TEXAS PARKS AND WILDLIFE

DEER MANAGEMENT WITHIN SUBURBAN AREAS

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INTRODUCTION

White-tailed deer populations within the United States have undergone tremendous change within the past two centuries. Unregulated market hunting and extensive habitat modification resulted in the near extirpation of the species by the early 1900's. However, white-tailed deer numbers have dramatically increased during the past few decades. Natural habitat succession, deer restoration programs, intensive management efforts, predator control programs, public education campaigns, and the deer's natural adaptive abilities have all contributed to historic high deer densities across the United States. Currently, an estimated 4 million deer reside in Texas, alone. In many areas of the state, deer population densities have exceeded the land's ability to sustain them. In other areas, deer densities have exceeded society's ability to tolerate them. These unnaturally high deer densities can present significant ecological, social, and economic problems for a variety of stakeholders.

Nowhere are these problems more evident than in today's suburbs. As citizens increasingly seek refuge from urban life, they create a demand for residential areas that incorporate elements of the land's natural surroundings. These remnant natural habitat features commonly include patches or mosaics of undeveloped habitat utilized for visual obstruction, recreational areas, or erosion control. This highly fragmented landscape is the preferred habitat structure of white-tailed deer. Residential developments also possess a variety of planted trees and shrubs, and large portions of the landscape are watered and fertilized. In many cases, the nutritional quality of the food is not as high as that in rural areas, but the quantity of food is high. Thus, this enhanced landscape provides year-around stable living conditions for deer, as opposed to fluctuations in forage availability on natural ranges.

Another factor leading to suburban deer overabundance is the scarcity of predators within these habitats. Modern deer populations on natural ranges are maintained at suitable levels largely by fawn predation. The reduction of predators within less natural, suburban habitats contributes to unusually high fawn survival rates. Additionally, recreational hunting is not allowed within most residential areas. In rural areas across the United States where deer predators have been eliminated, recreational hunting has served to create a balance between deer populations and their available habitats.

Lastly, suburban deer overabundance presents unique challenges and circumstances to deer managers. While the biological constraints of deer herds are commonly considered when managing rural deer populations, suburban deer overabundance is usually solely a reflection of human values. When deer numbers approach or exceed human tolerance levels, they may be considered overabundant.

Problems Associated with Suburban Deer Overabundance:

1. **Deer/Vehicle Collisions**
   Each year in the US, about 29,000 people are injured and more than 200 people are killed in deer/vehicle collisions. An estimated 1.5 million deer are killed, annually, resulting in more than $ 1 billion in property damage (Conover 2002).
2. **Lyme Disease**
   White-tailed deer are the primary hosts for black-legged ticks, or deer ticks (*Ixodes* sp.). These ticks are responsible for transmitting the causative agent of Lyme disease to humans. According to Conover (2002), more than 13,000 cases of Lyme disease are reported, annually. Research has shown increased tick abundance and more human disease occurrences in areas with high deer densities.
3. **Landscape/Garden Damage**
   Many trees, shrubs, vines, and herbs planted within residential landscapes are highly preferred by white-tailed deer. Of course, severity of landscape damage is directly proportional to deer population density. It has been estimated that residential landscape damage in the U.S. may exceed $250 million per year (Conover 2002).
4. **Habitat Degradation**
   Excessive deer densities are known to cause long-term damage to wildlife habitats. Overabundant deer herds can extirpate preferred plant species, alter habitat structures, and disrupt natural succession of plant communities.
5. **Declining Deer Herd Health**
   As deer populations overutilize available resources, herd health inevitably declines. Increased parasite loads and declines in body weight, antler production, and fawn recruitment are often followed by large-scale deer "die-offs".
6. **Public Safety**
   Aggressive encounters between people and deer are relatively uncommon. Nonetheless, 5 – 10 people are killed annually in the U.S. by aggressive bucks (Conover 2002).

Obstacles Associated with Suburban Deer Population Control:

1. **Aesthetics**
   Many people enjoy wildlife watching within their neighborhoods. Their satisfaction derived from watching deer seems directly proportional to the number of deer observed. Furthermore, most residents have the misconception that deer control measures will result in deer eradication, thus eliminating wildlife watching opportunities.
2. **Safety and Liability Concerns**
   Harvesting or capturing animals within populated areas may create safety concerns for residents. While many safety concerns are only perceived, rather than real, special safety precautions must be addressed before deer control measures are initiated.
3. **Conflicting Social Attitudes and Perceptions**
   Controlling deer populations within residential areas involves numerous stakeholders. These stakeholders often present disparate views and opinions regarding control measures. Some people consider a deer's life more important than minor inconveniences and potential health and safety risks caused by deer. Others value human life and comfort more than deer. These people commonly view wildlife as a resource to be managed and utilized by humans.
4. **Hunting and/or Firearm Restrictions**
   Local ordinances and/or policies regarding hunting and the discharge of firearms may be obstacles to implementing deer control measures.
5. **Public Relations Concerns**
   Appointed decision makers within city governments, community associations, or development organizations are often hesitant to make controversial or divisive decisions.

