

A GUIDE TO DEER MANAGEMENT IN DEVELOPED AREAS OF PENNSYLVANIA



Version 2.3
November 2013

Pennsylvania Game Commission's Deer & Elk Section
www.pgc.state.pa.us



Contents

Section I: Introduction	3
Is there really a problem?.....	3
Problems associated with deer in developed areas	4
When is deer management needed?.....	5
Obstacles associated with community deer management.....	5
Where can you get help?.....	6
Before you begin.....	6
Deer management in developed areas: Facts & Fiction.....	7
Section II: Deer Management and Developing a Plan.....	8
Why have a plan?	8
Components of a Management Plan.....	8
Table 1: Recommended Steps	10
Figure 1: Flow chart for Adaptive Resource Management	11
Deer Population Estimates: Money not well spent	12
Section III: Management Options.....	13
Non-Removal Management Options	13
Removal Management Options.....	18
Literature Cited	21
Appendix A. Community Deer Management Plans	23
Appendix B. Landscaping Alternatives, Repellents, and Fencing Resources.....	24
Appendix C. Ordinance Prohibiting Deer Feeding	25
Appendix D. Community Managed Hunts.....	26

Section I: Introduction

White-tailed deer (*Odocoileus virginianus*) are one of the most widespread and popular wildlife species in North America as well Pennsylvania's state animal. Nearly extirpated from the state over 100 years ago, the whitetail has made a miraculous comeback. Now, this ghost of the forest has made itself at home even in the most urban settings. And while this wildlife management success story is a welcome addition to communities, this welcome is soon rescinded as deer in urban and suburban environments cause substantial conflict and controversy.

The suburbs are attractive to deer for some of the same reasons they are attractive to people. Deer are afforded the same conveniences and protection as suburban residents. There are natural areas, greenways, and parks, that provide bedding areas, escape cover, and birth sites. Homes are landscaped with trees, shrubs, and herbaceous cover, which are appetizing and nutritious to deer. And wild and domestic predators have been extirpated or controlled.

Deer populations in developed areas can grow rapidly. The combination of the above circumstances leads to high reproductive rates, low mortality rates, and small home range sizes for deer in urban and suburban areas (Swihart et al 1995, Kilpatrick and Spohr 2000, Etter et al 2002). The result can be a rapid increase of a deer herd that is not actively managed. The speed with which a deer population can increase is demonstrated by a classic example of deer population growth potential. In 1927, 6 deer were released into an enclosure in Michigan. By 1933 those 6 deer had increased to 160 deer (McCullough 1979). With growth potential like this, a deer population can quickly overwhelm an area.

Managing a deer herd requires knowledge of deer biology, familiarity with public attitudes about deer in the area, and adequate tools to address the issue.

Is there really a problem?

Deer in urban and suburban environments can cause substantial controversy and can divide communities. Before you embark on the deer management path, it is prudent to ask if there is really a problem. This may seem a bit odd but human perceptions define wildlife conflicts. An interaction is only negative if someone perceives it as such.

When it comes to deer, there are a wide variety of views. This is where the difficulty with regard to deer management stems. What is intolerable to one community member may barely be an inconvenience for another.

Here are some questions to consider:

- Is this a community-wide problem or is it restricted to certain areas within the community?
- How bad is it? Is there a consensus or just a few individuals with issues?
- Have problems (deer vehicle collisions, resident complaints) shot up recently or has there been a gradual increase over time?
- Can residents plant shrubs and flowers with a reasonable expectation of them not being destroyed?

Consider these things before engaging in what could be lengthy, and perhaps unnecessary, debate on deer management. Knowing the extent of the issues will allow you to direct resources and illuminate your course of action.

