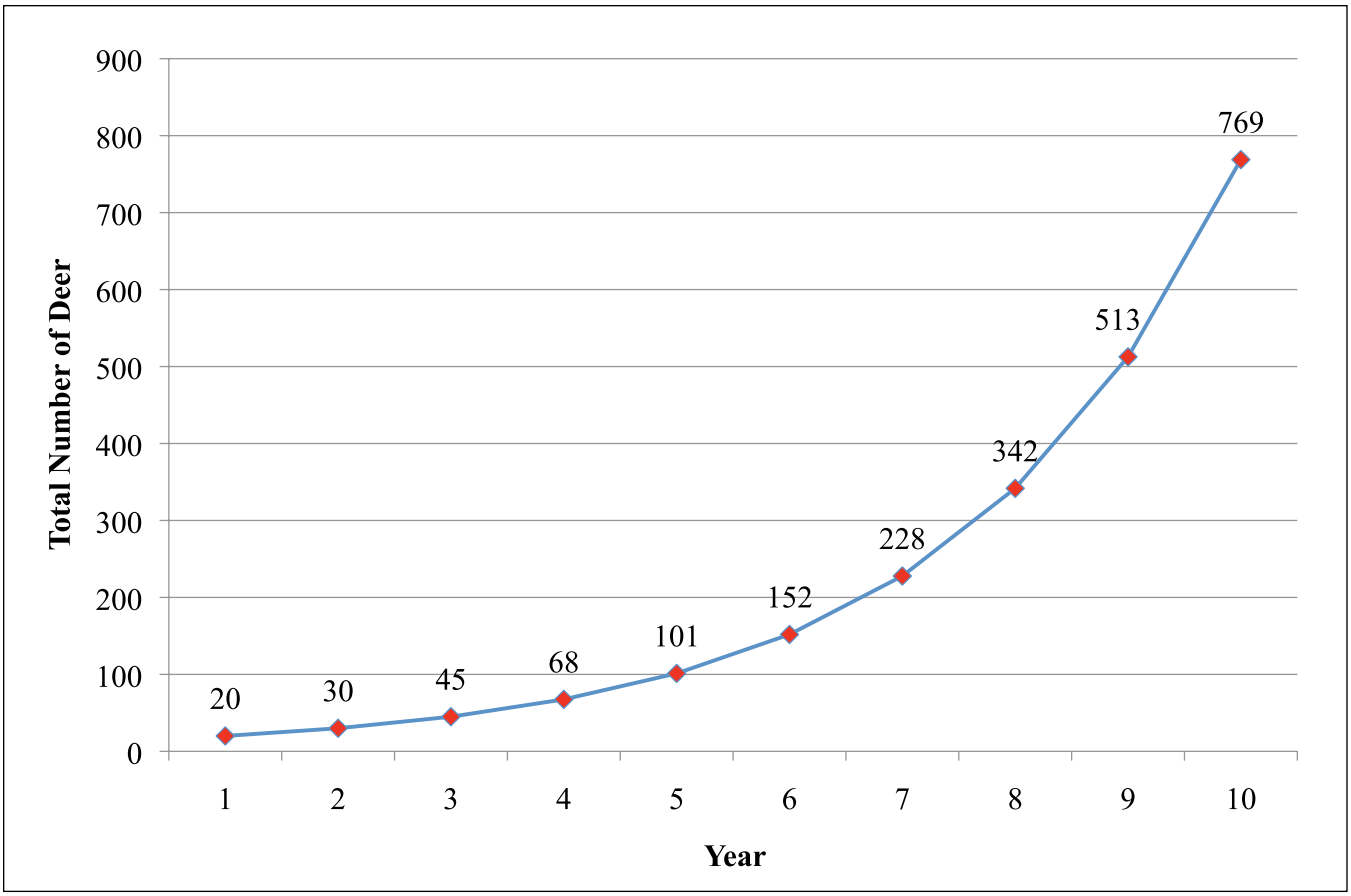
Biological carrying capacity is a concept within wildlife science. It is defined as the maximum number of individuals that a given environment can support without detrimental effects. Biological carrying capacity for deer is a moving target in that it changes yearly and seasonally. For example, springtime typically provides more vegetation than winter, thereby potentially supporting a larger number of animals. Biological carrying capacities for an area should be based on the time when resources are lowest (i.e., winter) versus when resources are at their peak. Populations may exceed biological carrying capacity, but with detriment of the habitat. Supplemental food cannot increase the carrying capacity of an area. It can however, artificially sustain populations above the acceptable limits of the natural habitat. In supplementally fed habitats, populations are vulnerable to volatile and unstable population growth and crashes. The concept of biological carrying capacity is widely used for deer populations in natural habitats; however, it should be noted that carrying capacity is an immeasurable ecological concept.

