

# **Deer Management Strategies**

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## **The Problem**

White tailed deer populations (*Odocoileus virginianus*) have become troublesome in the United States over the past hundred years. However, deer have not always been a problem in the United States. In the past, natural predators along with hunting by Native Americans, maintained deer populations (Audubon 2003, 3). The arrival of Europeans introduced trade of white-tailed deer products. An exploitation era from about 1850 to 1900 saw dramatic reductions in deer populations (Audubon 2003, 3). Eventually, environmental consciousness, low wildlife numbers and protection laws increased the deer population in the absence of natural predators. The abandonment of agricultural fields and the growing industry of timber harvesting also supported deer populations. Deer continued to thrive, and deer populations grew out of control in suburban and urban areas where few factors were present to limit deer population.

## **Deer Ecology**

White tailed deer have a lifespan of about 18 years (Audubon 2003, 4). Their mating season runs from late October to early January (Audubon 2003, 4). Deer eat five to ten pounds of forage per day. Foods include grasses, flowers, fruits, twigs and buds from trees (Audubon 2003, 4). Edge and early-successional forests with gaps and grassy openings are favored habitats (Audubon 2003, 4). Most deer stay within a core area of only 30 acres (Brash et al, 2004, 6). Because of this, reducing deer numbers in closed off locations can allow low density deer populations to persist for several years (Audubon 2003, 5).

## **Impacts of Deer Abundance**

Deer density can be estimated in defined areas. The amount of deer present in a location will greatly affect the management plan of a suburb. Greenwich, Connecticut estimated 20 deer per square mile, while more rural areas showed higher densities of 43 and 60 deer per square mile (Audubon 2003, 4). However, these estimates were based on aerial photography, which experts say underestimate actual population numbers (Audubon 2003, 4). Generally, actual deer numbers are 50 to 100 percent higher than visible in aerial photographs (Audubon 2003, 4).

The increased numbers of deer have created significant problems in suburban and urban areas. Deer cause car accidents in urban and suburban areas. They also spread Lyme Disease (Audubon 2003, 3) by moving the black legged tick (*Ixodes scapularis*), known as the deer tick, which

carries the Lyme Disease spirochete. These ticks also carry two other diseases, human babesiosis and human granulocytic ehrlichiosis (Audubon 2003, 10). It is possible to treat deer for ticks with a baited self-application system, but that approach is unlikely impact the rate of tick-borne disease (Audubon 2003, 10). The danger to human health can be a powerful motivator to residents who may not care to damage vegetation.

Vegetation impact from deer consists of three stages (Audubon 2003, 5). The first stage is selective feeding on their preferred plants, including wildflowers, other herbaceous plants, and tree seedlings (Audubon 2003, 5). The second stage develops a browse line, where deer eat anything within their reach, usually five- to six-feet above the ground (Audubon 2003, 6). After the second stage continues for some time, the third stage develops where the browse line is not apparent enough. Depleted vegetation at the low and intermediate levels make it very difficult to see where deer have eaten because there is not much left to see (Audubon 2003, 6).

Deer also consume landscaping plants and overgraze on forest ecosystems, which negatively affects forest development (Audubon 2003, 3). Plants and trees unable to flourish because deer eat plant matter before it has a chance to grow. Overabundant deer have been shown to negatively affect other wildlife species through competition, drive some local plants to extinction and reduce or eliminate forest regeneration (Audubon 2003, 5).

The effects of deer browsing are well documented in a study by the Connecticut Agricultural Experiment Station managed by The Nature Conservancy (Audubon 2003, 6). That study observed 82,000 tree seedlings per acre in 1984. By 1998, deer density had grown to 60 deer per square mile and seedling numbers fell to 22,000. Sapling density also fell in the same years from 3,600 stems per acre to 1,400 stems per acre. Oaks and conifers were replaced by other species such as red maple and black birch because of the deer's dietary preference for certain tree species. No white pine seedlings survived in a monitored unprotected plot, while a protected plot saw an 80 percent survival rate. The inability of deer to access the exclosed area allowed these trees to develop into maturity. Additionally, many invasive plants are resistant to deer browse, allowing them to dominate the landscape with increasing deer density (Audubon 2003, 6). Wildflowers have the capability to hide underground for years under intense browsing pressure,

but over decades, they are eliminated due to a lack of seed source (Audubon 2003, 7). The dietary habits of deer affected both tree and flower species and did not allow plants to fully develop as they normally would.