Problems associated with deer in developed areas

1. Deer-vehicle collisions

An estimated 1.5 million deer-vehicle collisions (DVCs) occur each year in the U.S. The average cost of vehicle repairs was \$1,500 which means that total vehicle damage resulting from a collision with a deer exceeded \$1 billion annually (Conover et al. 1995). Based on their known market share in Pennsylvania, State Farm Insurance projected more than 115,000 deer-vehicle claims for all insurance companies in the state during July 1, 2011 – June 30, 2012. It is also estimated that 29,000 people are injured and more than 200 fatalities occur annually in the U.S. as a result of a DVC (Conover et al. 1995). Pennsylvania was in the top 10 states for fatalities 10 out of 14 years from 1994-2007 (DeerCrash.org)

2. Landscape/garden damage

Deer browsing on ornamental trees, shrubbery, and gardens in suburban and residential areas is a common complaint and financially impacts homeowners each year (Connelly et al. 1987, Witham and Jones 1987, Conover 1997b). Wildlife damages incurred by metropolitan residents in the U.S. have been estimated at \$3.8 billion annually. This is in addition to spending \$1.9 billion and 268 million hours trying to solve or prevent the problem (Conover 1997b). Deer are not responsible for all of this damage. Only 4% of respondents to a 1997 survey reported a problem with deer. Using this percentage, a conservative estimate of deer damage and preventive measure costs to households is \$376 million (Conover 1997a).

3. Public Safety

Encounters with aggressive deer are not uncommon in urban and suburban areas where deer and people interact frequently. These encounters are almost always associated with the fawning and breeding season. Does are highly defensive of their young and have been known to attack unsuspecting dogs and people who get too close to their fawns. In the fall, bucks in breeding condition with hard antlers and high levels of testosterone can cause significant harm, even death. Feeding deer exacerbates this type of problem by bringing deer and people closer and habituating deer.

4. Lyme Disease

Lyme disease was first recognized in the U.S. in 1975. Lyme disease is caused by the spirochete *Borrelia burgdorferi* and is spread through the bite of an infected tick (*Ixodes scapularis*). Lyme disease, as well as other tick-borne diseases, poses a significant threat to humans. Deer are dead-end hosts for Lyme disease and play no role in the transmission cycle (Underwood 2005, Perkins et al. 2006). However, deer play a part in the complex life cycle of *I. scapularis*, by supplying adult ticks with a final blood meal and a place to mate (Underwood 2005, Perkins et al. 2006).

5. Habitat Degradation

Deer can have a major impact on the natural community in which they live. As the number of deer increases, plants that are preferred by deer will become less abundant or may disappear

(Ross et al.. 1970, Marquis 1981, Tilghman 1989, Healy 1997). Preferred plants become scarce as deer densities increase. The disappearance of certain plant species adversely affects other wildlife species and can cause a dramatic reduction of biodiversity in forest ecosystems (Whitney 1984, McShea and Rappole 1992, deCalesta 1994, 1997).

When is deer management needed?

Wildlife management attempts to balance the needs of a species with the needs of people, using the best available science. Deer management is the art and science of reaching defined goals by manipulating and/or maintaining habitats and wildlife populations.

Opinions and philosophies vary widely about deer management. The most basic deer management decision is whether or not to take any action at all. If no community deer management action is taken, then residents must accept the problems they are experiencing or try to reduce them on their own.

The decision to take action to manage deer in your community rests on local interests and personal values. Deer management is needed when there is a consensus among residents or persons representing larger groups within the community that the deer issues facing them are no longer acceptable.

Obstacles associated with community deer management

1. Aesthetics

White-tailed deer are the most easily viewed of all large mammals in Pennsylvania. Wildlife watchers outnumber sportsmen in Pennsylvania by more than 3 to 1 with more than half its residents spending time viewing or watching deer around their home (U.S. Department of Interior and U.S. Department of Commerce 2008, Responsive Management 2012). Residents erroneously assume that deer management actions will lead to elimination of deer and their wildlife viewing opportunities.

2. Conflicting social attitudes and perceptions

Addressing deer issues in developed areas involves numerous stakeholders. This diversity often results in wide range views and opinions regarding what action, if any, should be taken. Residents unfamiliar with wildlife management techniques may not be comfortable with hunting or other removal methods. While others may feel control measures are necessary for the safety and quality of life of all residents.

3. Hunting and/or firearms restrictions

Local ordinances governing the discharge of firearms may be impediments to implementing deer management measures.

4. Safety and liability concerns

Lethally removing or capturing animals within populated areas often generates safety concerns from residents. Whether concerns are real or perceived, they must be adequately addressed before deer management actions are taken.

5. Public relations concerns

Appointed or elected decision makers are often hesitant to make controversial or unpopular decisions even if they are supported by the majority of residents or by an abundance of evidence.

Where can you get help?