People attach dramatically different emotions and value systems to white-tailed deer.

A measurable variation of biological carrying capacity is the cultural carrying capacity of a community. **Cultural carrying capacity** is the maximum number of deer that society will accept within an area or similarly, the number of deer that can compatibly coexist with the local human population. The cultural carrying capacity can be exceeded without exceeding the biological carrying capacity for the area, because different communities have different tolerance levels of deer numbers. In most human-deer conflict situations however, both are exceeded and are correlated.

Problems Associated With Deer Overabundance

Deer-vehicle collisions have steadily increased across North America over the last two decades. State Farm Insurance estimates that 2.4 million deer-vehicle collisions occurred between July 1, 2007 and June 30, 2009. This number is an 18.3% increase from the previous five year period. The Insurance Institute for Highway Safety estimates that deer-vehicle collisions cause more than 150 fatalities per year, and the average property damage cost is $3,050. In Texas, deer-vehicle collisions have jumped 33% in less than a decade and Texas drivers have a 1 in 416 likelihood of colliding with a deer over the next year.



Example of population growth

Figure 2. A deer population starting with 10 males and 10 females is projected for 10 years, assuming 50% fawn recruitment and 50% fawn mortality. Given none leave or others come into the population, a population beginning with 20 individuals will grow to 769, degrading and exhausting habitat resources.

Deer-vehicle collisions are often prominent in and around urban areas with high densities of deer. Urban areas associated with rapid increases in human population growth and increasing road density are more susceptible to increasing deer-vehicle collisions. Although several techniques (reflectors, whistles, warning signs, and reduced speed limits) have been evaluated to reduce deer-vehicle collisions, none have been consistently effective.

Disease transmission between deer and humans is a concern for many communities with overabundant white-tailed deer populations. White-tailed deer are a host for the black-legged tick (*Ixodes scapularis* and *Ixodes pacificus)*. Black-legged ticks can transmit several tick-borne diseases. The most notable, Lyme disease, is primarily found in the northeastern and north-central United States in addition to some western states including Texas (Figure 3). The life cycle of black-legged ticks is complex; however, tick larvae typically contract the disease when feeding on mice, birds, or other small animals. As adults, ticks can spread the disease to new hosts which can include humans. Deer do not become infected with Lyme disease although deer are a main food source for adult ticks and deer are important in transporting ticks and maintaining tick populations.