MANAGEMENT OPTIONS

When addressing suburban deer problems, the advantages and disadvantages of all available deer management techniques must be evaluated. Differing circumstances among suburban communities will result in varied approaches to solving the problem. Furthermore, it is likely that a combination of management techniques will be necessary to achieve desired results (DeNicola et al. 2000). Involved stakeholders should be made aware that suburban deer management objectives are achievable, but they are often difficult and costly. Deer control measures require community input, as well as considerable long-term planning and commitment. The costs of suburban deer management should always be compared to potential benefits such as reduced deer/vehicle accidents, improved human safety, and decreased landscape/garden damage (Doerr et al. 2001).

It is important for communities to develop measurable long-term goals and objectives as part of a comprehensive deer management plan before implementing deer control measures. Objectives based on deer abundance could be evaluated with standard deer survey techniques such as survey transects or time/area counts. Indicators such as frequency of deer/vehicle collisions, number of reported deer complaints, or predetermined reductions in landscape damage, could be used to measure cultural objectives. Stakeholders should understand that the total elimination of the problem (or the deer herd) is neither practical nor achievable in most cases. Rather, the goal should be related to the reduction of deer-human conflicts to an acceptable level (DeNicola et al. 2000).

Managing an overabundant deer population should be accomplished in two phases (DeNicola et al. 2000). First, the **Initial Reduction Phase** is implemented to remove large numbers of deer from an overabundant herd during a short period of time to achieve desired deer densities. Deer managers have learned that deer herd reduction measures that remove less than 50% of the estimated population typically do not provide significant relief from density-related problems. After completion of the initial phase, a **Maintenance Phase** includes long-term efforts to maintain deer densities at target levels. Many protected areas include deer-proof fencing projects in their long-term maintenance program in order to restrict the ingress of additional deer and gain more control over their deer herd. Most importantly, deer managers should have long-term deer management plans in place before initiating deer herd reduction operations.

Deer management costs can be highly variable depending on available labor, deer densities, management objectives, and other site-specific factors. Additionally, it has been shown that the cost of removing, treating, or otherwise managing deer increases as deer management programs progress (Rudolph et al. 2000). As deer numbers decrease, it takes increased effort and resources to affect the remaining population. DeNicola et al. (2000) states, “High costs associated with diminishing returns may prevent achieving population goals with some techniques.”

Of course, deer managers must comply with applicable state wildlife regulations, city ordinances, and community policies while conducting deer control measures. Lethal control measures commonly require the approval of city government and special authorization from Texas Parks and Wildlife Department.

1. HUNTING

For decades, regulated hunting has proven to be an ecologically sound, socially beneficial, and fiscally responsible method of managing rural deer populations (NH Fish and Game Dept. 1996). Recently, as deer overabundance issues have become more common, controlled hunts have been successful in several protected areas across the United States (DeNicola et al. 2000). Controlled hunting sometimes results in lower deer harvest rates when compared to other deer control measures. However, this technique has also been shown to increase deer wariness toward humans, possibly alleviating some nuisance problems (Sage et al. 1983, Kilpatrick and Lima 1999).

Hunting is the only method with potential to generate revenue for landowners or communities. Costs associated with controlled hunts (support staff wages, administration, and equipment) usually range from $75 to $100 per harvested deer in Texas, which can be recovered with hunter fees. The additional provision of hunting opportunity for area residents may also be a positive consideration. Nonetheless, many additional factors must be addressed before implementing this practice within suburban areas. Some of these additional factors may include: safety considerations, competing land-use priorities, legal constraints, and social values.

When developing plans for a hunting program, several factors should be considered when selecting a hunting technique. Considerations include property size and layout, number of hunters, weapon type, deer densities, and any other local factors which could affect the success of the program or safety of the residents. Regardless of weapon type, elevated hunting stands are commonly used so that the ground is used as a backstop for the projectile (DeNicola et al. 2000). Baited areas are also utilized to concentrate deer and improve hunter success.