When deer-human conflicts increase beyond tolerable levels, landowners and communities often do not know where to turn to get help. As the state wildlife agency, it is the Game Commission's responsibility to manage all wildlife in the Commonwealth. Deer are one of these valued species and are perhaps our most notable management responsibility. The Game Commission is challenged to minimize negative effects of deer in developed areas while maintaining positive benefits they provide to residents.

While Game Commission manages for all citizens of the commonwealth, every community is unique. Therefore the Game Commission can not and does not come into a community to solve deer-human conflicts. The Game Commission sets the framework for deer management. Communities can customize their deer management actions to accommodate their individual needs within the framework the Game Commission has provided.

Wildlife management requires sustained effort. Managing deer in developed areas is no different. There is no quick fix, one-time solution to reducing deer-human conflicts. Once deer have integrated themselves into a community, the community must initiate a long-term plan to manage them.

The Game Commission can provide technical assistance and help guide communities through the maze of management options. This guide is the first step in acquiring the necessary knowledge and information needed to tackle community deer management.

Before you begin

Other valuable wildlife and deer management resources for communities produced by Northeast Wildlife Damage Management Research and Outreach Cooperative include

[*Human-Wildlife Conflict Management*](#)

[*Community-Based Deer Management: a practitioners' guide*](#)

[*Managing White-tailed Deer in Suburban Environments: a technical guide*](#)

Landowners and communities should become familiar with these publications prior to initiating deer management efforts.

Deer management in developed areas: Facts & Fiction

- In a healthy population, female deer can breed as fawns (6-7 months of age) producing young at 1 year of age. Average pregnancy rate of doe fawns in developed areas is 40%.
- Healthy adult does most often produce 2 fawns annually.
- Removing deer from a healthy population will NOT increase reproductive rates of the remaining deer. Deer in Pennsylvania breed once a year. Average reproductive rate for adult does in developed areas in Pennsylvania is 1.8 fawns/adult doe with 15% producing 1 fawn, 79% producing twins, and 6% producing triplets. Reproduction in females is already close to maximum, so there is little room for reproductive increases.
- Deer can live up to 18 years of age.
- Deer populations can double in size every 2-3 years.
- Deer eat about 5-10 pounds of food daily.
- Deer home ranges are relatively small in urban areas (100-300 acres).
- Current birth control practices are costly and ineffective in controlling free-ranging deer populations over a large area.
- Hunters can assist landowners at no cost.
- Landowners can impose additional hunting restrictions on their property.
- Homeowners can waive the 50-yard archery or 150-yard firearm safety zone.
- Hunting does not increase deer-vehicle accidents. During fall, deer naturally move more due to increased activity associated with breeding season. Investigations have shown deer-vehicle accidents occur more frequently on Sundays when no hunting is allowed than on Saturday (high hunter participation day) and 1-4 hours after dark which is after hunting hours.
- Landowners who allow the use of their property without a fee are protected from liability.
- Typically, the removal of 1 adult doe during the hunting season equates to 3 less deer the following spring.
- All deer management programs require long-term maintenance.

Section II: Developing a Plan for your Community

Deer management can be a daunting task. For communities with no history of deer management activities, the waters can be deep and murky. Initially, it is important to assess the situation by gathering information on the extent of deer-human conflicts and the attitudes of local residents.

Why have a plan?

Once you have taken the pulse of your community with regard to deer, it is important NOT to jump straight to solutions. Proceeding without a plan is the folly of many community deer management actions. A well thought-out, thoroughly-researched, community-supported deer management plan will benefit all involved. And once developed, it will set direction, list management options, provide recommendations, direct implementation, and provide your community with guidance for years to come.

As communities and deer populations are dynamic, a static and rigid management plan which does not consider changing community needs or new management tools would not be the most efficient or useful. Therefore, an adaptive resource management approach is most appropriate. Adaptive management is characterized by establishing clear and measurable goals, implementing management actions, monitoring those management actions, evaluating management actions based on established goals, and adapting policy and management actions as necessary (Figure 1). Adaptive management recognizes deer management decisions must be made without the luxury of perfect information. Consequently, the focus of adaptive management is on monitoring responses to management actions and learning.

There are many approaches that may be taken to produce a community deer management plan. A comprehensive review and guide to these approaches can be found in [*Community-Based Deer Management: a practitioners' guide*](#) produced by Northeast Wildlife Damage Management Research and Outreach Cooperative.