Many studies point to similar specific impacts by deer on vegetative communities, even though objectives and methodologies are not consistent between studies (Audubon 2003, 6). Problems with tree generation begin at deer densities exceeding 20 deer per square mile. Impacts on shrubs and herbaceous plants can occur at even lower density levels (Audubon 2003, 6). Because of this, a deer density of 10 to 15 deer per square mile is recommended to ensure sustainability of vegetation and the native forest bird community (Audubon 2003, 6).

Greater numbers of species and individuals have been associated with forest areas that contain fewer deer (Audubon 2003, 8). Migratory birds are present in greater numbers when fewer deer are present (Audubon 2003, 8). As deer density grew above 20 deer per square mile, birds nesting in trees disappeared from Pennsylvania's Alleghany National Forest (Audubon 2003, 8). The disappearance of shrub and herbaceous layers negatively affect the birds that nest or feed in shrubs or on the forest floor (Audubon 2003, 8). Higher deer densities caused the disappearance of the middle canopy layer and the songbirds that live there (Audubon 2003, 8). When deer density reached 64 deer per square mile, adaptable species like robins and phoebes were forced out (Audubon 2003, 8). Additionally, the autumn diet of deer consists heavily of acorns, bringing them into competition with other mammals (Audubon 2003, 8).

## **Management**

Several management options are available for addressing overabundant deer including fencing and repellants, trapping and relocation, fertility control in does and sterilization of males, hunting, or even no action (Audubon 2003, 11). Carrying out no actions will still affect the deer population because higher densities lead to higher rates of disease, car collisions, and starvation in winter (Audubon 2003, 11). Overpopulation leads to fawn abandonment as does cannot find suitable fawning territory (Audubon 2003, 11).

Fencing has shown success in supporting vegetation structure and diversity (Kilpatrick et al 2007a, 5). After five, years, eight-foot high fenced areas were shown to dramatically increase diversity in areas where deer were kept out (Kilpatrick et al 2007a, 5). However, fencing requires substantial initial investment and regular maintenance over time (Audubon 2003, 11). Fencing will protect vegetation but also restrict the movement of other medium and large sized mammals, which could lead to detrimental effects on natural breeding and feeding (Audubon 2003, 11). In addition, fencing could channel deer movement onto roadways (Brash et al 2004, 6).

Repellants could be applied to plantings, but they require repeated applications (Audubon 2003, 11). Trapping and relocation can lead to deer mortality as deer deal with capture-related stress, or are struck by vehicles after wandering extensive distances (Audubon 2003, 12). Trapping and relocation is also labor intensive and expensive; the Connecticut Department of Environmental Protection estimates costs of up to \$3,000 per deer (Audubon 2003, 12). There must also be a suitable location to release deer, not always available. In addition, relocating deer from overpopulated areas can spread disease (Audubon 2003, 12).

None of these management techniques address the problem of deer overpopulation. Surgical sterilization of deer has high cost and must treat many deer in a population (Audubon 2003, 12). Immunocontraceptive hormones can be administered with darts, but requires multiple treatments a year, and may prolong the breeding season of deer (Audubon 2003, 12). Deer are most active during breeding season and will travel the most during these months. The use of immunocontraceptives may increase the rates of deer-vehicle collisions from the increased travelling of deer (Audubon 2003, 12). However, even with small, isolated deer populations, an adequate number of female deer may not be successfully treated to adequately limit population control (Audubon 2003, 13).

Hunting is a management tool that controls population, and is used by state wildlife agencies throughout the United States (Audubon 2003, 13). Depending on the size and location of herds, hunting can quickly bring down deer numbers to manageable levels. A three-day hunt in Mumford Cove, Connecticut removed 82 percent of the deer population, while a six-day hunt in

the Mumford/Groton Long Beach area removed 92 percent of the deer population (Audubon 2003, 14).

To implement a management program in Greenwich, Connecticut, the Conservation Commission set four goals: review existing information on deer management, establish an outreach program, establish baseline data, and implement a plan based on scientific information and community needs (Brash et al. 2004, 3). Following this plan, Howard Kilpatrick, a researcher on deer management, recommended first identifying large landowners including parks, golf courses, water company land and private lands, followed by deer management on town-owned land using bow hunting, focusing on the largest areas (Brash et al. 2004, 9). Large landowners play a critical role in controlling deer populations by allowing hunting. Meanwhile, public education focusing on the impacts of deer and management options helps develop community support for management programs.