Archery hunting has been the preferred method within many residential areas, due to the weapon's limited shooting range and relative silence (Lund 1997, Ver Steeg et al. 1995). However, Texas Parks and Wildlife Department's public deer hunt data suggests that hunter success is usually much lower with this method compared to firearms hunting. Additionally, archery hunting is commonly perceived to result in higher wounding losses and increased travel distances before deer succumb to their injury (Kilpatrick and Walter 1999). This could lead to possible conflicts with nearby residents and should be considered prior to employing this technique.

Shotgun hunting is another alternative to high-velocity rifles, due to the weapon's limited effective range (Kilpatrick et al. 2002). Hunter success can be improved with this method by employing rifled gun barrels with sights or scopes (DeNicola et al. 2000).

Possible hunting program options/suggestions:

- **Allow each homeowner to hunt deer, if they wish.**
- **Have a lotto drawing for a designated number of hunters.**
- **Mandate a proficiency test before any hunter is allowed to hunt (target shoot test).**
- **Mandate an orientation/safety meeting for all hunters.**
- **Mandatory check in/check out for all hunters.**
- **Designate specific hunt areas or shooting lanes.**
- **Allow hunting from elevated stand, only.**
- **Sign agreement to harvest 2 does before harvesting a buck.**

2. SHARPSHOOTING

Many suburban communities and protected areas across the United States have employed trained and experienced sharpshooters to reduce or control deer numbers. Sharpshooting has been demonstrated as an effective technique to discreetly remove significant numbers of deer from targeted areas within a relatively short time period (Butfiloski et al. 1997, DeNicola et al. 2000). Some protected areas and parks have utilized on-staff conservation officers for sharpshooting programs. Others have hired and trained off-duty police officers or employed specialized contractors to conduct sharpshooting operations (DeNicola et al. 1997, Frost et al. 1997, Jordan et al. 1995, and Stradtmann et al. 1995). Specialized sharpshooting contractors commonly utilize night-vision equipment, suppressed rifles, and elevated stands to harvest deer at baited areas. Regardless of the chosen method, sharpshooters should be selected based on experience, training, and efficiency at harvesting deer. There is most likely a significant difference in harvest efficiency among shooters.

Sharpshooter operations may cost $100 - $250 per deer. This cost includes: sharpshooter and support staff wages, administration, bait, equipment, etc. Project costs are significantly reduced if landowners handle arrangements for transporting, processing, and donating the meat.

Sharpshooter operations are often not authorized by state natural resource agencies unless landowners have taken steps toward long-term deer control (i.e., constructing deer-proof fence around area).

Possible Sharpshooting Program Options/Suggestions (adapted from DeNicola et al. 2000):

- **Use baits for attracting deer to designated areas prior to removal efforts.** Research has shown that sharpshooting over bait is more productive than opportunistic sharpshooting.
- **Shoot deer from portable tree stands, ground blinds, or from vehicles during day or night.**
- **When possible, select head (brain) or neck (spine) shots to ensure quick and humane death.** Cranial shots are very humane and approved by the American Veterinary Association as an acceptable means to dispatch animals.
- **Process deer in a closed and sheltered facility.**
- **Donate meat to food banks for distribution to needy people in the community.**

3. TRAP AND TRANSLOCATE

Trap and translocation efforts have been utilized by numerous communities and protected areas across the United States. This technique's popularity has been a result of the general public's perception that it poses no risk to human safety and is a non-lethal solution to deer overabundance problems (Stout et al. 1997). However, very few deer managers have accomplished population reduction goals with this method. Capture and translocation has been shown to be ineffective and costly (Jones and Witham 1990). Furthermore, translocated deer have demonstrated high mortality rates resulting from: capture-related injuries, capture myopathy (trapping stress), unfamiliarity with the release site, human activities, and encounters with new mortality agents (Beringer et al. 1996, Jones and Witham 1990). Translocated deer from residential areas usually demonstrate reduced flight distances when disturbed and a preference for roadsides and open lawns. Studies have shown that as many as 25% of translocated deer die within the first two months of trapping/translocation, and more than 65% of deer may not survive longer than one year (Beringer et al. 1996, Jones and Witham 1990, NH Fish and Game Dept. 1996, O'Bryan and McCullough 1985).

There are several other factors, which contribute to this technique's impracticality. Trapping success is often related to habitat type. Deer are less attracted to artificial baits in areas with adequate forage. Deer also become increasingly wary of trapping mechanisms as projects progress. Translocation efforts are further complicated by the lack of suitable release sites. Most habitats within the species' native range are already saturated with deer, and cannot withstand supplemental stockings without risking damage to the habitats. Lastly, wildlife diseases are another concern when deer are moved from one location to another. This technique has the potential to spread harmful and contagious pathogens from one deer population to another.