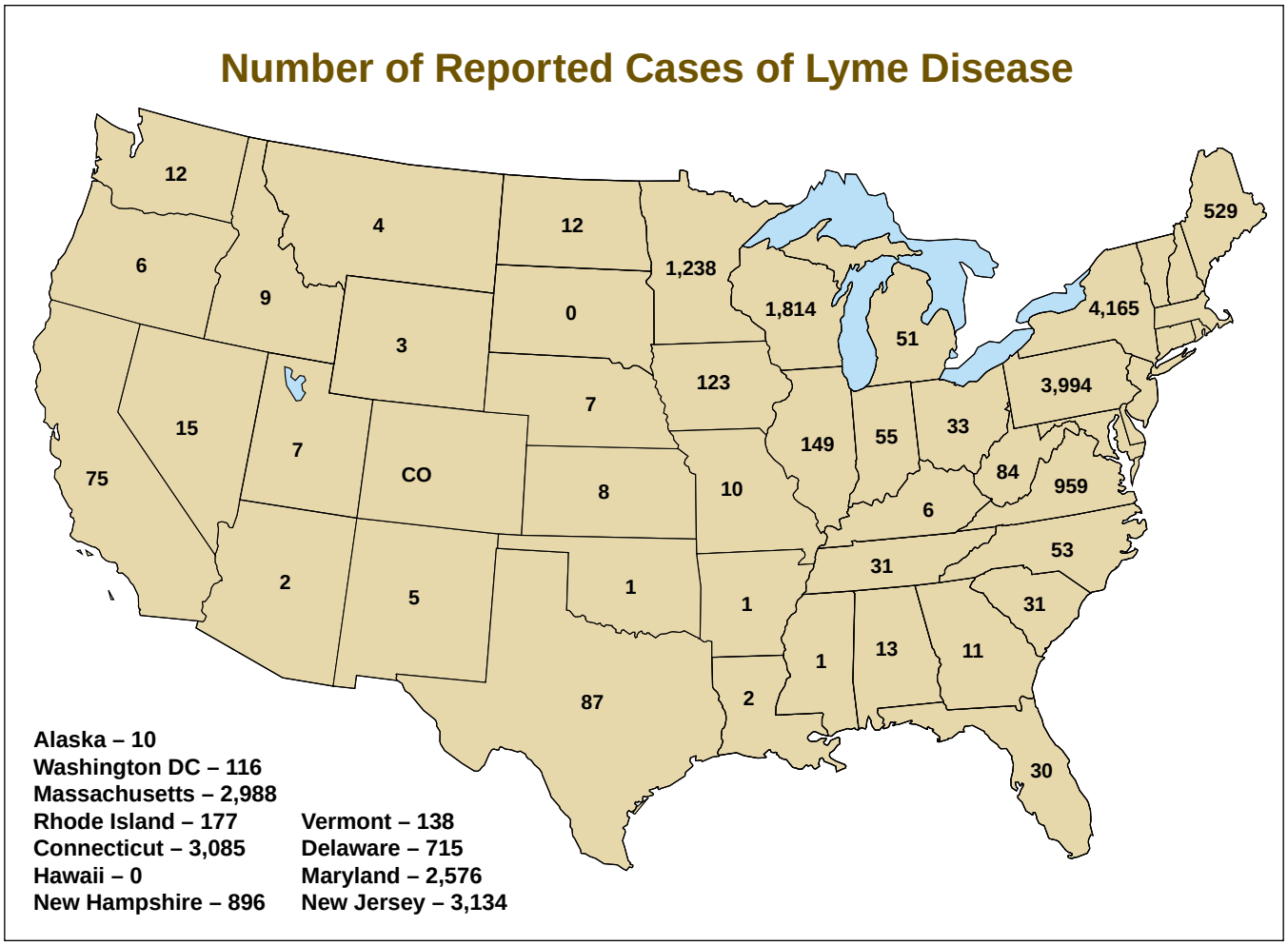


Figure 3. Number of reported cases of Lyme disease in the United States in 2007. (Data from Center of Disease Control; http://www.cdc.gov).

According to the Center for Disease Control, approximately 21,000 cases of Lyme disease have occurred on average over the last 10 years, nationwide. Several studies have evaluated the impact of deer reduction on tick abundance. Despite conflicting results in various studies, a reduction in deer generally corresponded with a reduction of ticks. However, the level of deer reduction necessary to reduce the risk of Lyme disease to humans has not been established.

Ecological Impact of Urban Deer Overabundance

Residents of communities with high deer numbers sometimes recognize the adverse effect deer have on gardens, flowerbeds and ornamental landscaping. More often residents recognize the spot damage as it occurs but they do not recognize the accumulated damage over time. Deer cause an estimated $250 million in landscape damages on an annual basis nationwide. Just as deer are capable of destroying ornamental landscapes, deer have a negative impact on native habitats where their numbers exceed the biological carrying capacity.

By consuming leaves, stems, flowers and fruits, deer directly affect the growth, reproduction, and survival of plants. Deer will consume preferred plants first, leaving only plants with lesser wildlife value to dominate the area. Overabundant deer populations can consume large quantities of vegetation; eventually creating a void of both preferred and less preferred vegetation anywhere within a deer's feeding range (ground to 6 ft). Such a situation is characterized by a browse line or by the presence of plants that show hedging. These are clear signals of high deer numbers.

Many native plants have evolved to cope with herbivory (consumption of a plant or its parts) through various means such as thorns and toxins. However, these defenses are typically not sufficient to prevent over-foraging in areas with overabundant

deer. Diversity of the overall plant community is reduced and regeneration of preferred plants is limited due to continued deer consumption.

The impact of deer on a plant community has a cascading effect on deer and other animal populations. Invertebrates, reptiles, amphibians, birds, small and large mammals rely on diverse plant communities for food and cover, especially within those zones easily reached by foraging deer. Recovery of habitat affected by deer is impacted not just by short-term deer numbers, but also by the history and severity of over-browsing, soil conditions, and climate. Some studies indicate that drastic reductions in deer numbers have little effect on increasing plant diversity over the short-term and vegetation recovery may only occur through extended periods of low deer densities.

The negative impact of deer can be seen by browse lines and by the presence of plants that show hedging.

Laws and Regulations Concerning Urban Deer

Who's In Charge of Managing Urban Deer?

Residents of communities with urban deer problems often ask "Who is charged with managing urban white-tailed deer?" The difference between regulation and management becomes important in this discussion. Regulation is the process of developing laws that govern the well-being of animal species. Management is the manipulation of habitat and populations to establish a sustainable balance within an ecosystem. Responsibility for management is different for rural and urban locations. The sole responsibility of management on rural properties is the landowner whereas the responsibility of management in urban areas typically includes residents, city officials, and citizen organizations such as property owners associations.

Overabundant deer populations can consume large quantities of vegetation; eventually creating a void of both preferred and less preferred vegetation.

Who's In Charge of Regulating Urban Deer?