### **Community Engagement**

It is essential to maintain community support in implementing deer management programs. Attitudes toward deer depend on factors such as plant damage on personal property and incidences of deer vehicle collisions (Storm et al 2007, 56, Urbanek et al 2012). Surprisingly, those who listed plant damage as a primary concern were more likely to support a population decrease than those who worried more about deer vehicle collisions (Storm et al 2007, 56). This is likely due to perception of blame towards driver error causing accidents with deer instead of overabundant deer wandering into streets (Storm et al 2007, 56). High incidences of Lyme Disease and other tick borne diseases is also an important concern to residents in urban areas with high deer densities (Kilpatrick and Labonte 2003, 345).

Although people may be initially uncomfortable with lethal management techniques, the alleviation of deer problems that follows hunting can change public attitudes. For example, the Mumford Cove community in Groton saw increased support for hunting as a deer management technique after hunts had taken place (Kilpatrick and Labonte 2003, 340). Residents saw the safety and effectiveness of deer hunting in their community.

Costs must still be considered when evaluating which strategies to implement. A survey in Greenwich, Connecticut saw that increasing costs of deer management reduced resident's willingness to wait for population reduction (Kilpatrick Labonte and Barclay 2007, 2097). Residents should also be in agreement regarding management techniques. A survey of suburban Illinois residents around conservation areas saw residents agreed most on implementing archery hunts (Urbanek et al 2010). Deer management techniques will not be sustainable if residents do not support or agree with them.

Hunter support is also important if using hunting as a management technique. Incentives for additional harvesting by hunters included earning a bonus buck tag for shooting additional antlerless deer (Kilpatrick 2004, 1182). Dedicating funding to cover the cost of processing meat could also provide incentives to harvest additional antlerless deer (Kilpatrick et al 2004, 1182). Maryland has passed legislation to create a fund for the Farmers and Hunters Feeding the Hungry (FHFH) program through which hunters donate venison (Kilpatrick et al 2004, 1182).

Controlled deer hunts consist of two phases. High intensity hunting is followed by a maintenance phase when hunting intensity is lowered (Audubon 2003, 14). Managing a population to always be at a specific level can be inefficient (Rondeau and Conrad 2003, 278). Instead, focus should be placed on harvesting antlerless deer, then allowing deer repopulation, followed by further management action, such as harvesting. This creates an efficient pulsing population effect where deer numbers will increase and decrease over time (Rondeau and Conrad 2003). These levels will decrease negative deer effects on a community while still allowing deer to be present in an environment.

Hunting can be controlled with many restrictions including the number of hunters, selection of hunters, timing of hunt, hunting implements used, areas open to hunting, and the number and sex of deer harvested (Audubon 2003, 15). Hunters could also be required to demonstrate mastery of safety and hunting techniques. In Connecticut, all new hunters are required to take a 16-hour firearm course, while bow hunters are required to take an eight-hour safety course (Kilpatrick et al 2007a, 11). Suburban hunts typically use bowhunting, considered quiet safe (Audubon 2003, 15). It should be noted that use of crossbows is also legal in Maryland (Kilpatrick, Labonte and

Barclay 2007b, 2095). Additionally, chances of bowhunters wounding but not killing the animal are low, with an even less likely chance of a deer walking away with an arrow in its body (Audubon 2003, 15). Baiting could be used to attract deer from adjacent un-hunted properties, leading to safer hunting opportunities (Kilpatrick Labonte and Barclay 2007b, 2100). Baiting with corn is shown to be a cheap source of food to put in automatic feeders (Kilpatrick Labonte and Barclay 2010, 716). It could establish regular feeding patterns for deer, allowing for more efficient harvest opportunities (Kilpatrick Labonte and Barclay 2010, 716).

## **Conclusion**

Many factors should be considered when creating a deer management program. The support of residents is essential. Hunter programs and incentives must be factored into management options. Costs should also be considered, especially with respect to long term sustainable deer management. Many management techniques exist, and should be evaluated with respect to current conditions for successful deer control. Most importantly, safety of residents should be considered, not only regarding firearm and bow discharge, but also tick-borne diseases and vehicle-deer collisions.