Components of a Deer Management Plan

1. Introduction and mission statement

Brief description and background of the area, its location, and size. Definitive statement of the problem(s) caused by deer that are preventing you from obtaining your mission. A mission statement puts your deer management activities into context. Mission statement examples: To provide residents with safe environment; to preserve natural and cultural amenities; or to offer recreational opportunities.

2. Goals

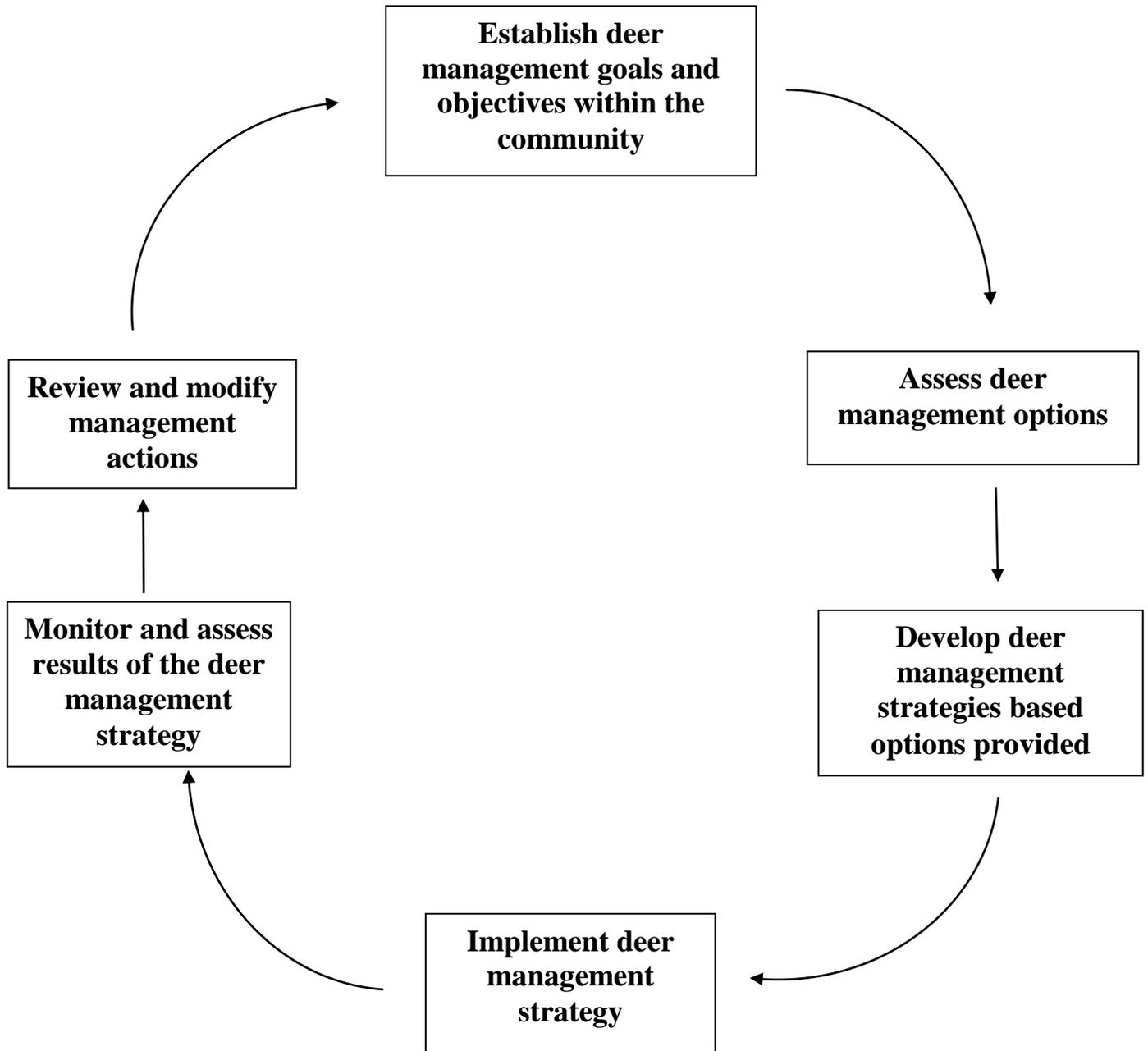
Statements of what you want to achieve with your deer management activities. It is important to keep these economically feasible and realistically attainable. If they aren't, your plan may be a disappointment for failing to achieve them. Examples: Reduce risk of deer on roadways; preserve natural diversity of your community's flora and fauna; minimize deer depredation of agricultural crops or landscaping; educate residents on actions they can take to reduce deer-human conflicts.