Texas Parks and Wildlife Department (TPWD) is mandated by law to protect the state's natural resources. They do so by establishing laws and regulations, and by providing permits and educational materials to the public. The public can use these tools and recommendations in their decision-making process. It is the responsibility of communities to take action on management decisions, and carry them out. This is the same strategy used on rural lands. Texas Parks and Wildlife Department is not responsible for making management decisions or implementing management strategies for white-tailed deer on private property.

Is Fertility Control a Management Option?

Currently, fertility control is not a management option in Texas. Fertility control is often a popular request from urban residents wishing to manage overabundant urban deer herds. Fertility control does not reduce the number of deer in a population, and it will not help in a situation where deer are already overpopulated. Fertility control can only be used to reduce a population's growth rate, and is therefore only appropriate to maintain a deer population at its current level. Fertility control is a viable option under certain conditions only; for example, in a geographically closed population with a small number of deer. Another limitation of fertility control is cost (ranging between $350 and $1,100 per treated female). In most cases, deer must be captured to administer the drug thereby dramatically increasing the costs. Capture places stress on the animal which on occasion may result in death. Some fertility control agents are

Table 1. Nonlethal techniques used to minimize human-deer conflicts.

Technique	Description
Fencing	
High Fence (8 ft tall)	A high fence is an effective method for keeping deer out of protected areas. Although expensive, high fences can be a long-term solution.
Electric Fence	Electric fencing is useful at keeping deer out of protected areas. It is less expensive than other fencing options however; some communities may have ordinances prohibiting electrical fencing. Effectiveness is dependent upon the size of the area and design of fence.
Habitat Modification	
Unpalatable Landscape Plants	Planting undesirable plant species or fake plants will cause deer to seek food elsewhere. This is an effective method although costs depend on the size of project.
Deterrent Techniques	
Visual	Scarecrows, shiny pans and other visual devices can be used to provoke caution in deer. Although inexpensive, overabundant deer quickly habituate to visual deterrent techniques and become less scared of them.
Auditory	Noise making devices can also stimulate caution in deer but again deer habituate quickly to noises. Auditory devices can be a nuisance to neighbors.
Olfactory	Odors can be used to repel deer. Several commercial repellants are available, but their efficacy is questionable. Their life span is short, lasting between a few days to 3-4 months in dry conditions.
Dogs	Dogs are effective, long-term stimuli to keep deer away.

single dose drugs that last several years whereas others require annual booster shots to remain effective and thus require recapture of individuals annually.

There is only one Environmental Protection Agency (EPA) approved immunocontraceptive (GonaCon™) which is only available to federal and state wildlife agencies. It has not been approved for use in Texas and is not expected to be practical for most urban communities. Time, labor, and equipment associated with deer capture are more costly than the drug (vaccine is $1 per dose). Studies indicate that to maintain a population at a desired level, at least 50% of the females must be inoculated. Hands-on delivery of the drug is too cost prohibitive. Consequently passive delivery systems through supplemental feed must be developed, though currently, no such solution exists.

Management Options in Texas

There are both nonlethal and lethal options for managing deer in an urban landscape (Table 1). **Nonlethal methods** do not reduce the deer populations. They can modify the behavior of deer, restrict their movements and access to certain areas (e.g., greenbelts, park, vs. roads, gardens), or encourage deer to leave the immediate area. Some of the nonlethal methods provide only a short-term fix (repellants fade quickly) while others can be a long-term solution (high fence can last many years) to human-deer conflicts. Regardless, nonlethal methods are best utilized in conjunction with a comprehensive deer management program.

Trap, Transport, and Transplant (TTT) is considered a nonlethal method, however, research shows that some deer die from capture stress. It should also be noted that in Texas, release sites that accept urban deer are or will become a hunted population.

Lethal methods directly or indirectly reduce the deer population in one of two ways: (1) trapping and processing deer, or (2) harvest of deer through regulated hunting. Each method has advantages and disadvantages, but it is important to remember that reduction methods often require an **initial treatment phase** (i.e., certain proportion of deer are removed) followed by **annual maintenance phases** (i.e., additional deer are removed). It is typically insufficient to implement a one-time management program for urban white-tailed deer. Maintenance phases usually require long-term efforts to achieve and maintain wildlife management goals.

Hunting is an effective method for controlling overabundant urban deer and can be conducted by hunters (a person holding a valid, state issued hunting license) or professional sharpshooters (trained marksmen). It is critical that deer harvest

Table 2. Comparison of methods to reduce urban white-tailed deer densities.