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## Annotated Bibliography

Board, Audubon Greenwich. 2003. "Management Plan for the Control of White-tailed Deer at the Audubon Center in Greenwich, Connecticut."

This is an excellent overview of problems associated with deer overpopulation in Greenwich, Connecticut. Explanations include impacts on forest composition, wildflowers, shrubs, birds, and other wildlife. Conflicts with humans are also explained. Management options are presented, with the favored option being hunting. It also reviews the obstacles to hunting, including safety and public outcry, and offers solutions to each problem including certifying hunters and regulations of when and where hunting will occur. This source is dated, but provides an excellent overview of the options that a community has to control deer population. Additionally, hunting as a control measure was used in a 300-acre parcel at an Audubon Center, and not in a suburban area.

Brash, A.R., E.V.P. Brower, L. Henrey, and D. Savageau. 2004. "Report on managing Greenwich's deer population." *Greenwich Conservation Commission Wildlife Issues Committee, Greenwich, Connecticut, USA.*

This paper reviews the start of deer management in Greenwich, Connecticut with background on deer overpopulation, problems with vegetation growth, road accidents, and Lyme Disease. A study by Howard Kilpatrick on deer management is explained, where residents were surveyed to gauge support for deer management strategies. Findings and recommendations include identifying large landowners (parks, golf courses, private land, and water company lands) for deer management, managing on town-owned land with bow hunting as a minimum, and continuing public education about deer impacts and management options. This paper provides excellent recommendations based on surveys, but does not provide any figures or statistics for deer management that had been carried out specifically in Greenwich.

Storm, Daniel J., Clayton K. Nielsel, Eric M. Schaubert, and Alan Woolf. 2007. *Deer-human Conflict and Hunter Access in an Exurban Landscape*. DigitalCommons@University of Nebraska - Lincoln. <http://digitalcommons.unl.edu/hwi/133>.

Residents in exurban areas near Carbondale, Illinois were surveyed about their experiences and attitudes toward deer. Deer vehicle collisions concerned the greatest number of respondents. However, plant damage was more influential in determining a resident's tolerance of deer. Many respondents did not allow hunting on their property, allowing for large numbers of deer to be protected from control efforts. This study focused on an exurbanite area, where residents often consider themselves rural citizens. The perceptions of deer may be different in a suburban area like Columbia, MD, compared to an exurban area like Carbondale, Illinois.

Kilpatrick, Howard J., and Andrew M. LaBonte. 2003. "Deer Hunting in a Residential Community: The Community's Perspective". *Wildlife Society Bulletin* 31 (2): 340-348. <http://www.jstor.org/stable/3784312>.

Kilpatrick et al. evaluated public expectations and perceptions of deer following management techniques, including immunocontraception control and hunting with shotgun and archery techniques. The Mumford Cove community in Groton, CT was surveyed over a seven-year period, with an at least 90 percent response rate. Deer management options were presented to the community in 2000, when it voted 2:1 to discontinue immunocontraception control of deer,

repeal the no-hunting ordinance, and implement a deer hunt. The survey after the hunt found decreased experience with damaged landscape plantings, increased satisfaction with personal deer abatement techniques, decreased cases of Lyme disease, and increased support of hunting. Problems with the hunt included disagreeing with the concept, safety concerns, trespassing, firearm noise, and not enough deer killed. Hunting as a management technique may be hard to implement in communities where deer are not viewed as an intense nuisance, and in areas with little exposure to hunting. However, skeptical residents supported future hunts after seeing its effectiveness. This case study involved a much smaller community than Columbia, and may not be the best comparison. Still, surveys showed public perception before and after deer hunting in a residential community.

Kilpatrick, Howard J., Andrew M. LaBonte, John S. Barclay, and Glenn Warner. 2004.  
"Assessing Strategies to Improve Bowhunting As an Urban Deer Management Tool."  
*Wildlife Society Bulletin* 32 (4): 1177-1184. doi:10.2193/0091-  
7648(2004)032[1177:ASTIBA]2.0.CO;2.