Trapping operations can range from $150 - $500 per deer. Trap and translocation costs for Lake Way subdivision near Austin, Texas cost $150 per deer in 2000. The donor property usually encumbers the cost. However, receiving landowners occasionally share trap and translocation expenses.

4. TRAP AND EUTHANASIA

Deer can be captured with a variety of traps or nets. They can be driven, or herded, into the entrapments or attracted with bait. Following capture, deer are euthanized either on or off site, most commonly with a bolt-gun. Texas Parks and Wildlife Department recently approved this method to control overabundant deer herds. However, trap and euthanasia is not currently authorized by all State natural resource agencies, and has been assessed or considered in only a few locations within the United States. This technique may be preferred in areas where firearms discharge is a major concern. Additionally, it has been proposed as a complement to sharpshooting programs in areas with extremely high deer densities.

Most deer control methods that involve live-trapping are inefficient and cost-prohibitive. Refer to **Section 3. Trap and Translocate**, above.

5. FENCING

Fencing is a method most protected areas utilize for effective and long-term deer control. This method prevents the ingress of additional deer and aids with local population control measures. However, many residents may perceive fence construction as a distraction from the aesthetics of their community. Other difficulties encountered with this technique may include road, stream, and utility right's-of-way that traverse the proposed fence line. In some cases, multiple ownership of proposed fence lines may also be an obstacle to fence construction.

Most effective fence designs include mesh or high-tensile wire at least 8 to 9 feet in height in order to restrict deer movements. Private contractors usually charge between $10,000 and $15,000 per mile to construct these fences. Construction costs increase if fence lines require clearing. While initial fence construction costs are high, long-term costs of this deer control method are comparable to other techniques. For example, if 100 deer are prevented from entering a one-mile section of the property during a 10-year period, the fence has saved landowners $10,000 to $25,000 in sharpshooting program expenditures.

In some situations, partial fences can be constructed along deer travel corridors to restrict the ingress of additional deer. Some properties begin fencing projects on these highly traveled borders and construct additional sections as funds become available.

6. FERTILITY CONTROL AGENTS

Researchers have been experimenting with fertility control agents for free-ranging deer for many years. However, past studies have indicated the use of these drugs to be impractical and cost-prohibitive (NH Fish and Game Dept. 1996, Rudolph et al. 2000). Due to extensive man-hour requirements, costs per treated female have been as much as $550 for the initial treatment and up to $175 for annual booster treatments. Furthermore, no effective fertility control agents are likely to be developed in the near future for suburban deer herds (DeNicola et al. 2000). Regardless, residents often request this technique as a way to solve nuisance deer problems humanely, safely, and non-lethally.

Researchers commonly separate deer fertility control agents into two groups (DeNicola et al. 2000, Waddell et al. 2001): (1) contraceptive agents that prevent conception and (2) abortion chemicals that terminate pregnancy. Fertility agents are typically administered remotely with a rifle. Oral contraceptives are not feasible due to the inability to select for a target animal, lack of dosage control, and difficulties with absorption of the active ingredient (NH Fish and Game Dept. 1996, Rudolph et al. 2000).

Obstacles to Effective Fertility Control:

1. **Deer Population Must Be "Closed"**
   Treated deer populations must be isolated, or closed, from adjacent populations. Deer immigration from adjoining properties would negate any fertility control efforts within the treated area. New immigrants would not have been exposed to the fertility agents. Additionally, chemicals used to control white-tailed deer fertility are experimental and not FDA-approved for human consumption. A treated deer in an "open" population could leave the property, where it could be subject to human harvest and consumption.
2. **Population Must Be Small**
   Because annual mortality rates for suburban deer populations are often very low, a large proportion of the females (70 to 90 percent) must be treated to curb or reduce population growth. Since oral fertility agents are not an option, the majority of females within the population must be captured, marked, and treated with the drug. With some drugs, sequential treatments must be administered to each female (Rudolph et al. 2000)
3. **Population Must Be At Target Level**
   As previously stated, mortality rates for suburban deer populations are usually low. Eliminating reproduction within the deer herd will not reduce total deer numbers for several years after initiating the antifertility program.
4. **Timing of Drug Administration**
   Abortion agents, such as Prostaglandin $F_{2\alpha}$, must be administered at a certain period of fetal development in order to effectively control reproduction. Females treated during early gestation are often not affected by the drug. If the drug is effective, females often resume their normal estrous cycles after abortion. When treated during late gestation, abortion-related animal behavior may repulse humans (abortion of late-term fetuses and fetal cannibalism; Waddell et al. 2001).