Nonlethal methods	Pros	Cons	Cost
High fence (8 Ft. tall)	Effective barrier, long-term.	Relatively expensive.	Varies by project
Electric fence	Effective barrier, long-term.	Prohibited in certain areas.	Varies by project
Unpalatable landscape plants	Somewhat effective, long-term.	Large plantings become expensive .	Varies by project
Visual deterrents	Inexpensive.	Deer habituate quickly.	Varies by project
Auditory deterrents	Inexpensive.	Nuisance to humans, deer habituate quickly.	Varies by project
Olfactory deterrents	Somewhat effective, relatively inexpensive.	Relatively short-term.	Varies by project
Dogs	Effective, long-term.	Medical and food expense.	Varies by project
Trap, Transport, and Translocation (capture and release)	More accepted by public. Can be used in areas where firearms are restricted. Receiving landowner may be willing to pay costs associated with relocation.	Must find suitable, approved deer habitat. Permit required. Limited number of release sites. Some mortality due to trapping stress. Time and labor intensive. Requires expensive equipment. Disease testing is required.	$150 to 750/deer
Fertility control	Socially attractive.	Prohibitively expensive, ineffective for deterring or reducing deer populations.	$350 to $1100 per treated female
Lethal methods	**Pros**	**Cons**	**Cost**
Trap, Transport,and Process	Suitable release sites not necessary. Disease testing is not required. Can be used in areas where firearms are restricted. Meat is donated to charitable organizations to feed the needy.	Lethal means opposed by some. Time and labor intensive. Requires expensive equipment. Permit required.	$175 to $300/deer
Individual hunting	Local residents solving local problem. Expensive transporting equipment not required. Disease testing is not required. Increases outdoor recreation.	Lethal means opposed by some. Requires greater coordination among community and hunters. Additional security costs for law enforcement personnel. Requires large number of willing and proficient hunters. No sound suppression on firearms. Permit required. Limited in application.	$85 to $300/deer
Sharpshooters	Requires only a few individuals. Can be done discretely. Sound suppression on firearms.	Lethal means opposed by some. Must hire for this service. Additional security costs for law enforcement personnel. Permit required.	$250+/deer

through hunting in urban communities is conducted to maximize human safety, humaneness, discretion, and efficiency. Existing city ordinances may prohibit the use of firearms but archery equipment is often a safe alternative. In consultation with TPWD and other wildlife professionals, city officials evaluate the location and size of common areas, greenbelts and undeveloped areas in and around the community to determine if they can be safely hunted.

In communities where hunting is feasible, hunters should meet proficiency standards established by the community in order to participate. Hunters should also be evaluated to determine that they are responsible and ethical. In Texas, these standards are

conducted at the community level. Hunting zones within the community are identified to maximize human safety and promote ethical, humane, and efficient deer harvest. Deer are often baited into the area for a period of time and then hunters are placed at those locations. Meat from carcasses must be used by the hunter or donated to a designated charitable organization. Both hunters and non-hunting residents must recognize that urban deer hunting is a management tool designed to reduce the number of deer, with considerable emphasis on removing females. This is not a trophy buck hunt. Hunting in Texas can be done using traditional hunting license tags or through hunting permit programs offered by TPWD that allow individuals to harvest more than regular bag limits (**Managed Lands Deer Permits** or **Landowner Assisted Management Permitting System**).

High fencing can be a long-term solution to human-deer conflicts

Another type of hunting is done by hired **sharpshooters**. Sharpshooting uses trained professionals to harvest deer. Sharpshooters use baited sites to attract deer and take relatively short shots (<50 yards). Shooting is often done from an elevated position so that the shot's trajectory is towards the ground. Sharpshooters typically use sound suppression devices on their firearms to limit noise and disturbance. Sharpshooters often work at night and are capable of removing many deer by a few individuals as compared to an urban hunting program, which consists of daytime hunting by a larger number of individuals.

Laws Governing Trap, Transport, and Translocation (TTT) and/or Process (TTP)

Texas Parks and Wildlife Department has established rules governing two management options known as **Trap, Transport, and Transplant** (TTT) and **Trap, Transport, and Process** (TTP; **Table 2**). Specific language for each method can be found in the Texas Administrative Code, more specifically **Section 65.101 – 65.119 and TPWD Code Title 5, Subtitle A, Chapter 43, Subchapter E, Sections 43.061-43.062**.

Both hunters and non-hunting residents must recognize that urban deer hunting is a management tool.

In order to use these deer control methods, the landowner or governing body (property owners associations, city, and municipality) must obtain a permit from TPWD. If a rural landowner requests white-tailed deer for their property, the deer may be transported to their location, but only after meeting TPWD guidelines. For TTT methods, before deer are trapped, TPWD must inspect the release sites for suitable habitat; receive and approve a **Wildlife Management Plan**; and receive Site Information Forms for every release location. The state requires that 10% of deer (from the source herd) be tested for Chronic Wasting Disease before they are relocated. Testing is not required for deer trapped under a TTP. Processed deer meat is donated to approved charitable organizations like **Hunters for the Hungry** or local food banks.