3. Objective(s)
Objectives measure progress towards your goals. Data form their basis. This monitoring component of your deer management plan is a long-term measure that tracks changes over years. You cannot have a goal without a way to monitor progress towards that goal. Examples: to reduce and maintain an acceptable number of deer-vehicle collisions and/or deer-related complaints in your community. Determining whether objectives have been achieved will require data collection and monitoring of those numbers.
4. Background Information and Site Description
Detailed description of the area (human population, housing density, open space, parks, etc) and history of deer management activities. Document deer related damage, potential safety hazards, and complaints. Include quantitative and cost estimates of damage; potential or actual safety hazards to the public; number and scope of complaints if possible.
5. Management Actions
This section identifies the management practices specific to your community that address your goals and objectives. Techniques include removal and non-removal methods, communications strategies, and outreach materials and distribution.
6. Schedule
Timetable for implementation of the program.
7. Supporting Documents
Additional support documents as necessary.

Table 1. Recommended steps for communities in addressing deer-human conflicts in developed areas. The Game Commission can provide technical assistance throughout this process, but will not complete any actions on behalf of the community.

Step	Community Actions	Comments
1.	Establish Deer Management Committee	Deer management can be an emotionally charged and difficult task, especially in developed areas. As a result, we recommend a group be established to address the challenges of deer management.
2.	Committee becomes familiar with deer biology and management issues and options	Refer to <i>Managing White-tailed Deer in Suburban Environments: a technical guide</i> and <i>Community-Based Deer Management: a practitioners' guide</i>
3.	Review deer management tools and options	References to tools and options may include: <ul style="list-style-type: none"> 1. Section III of this guide 2. <i>Managing White-tailed Deer in Suburban Environments: a technical guide</i>
4.	Develop a deer management plan (DMP)	See Appendix A: Examples of Community Deer Management Plans. Also refer to <i>Community-Based Deer Management: a practitioners' guide</i> for additional information.
5.	Implement DMP	
6.	Assess and monitor DMP progress through objectives	
7.	Review and modify DMP if needed (step 4)	

Figure 1. Flow chart for Adaptive Resource Management



Deer Population Estimates: Money Not Well Spent

It is worth noting that knowing the *number* of deer was never mentioned as a component for managing them. Many communities get preoccupied with knowing the number of deer in the area.

Questions swirl like “how many are there?” and “how many should there be?” Communities get distracted with a number that has little meaning. Deer problems are not defined by the *number* of deer. They are defined by the impact of those deer and the values of the residents they affect.

Population estimates are overrated. Knowing the number of deer will not reduce deer-vehicle collisions or increase the natural diversity of your parks.

Trends are important relative to your goals – if your goal is to reduce deer-vehicle collisions, you have achieved this goal when there are less accidents, not when there is a predefined density of deer in your community.

The number of deer may be linked to deer-vehicle collisions but you don’t need to know one to achieve the other. Resources spent on estimating deer numbers are better spent on other aspects of your deer management plan. Even if deer numbers are *ecologically-balanced* in your community, residents may still be experiencing unacceptable levels of conflict.

Section III: Management Options

When considering community deer management actions, the advantages and disadvantages of all available techniques must be evaluated. As stated previously, every community is different so, success is rarely achieved with a single method. An integrated approach combining several management options will likely yield the best results. It is also important to note that deer management requires considerable long-term planning and commitment. No matter what blend of management options employed, actions will need to be sustained for years.

Non-Removal Options

1. Roadside devices

Definition:

Devices which flash light and/or emit noise into the surrounding area triggered by passing vehicles. The intention is to scare deer away from the area.