7. PREDATOR REINTRODUCTION

Stakeholders often suggest predator reintroduction as a means of controlling deer overabundance with minimal human involvement. Coyotes (*Canis latrans*), bobcats (*Lynx rufus*), and black bears

(*Ursus americanus*) are currently the principle white-tailed deer predators within most of the eastern United States. While these predators are undoubtedly important sources of annual fawn mortality, research has shown that this predation is not sufficient to reduce high population densities. Historic predators such as wolves (*Canis sp*.) and mountain lions (*Puma concolor*) are known to control population densities of large ungulates. However, restoration of these predators within suburban areas is not feasible because of unsuitable habitat and human safety concerns.

8. ADJACENT PROPERTIES

The legal harvest of deer on neighboring properties may help control deer populations. Harvests on these neighboring properties should be encouraged, as long as these measures can be implemented safely.

9. LOCAL OPTIONS

Local options are techniques that can be utilized to prevent deer from damaging small areas (yards, gardens, etc.). These techniques include fencing, repellants, the use of dogs, etc.

Feeding

Even though many people enjoy providing food for deer and other wildlife, feeding encourages large congregations of deer to inhabit small areas. Feeding exacerbates an already problematic situation by restricting deer movements and enhancing their reproduction and survival. This practice also makes them more tame and fearless of people.

Community education efforts regarding the negative impacts of feeding may help alleviate this problem. Alternately, regulations which prohibit feeding have been passed in some areas with varying degrees of success. For example, Elkins Lake subdivision in Walker County, Texas successfully passed an anti-feeding regulation in 2004. Large deer congregations, which were previously observed traveling from one feeding area to another, were significantly reduced. However, total elimination of supplemental feeding has not occurred within this area. It is important to note that enforcement of these regulations can be difficult without substantial community interest and involvement (DeNicola et al. 2000).

Fencing

Deer can sometimes be excluded from small areas with a variety of fence designs. Texas Parks and Wildlife Department can provide more information regarding these fencing projects.

Use of Unpalatable Plants

While deer have a definite preference for some plants over others, very few plants can be considered "unpalatable", meaning that deer will always avoid them. Furthermore, certain plants can be more or less palatable depending on deer densities and overall forage availability, time of year, and individual plant health (which can be changed with supplemental water and fertilizer). However, utilizing plants known to be less desirable to deer may help to alleviate unwanted damage to suburban landscaping. Texas Parks and Wildlife Department can provide more information regarding regional plant species that are less preferred by deer.

Repellants

Numerous commercial deer repellants have been developed to prevent unwanted damage to commercial crops, residential gardens, and landscape plants. Refer to DeNicola et al. (2000) or Coey and Mayer (2004) for a comprehensive listing of available commercial repellants. Unfortunately, the

success of these substances in preventing deer damage has been limited. The ability to deter deer browsing pressure on any particular plant by applying a repellant is dependant on deer densities and overall forage availability, plant species, and the amount of time passed since repellant application. Most successful attempts to deter deer with repellants typically occur with relatively low deer densities and frequently repeated repellant applications. It is important to note that total avoidance of repellants by deer is rare (DeNicola et al. 2000).

Non-commercial treatments with items such as human hair or soap are not reliable deer repellants.

Types of Commercial Repellants (Beauchamp 1997; Mason 1997; Wagner and Nolte 2001):

- **Fear** (odor-based substances that imitate predator scents; e.g., Deer-Away®, Hinder®, Deer Buster's™, etc.)
- **Conditioned aversion** (causes illness that deer associate with treated item; e.g., Detour™, etc.)
- **Pain** (causes pain or irritation to mucous membranes; e.g., Hot Sauce®, Deer-Away®, etc.)
- **Taste** (include bittering agents in attempt to negatively affect taste; e.g., Ropel®, Tree Guard®, Orange TKO, etc.)

* Not all deer repellants are approved for application on edible crops. Inspect labels carefully.

Harassment Techniques

Noise-makers, motion-activated lights, silhouettes, and movement contraptions are often utilized in an attempt to repel deer. These techniques are mostly ineffective. Deer are extremely adaptable, and become habituated to these sights and sounds in a very short period of time. Furthermore, some of these harassment techniques will have limited application within subdivisions where loud noises are prohibited.

In some situations, dogs contained by a leash or an invisible fencing system have been used to successfully deter deer from small acreages. It is important to remember that only the area within the dog's reach will be protected, however, as deer quickly learn the dog's boundaries. Dogs must patrol the area night and day in order for this technique to be successful. Additionally, the dog's size and temperament will affect this technique's success.

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