Steps for Managing Urban Deer Populations

There are many communities that are in one of three biological/sociological stages in the urban deer management process. These three stages can be classified as:

Emerging – Biologically, deer are present and signs of browsing on landscape plants and garden vegetables start showing and the deer population is increasing each year. Sociologically, incidences of human-deer conflicts occur. This is the ideal time to initiate a proactive urban deer management program before the next stage becomes evident.

Crisis – Biologically, the problem of a growing urban deer herd has been ignored for so long that the

community is over-populated with deer. There are noticeable browse lines in the trees, hedging of shrubs, and loss of understory plants. Sociologically, incidence of human-deer conflicts is high with accelerated loss of landscape plants and garden vegetables, and increased human/deer conflicts. Development of an urban deer management plan is no longer an option, but an absolute necessity.

Managed – Biologically, deer numbers are more balanced with available habitat. Sociologically, human-deer conflicts are reduced. These are communities that have initiated an urban deer management program by completing the list of steps discussed below. Urban deer management is an ongoing process where a pre-determined number of deer are removed from the community on an annual basis.

There are several sequential steps that need to be taken to develop an effective urban deer program.

Timeline – Managing urban deer is a process and setting realistic goals is important. Expect each step in the process to take longer than initially anticipated. Each community is different and the process may take months or years before any action is taken. Conflict arises when actions are taken without the residents' knowledge or input, rushing through this process or failing to follow steps described below. We cannot stress the importance of communication enough, and the lack of communication or consideration of public input often results in the downfall of most urban deer conflicts.

Step 1: Form a Deer Management Action Committee

Urban deer management is a combination of managing both people and deer. The first form of action should be the establishment of a Deer Management Action Committee (DMAC). Some community entity, usually the city council, mayor's office, or property owner's association should announce the formation of the committee, invite residents to become members, and attend an organizational meeting. The DMAC should consist of three to seven residents of the community and their purpose is to examine the nature and extent of the urban deer problem and recommend solutions. Their first order of business is to determine the scope of the problem.

Step 2: Determine the scope of the problem

The first steps in determining the scope of the problem is to evaluate citizen knowledge and opinions of white-tailed deer ecology and management. It is critical to invite the professional input of TPWD urban wildlife biologists, private sector biologists, and extension wildlife specialists. The citizen survey determines community residents' opinions on deer numbers, desire to implement management options, feasible and acceptable management options, and who is in charge of developing and implementing a deer management plan. The citizen survey can also determine the level of knowledge that residents have about urban deer ecology and management options which provides guidance in the development of relevant educational materials. It is strongly suggested that communities

seek out survey research professionals to design, administer, analyze, and report the results of citizen surveys. Once the citizen survey has been completed, the community can move to the third step if justified.

Step 3: Hold a Town Hall Meeting

The first consideration in Step 3 is to identify the relevant stakeholders that might participate. Some examples are community residents, city and state government officials, property owners associations, law enforcement, and others that might be identified from the results of the citizen's survey. The second consideration is who will call the meeting to order. Some communities have chosen their property owner's associations, while others have utilized the infrastructure of their city council. Texas Parks and Wildlife Department has its own unique role in urban deer management as discussed above and they should not chair the meeting. It is during the town hall meeting that the results of the citizen's survey will be presented. Additional information may be provided by wildlife professionals. Expect the first meeting to be a venting and even contentious session given the attendance of residents who are likely to present opposite and emotional opinions concerning deer management. Subsequent meetings tend to be less contentious. The whole purpose of the town hall meeting(s) is to provide as much relevant information as possible so the citizens can participate in the development of an urban deer management plan that is acceptable and, more importantly, effective.

Step 4: Develop an Urban Deer Management Plan

Prior to developing an **urban deer management plan**, it is instructive to understand those factors that contribute to deer abundance in North America. Deer are superbly adapted to exploit the resources in urban areas, and can easily develop exponential growth patterns (Figure 2) because of the following conditions:

1. Lack of hunting in urban areas, and regulatory protection at the city governmental level.
2. Abundant alternative food resources in the form of ornamental shrubs, garden plants, succulent grasses, small plants, and supplemental feed.
3. Low abundance of natural predators. Large predators are the first species eliminated during urban sprawl.
4. Tolerance of urban disturbances including human presence and their activities.
5. High production and survival rates of offspring.
6. Longer life spans in the city when compared to the country.

In general, management plans should be focused on reduction and control of deer populations and to reduce related damage. Different communities will need different plans that best fit existing conditions. There are three urban deer management approaches.

Management plans should be focused on reduction and control of deer populations and to reduce related damage.