This report evaluated bowhunting was evaluated as a tool to manage deer populations in urban-suburban areas. Bowhunters were surveyed for harvest rates, success rates, interest in employing aggressive deer management strategies, and willingness to harvest additional antlerless deer. Hunting on Sundays, using bait, convenience in donating deer, and earning a tag to hunt an additional buck by harvesting additional antlerless deer had the greatest positive responses to increase effectiveness of bowhunting in Greenwich. Harvesting all antlerless deer passed up by hunters was projected to have the greatest impact on white-tailed deer population. Although these strategies are predicted to have the greatest impact on deer populations, it may be difficult to implement hunting programs of the same intensity in Columbia, MD. Public education could be required to begin acceptance of lethal deer management.

Kilpatrick, Howard Joseph, and Andrew M. LaBonte. 2007a. *Managing urban deer in Connecticut: a guide for residents and communities*. Connecticut Department of Environmental Protection, Bureau of Natural Resources-Wildlife Division.

This report is a public resource for Connecticut residents and communities. It includes a review of deer overabundance, including vehicle accidents, Lyme Disease, and ecological damage. Non-lethal management options are presented, followed by explanations of hunting practices and regulations. It reviews 11 examples of special and local deer reduction programs in Connecticut, with rates of deer removal and results of removal efforts summarized. Facts about deer and deer management at the end of the paper answer common questions about state policies and regulations, as well as expected results for the deer removal. Recommendations for developing management programs are also given, and cover cooperation with residents, hunting practices, and venison donations to local food banks. Overall, this is an excellent overview resource with results of previous and ongoing deer hunts. Pictures show examples of topics and make the report accessible to people without a specialized background in deer management and ecology.

Kilpatrick, Howard J., Andrew M. Labonte, and John S. Barclay. 2007b. "Acceptance of deer management strategies by suburban homeowners and bowhunters." *The Journal of Wildlife Management* 71 (6): 2095-2101.

From surveys mailed to residents of Greenwich, Connecticut, results showed several components of attitudes toward deer management strategies. Most homeowners supported lethal strategies, particularly bowhunting. Most homeowners were also unaware of the cost effectiveness of deer birth control, and supported a special crossbow season outside of the existing archery season. Most residents were willing to wait three to five years to see reduced deer population if there was no cost to them. If costs increased, wait time decreased. The preference of residents in Greenwich, for bowhunting and archery over firearms could be very valuable information for implementing a lethal deer control population in Columbia.

Kilpatrick, Howard J., Andrew M. Labonte, and John S. Barclay. 2010. "Use of Bait to Increase Archery Deer Harvest in an Urban-Suburban Landscape." *The Journal of Wildlife Management* 74 (4): 714-718. doi:10.2193/2009-244.

Using bait gives positive results in harvesting more deer with hunting techniques. However, some states have restricted baiting and feeding deer to reduce risk of spreading disease (e.g. chronic wasting disease and tuberculosis). Bowhunters who had previously harvested deer or purchased an archery deer permit were surveyed about attitudes and results of using bait while hunting. Those using bait harvested more deer and met their venison needs. Hunters using bait harvested up to eight times more deer than hunters using no bait. Although baiting may not be legal in Howard County, it should be considered seriously when evaluating and implementing a deer population control program.

Rondeau, Daniel, and Jon M. Conrad. 2003. "Managing Urban Deer." *American Journal of Agricultural Economics* 85 (1): 266-281. doi:10.1111/1467-8276.00118.

Management of a deer herd in Irondequoit, NY (a suburb of Rochester) involved removing deer by sharpshooters using rifles from 1993 to 1998. Afterwards, the study proposed an optimum management strategy that balanced the overabundance with deer against their recreational and aesthetic benefits. This model could be valuable in areas where deer are viewed favorably, but still have adverse effects.

Urbanek, Rachael E., Clayton K. Nielsen, Mae A. Davenport, and Brad D. Woodson. 2012. "Acceptability and Conflict Regarding Suburban Deer Management Methods." *Human Dimensions of Wildlife* 17 (6): 389-403. doi:10.1080/10871209.2012.684196.

This survey of 660 residents near 22 conservation areas in a suburban Illinois county evaluated acceptance and conflict for five deer management strategies. Strategies included archery hunting, gun hunting, sharpshooting, fertility control, and no deer management. Archery was most accepted by residents, and had the least amount of conflict. No deer management was least acceptable, and also had very little conflict between residents. Fertility control was the most controversial management strategy. If Columbia were to implement a deer management program, surveys would need to be done to gauge community acceptance.