Approach 1 – Planning for Wildlife: This is a proactive management strategy that involves urban development that integrates rather than excludes nature. It involves community designs that conserves the natural habitat, are sustainable in the use of natural resources, and reconnect human society with the natural world in which they live. Smart Growth, Design with Nature, and Conservation Design are three examples of existing urban development alternatives that avoid the problem of deer (wildlife) overabundance in urban communities.

Approach 2 - Getting at the Root Cause: Getting at the root causes of deer overabundance in urban areas requires an analysis of factors (see the above list of 6 factors) that promote deer presence in a "typical" urban community. The most common management actions required to get at the root cause are to foster an environment that does not encourage the overabundance of deer. The prohibition of feeding deer is critical to solving overabundance. Some communities have enacted feeding bans for many wildlife populations (to include raccoons, coyotes, foxes, etc), and some just for white-tailed deer. Enforcement of these feeding bans is just as critical. Additionally, encouraging residents to landscape with native, deer-resistant plants helps to alleviate resident complaints, slow financial losses resulting from damage, and restore native plant diversity. Reintroduction of predators is not feasible in urban areas, but naturally occurring urban predators, such

Table 3. Survey response by 256 residents of Hollywood Park and Lakeway, TX, concerning urban deer ecology and management (2008).

Statements	Answer	% Correct
1. The size of urban habitats prevents deer herds from growing too large.	False	60
2. Urban deer can carry diseases that affect humans.	True	59
3. Urban deer can destroy habitat used by other animals.	True	52
4. In order to survive, urban deer rely heavily on supplemental food sources.	True	36
5. Urban deer can begin to produce fawns when they are six months old.	True	17
6. Twins are a common result from urban deer reproduction.	True	52
7. More deer per acre means the deer will be physically larger in size.	False	86
8. The most common cause of death in urban deer herds is predators.	False	75
9. The least common cause of death in urban deer herds is disease and starvation.	False	49
10. Deer are an endangered species in Texas.	False	91
11. Deer live in urban areas because they have adapted to living near people.	True	55
12. People can help urban deer the most by letting nature take its course.	False	41
13. Deer live in urban areas because human development has pushed them out of their natural habitat.	True	81
14. People have done more harm than good for urban deer.	True	60
15. People can help urban deer the most by managing them.	True	69
16. Fertility control techniques for managing urban deer are cost effective and easy to implement.	False	10

as coyotes and bobcats, can help buffer exponential population growth, as long as human habituation by predators is not permitted.

Approach 3 - Do Nothing: There are groups of stakeholders that advocate a "live and let live (or die)" or "let nature take its course" philosophies of management regardless of population size. Advocates of this urban deer management option will need to prepare themselves and other community residents for increased loss of vegetation, increased deer-vehicle accidents, potential deer starvation, and subsequent exclusion of many songbirds, reptiles, amphibians, and other mammals. A do nothing approach to urban white-tailed deer management is unlikely to resolve problems and will likely lead to emotional and political escalation of existing problems.

Step 5: Implement the Plan and Monitor Results

Some communities have adopted urban deer management plans that are a combination of addressing immediate problems and planning for long-term implementation and monitoring. First, the DMAC should process the information from town hall meetings and wildlife professionals. The DMAC must then come to a solution for their community. This should be an open process that allows residents to voice concern/support, but in the end it is the DMAC that makes the final management decisions and conveys these openly to the community.

Once the plan has been implemented it is important to monitor the results. The effectiveness of the management plan may be monitored in terms of reduced plant damage, deer-vehicle collisions, and human-deer conflicts. It may also be monitored in the number of deer present in the community. This can be monitored with annual population surveys conducted by TPWD or other wildlife professionals. Expect annual additions to the deer herd from prolific reproduction and possible immigrations. The bottom line for communities is to accept the fact that their urban deer management plan will be an ongoing obligation as long as there are deer in the neighborhood. These case studies that follow provides evidence of this management obligation.

Case Studies

Two Texas communities were chosen to determine what residents knew about the ecology and management of urban white-tailed deer. Lakeway, Texas is located northwest of Austin, and Hollywood Park, Texas is located in the north central area of

San Antonio. Based on the United States Census Bureau's 2006 estimates, San Antonio is the 2nd largest city and Austin is the 4th largest city in Texas. Both communities have similar geographic, ecologic, and socioeconomic characteristics, which include:

1. High density of urban white-tailed deer populations.
2. Relatively abundant green space and lot sizes.
3. Potential for white-tailed deer population growth.

Since the 1990s, urban deer herds have impacted Lakeway and Hollywood Park through increased deer-vehicle collisions, defined browse lines throughout the community, and negative human-deer encounters. For example, these communities have Deer Control Committees that decide, with input from TPWD, strategies for managing urban deer herds. The measure of success in these communities is determined not by annual deer counts, but by changes in the number of deer-vehicle collisions, human-deer encounters, deer found injured or dead, and fence-related accidents. Early on, strong differences of opinion between stakeholder groups in Hollywood Park led to a more contentious urban deer management environment than is the case in Lakeway.

Both communities have implemented programs to influence resident behavior and control deer numbers. City ordinances which prohibit the feeding of deer, restrict public access to deer control areas during control activities, and assign penalties for damage or destruction of deer control equipment. Violators can be charged with a Class C misdemeanor punishable by a fine of not to exceed $500, when enforced by the local police department.

Need For Educational Program Development

A recent research project used a series of 16 knowledge and belief questions to determine what Hollywood Park and Lakeway residents knew about urban deer ecology and management (Table 3). Scores ranged from five to a perfect score of 16. The average score for residents of both communities was ten correct answers. The majority were unaware how urban deer feed, breed, and die, and the consequences and effectiveness of management options. A sixteen-point examination does not provide all of the information required for developing comprehensive educational programs on urban deer ecology and management, but it did help leaders identify development needs for educational programs on:

(1) deer population control methods,
(2) basic deer biology and ecology,
(3) management alternatives, and
(4) long-term strategies to solve human-deer conflicts.

Today, Lakeway deals with less controversy from their residents regarding urban deer management practices than in the 1990s when deer management first began. Although not as intense, Hollywood Park continues to deal with protesting residents who oppose deer management. Public education throughout these communities is an ongoing process. As residents move into communities with urban deer management plans, they too will need to be educated about urban deer ecology and management in their community. The current deer management programs in Lakeway and Hollywood Park seem to be effectively managing the deer population. Lakeway is currently using the TTP method and Hollywood Park is practicing a combination of TTT and TTP methods to manage urban deer in their communities. In the past, Lakeway and Hollywood Park have removed an excess of 250 deer a year in order to sustain a healthy deer population and ecosystem within their cities.

The current deer management programs in Lakeway and Hollywood Park seem to be effectively managing the deer population.

Final Thoughts

Often, urban residents do not recognize that if deer management stopped, populations would soon exceed the biological carrying capacity again. Residents would then experience more economic loss and increased deer-human encounters. It is important for managers to understand that when dealing with the public, a variety of issues will arise from different stakeholder groups. It is best to address issues before management programs are implemented in order to reduce the potential conflict between managers and residents.

Appendices

White-Tailed Deer Biology

General Description

- Adult coat color: brown (winter coat), reddish (summer coat)
- Fawn coat color: brown with white spots
  - *Pelage color serves to break-up the body's outline and blend with habitat.*
  - *Bright white hairs under the tail serve as a visual alarm to others.*
- Size
  - *Male ~ 150 lbs.*
  - *Female ~100 lbs.*
  - *Fawn – 4-8 lbs. at birth*
- Distribution
  - *Found throughout Texas.*
- Scent Marking
  - *Used for communication.*
  - *Scrapes - shallow depressions dug by the hooves.*
  - *Rubs - shrubs and trees are sometimes damaged when removing velvet from antlers.*
- Antlers
  - *One of the fastest growing tissues.*
  - *Only found in deer family.*
  - *Found only on males for white-tailed deer.*
  - *Produced and shed annually.*
  - *Growth begins in mid-March.*
  - *Hardened, polished antlers by September.*
  - *Antlers are weapons used both for offense and defense.*
- Habitat
  - *Food*
- Require 4-6 lbs of food per day; that is 2,000 lbs per year.
- Ruminants (4-chambered stomach) require a highly nutritious diet.
- Forbs (weeds), browse (leaves and woody stems), and only ~10% grass.
  - *Water*
- ¾-1.5 quarts per day.
  - *Cover*
- Need vegetation of diverse heights, thickness, and species to escape predators, hide fawns, and maintain body temperature.
  - *Space*
- Varies depending on habitat quality.
- Breeding Season
  - *Known as the rut.*
  - *Generally occurs between October and December.*
  - *Males are often more aggressive.*
  - *Males movements encompass a larger area.*
- Reproduction
  - *White-tailed deer are highly reproductive.*
  - *Females are reproductively capable at 6-8 months old.*
  - *Males are reproductively capable typically at 1.5 years old.*
  - *Pregnancy lasts 187-222 days.*
  - *Fawning*
- First attempt typically produces 1 fawn.
- Thereafter, females annually produce twins (triplets are rare).
- Longevity
  - *10-13 years.*
- Mortality
  - *actors*
- Predators (coyotes, bobcats, mountain lions, and humans)
- Diseases and parasites
- Automobile collisions
- Starvation
- Inclement weather
- Trauma (combat, injuries, infected wounds)
- Changing land uses (population level)
  - *Mortality is highest among fawns and it affects age classes at different rates.*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