Advantages:

- a) Readily available from several manufacturers
- b) Relatively simple to erect

Disadvantages:

- a) Cost ~\$150 each depending on design and manufacturer
- b) Requires maintenance (knocked over, weed-whack regularly, cleaning)

Application:

- a) Used along roads in areas where high numbers of deer-vehicle collisions have occurred

Expectations for Success:

- a) Effectiveness is not well substantiated

2. Landscaping Alternatives

Definition:

Selection of unpalatable (less preferred) herbaceous and woody plants to reduce deer browsing on ornamentals

Advantages:

- a) Species preference lists are readily available
- b) Can be practiced at the landowner level

Disadvantages:

- a) People and deer often prefer the same plants
- b) Few ornamentals are classified as rarely damaged by deer

- c) Displaces the problem to neighboring areas
- d) Only useful in areas with low to moderate deer feeding pressure
- e) Could negatively impact desirable wildlife species

Application:

- a) Individual landowner

Expectations for Success:

- a) Limited in areas with high deer density
- b) Unproven technique to control deer-human conflicts

3. Ban Deer Feeding

Definition:

Outlaw the supplemental feeding of deer by residents of the community

Advantages:

- a) Reduce artificially high deer populations in problem area
- b) Possible reduction in reproductive and survival rates
- c) Discourage deer tolerance of people

Disadvantages:

- a) Unpopular with residents
- b) Difficult to enforce

Application:

- a) Community-level as it requires the passing of an ordinance

Expectations for Success:

- a) High when in conjunction with a community education program (see [Please Don't Feed the Deer](#) (PGC Brochure) and [Feeding Wildlife. . Just Say NO!](#) by Scott Williamson, A Wildlife Management Institute Publication) and concerted effort by law enforcement

4. Repellents

Definition:

Product applied to plants that reduces attractiveness and/or palatability of treated plants to deer

Advantages:

- a) Many repellants commercially available
- b) Individual plants may be protected (orchards, nurseries, gardens, and ornamentals)
- c) May be used prior to or upon observation of damage
- d) Substantial scientific literature on effectiveness

Disadvantages:

- a) High application cost
- b) Impractical for row crops, pastures, or low-value commodities
- c) Effectiveness depends on availability of other forage
- d) Must be reapplied repeatedly during growing season
- e) Performance reduced with high deer density
- f) Only reduces damage, does not eliminate it
- g) May cause plant damage

Application:

- a) Individual plants
- b) Orchards
- c) Nurseries
- d) Gardens

Expectations for Success:

- a) Short term solution
- b) Problem will escalate each year

5. Fencing

Definition:

Construction of a physical or electric barrier to exclude or direct deer movements from an area

Barrier fencing (minimum 8-foot high; woven wire or individual wire cages 1.5-feet in diameter and 3-4-foot high; fine netting to cover shrubs and gardens; or any type of fencing that creates an obstacle to deer access)

Advantages:

- a) Provides long term deer exclusion
- b) Can be used for individual trees/shrubs/plants or large blocks
- c) Performs well under intense deer pressure
- d) Many options available

Disadvantages:

- a) Expensive (\$5-7 per linear foot)
- b) Regular maintenance is required
- c) Changes aesthetics of area
- d) Difficult to use across water gaps and flood plains
- e) For large areas, deer must be removed from inside the fence
- f) Local ordinances may restrict use

Application:

- a) Individual trees/plants/shrubs

- b) Orchards
- c) Nurseries
- d) Gardens or small plots
- e) Airports

Expectations for Success:

- a) High

Electric fencing (electric current passed through wire fence at regularly timed pulses)

Advantages:

- a) Less expensive than barrier fence (\$0.15 per linear foot)
- b) Easier to remove
- c) Several designs to suit area and needs

Disadvantages:

- a) Regular maintenance is required
- b) Possible injury to people, pets, and wildlife
- c) Deer learn to avoid contact

Application:

- a) Orchards
- b) Nurseries
- c) Gardens

Expectations for Success:

- a) Short term solution
- b) Problem will escalate each year

6. Hazing and Frightening Techniques

Definition:

Use of audible, visual, or other sensory cues to frighten deer from specific areas

Advantages:

- a) Effective before or at the initial stages of conflict
- b) Provides quick relief

Disadvantages:

- a) Deer habituate quickly to disturbances
- b) Deer movements or behavior patterns are difficult to modify once established
- c) Disturbance of surrounding residents

Application:

- a) Small farms or preserves near suburban areas

Expectations for Success:

- a) Short term solution

7. Fertility Control Agents

Definition:

Use of contraceptive drug or vaccine to reduce reproductive rate of deer population within a community

Advantages:

- a) Acceptable to many urban/suburban residents
- b) Viewed as a humane and safe way to resolve deer problems

Disadvantages:

- a) Fertility control agents are classified as “restricted use pesticides”
- b) Federal and state permits are required
- c) All treated animals must be marked
- d) Expensive (\$500 - \$1,300 per deer)
- e) Large proportion of females (>75%) must be treated to stop or reduce population growth
- f) May have health, behavior, and genetic impact on deer population
- g) Does not address existing population problems and may take a decade or more to have an impact on deer abundance

Application:

- a) Communities with limited huntable areas
- b) Requires a permit from the Pennsylvania Game Commission
- c) Limited to localized areas with closed populations

Expectations for Success:

- a) Unlikely given the current limitations of this method. Long-term field studies have demonstrated reduced population growth rates, but actual population reductions have not occurred or have taken more than a decade.

8. Trap and Relocate

Definition:

Capture animals, remove them from one area, and transfer them to another.

Advantages:

- a) Reduces population
- b) Acceptable to many urban/suburban residents

Disadvantages:

- a) High mortality during transfer and after release due to capture-related injuries, capture myopathy (trapping stress), unfamiliarity with the release site, human activities, and encounters with new mortality agents
- b) Potential for spreading disease
- c) Lack of suitable release sites
- d) Expensive (\$110 - \$800 per animal)
- e) Urban/suburban deer usually exhibit reduced flight distances and a preference for roadsides and open lawns seeking out comparable residential locations from which they came

Applications:

- a) Currently not approved for use in any area in Pennsylvania

Expectations for Success:

- a) Low

Removal Options

1. Hunting within statewide regulations (See Game Commission website, www.pgc.state.pa.us)

Definition:

Hunting by licensed sportsmen within the community as defined by PGC regulations set forth each year, including the Deer Management Assistance Program (DMAP).

Advantages:

- a) Makes deer wary of humans making them less likely to frequent inhabited areas
- b) Reduces population
- c) Proven effective technique
- d) Cost effective

Disadvantages:

- a) May be unpopular with some residents due to personal values or safety concerns
- b) Limited hunter access

Applications:

- a) Any huntable area with landowner permission. Safety zones (150 yard for firearms and 50 yards for archery) must also be considered.

Expectations for Success:

- a) Practical solution to deer population control
- b) High expectation for success where hunter access is adequate

2. Community Managed Hunts

Definition:

Hunting by licensed sportsmen within PGC regulations with increased restrictions defined by community or landowner.

Advantages:

- a) Makes deer wary of humans making them less likely to frequent inhabited areas
- b) Reduces population
- c) Proven effective technique
- d) Low cost
- e) Criteria defined by managing group (ie, marksmanship requirements, who may hunt, hunting methods, hunting times and locations, and the sex, age and number of deer that can be harvested)
- f) Equipment could be restricted or liberalized to influence effect on deer population or address public safety concerns

Disadvantages:

- a) May be unpopular with some residents due to personal values or safety concerns
- b) Not effective where hunting is prohibited from large areas of good habitat

Applications:

- a) Effective in large areas (ie, parks, watershed areas, homeowners groups, etc)

Expectations for Success:

- a) Practical solution to deer population control
- b) High expectation for success where hunter access is adequate

3. Deer Control Permits/Sharpshooters

Definition:

Permitted control agent hired to remove deer from specified areas within a community.

Advantages:

- a) Makes deer wary of humans making them less likely to frequent inhabited areas
- b) Reduces population

- c) Discreetly removes significant numbers of deer from targeted areas within a relatively short period of time
- d) Written contract provided
- e) Permitted to use tools not authorized for use by the general public (spot lights, small caliber rifles, etc)
- f) May be viewed as “safer” than hunting by the community

Disadvantages:

- a) May be unpopular with some residents
- b) Expensive (\$100-300/deer removed)

Applications:

- a) Small areas
- b) Requires permit from the Pennsylvania Game Commission

Expectations for Success:

- a) Limited solution
- b) Effective in areas where public hunting would not be allowed

4. Predator Reintroduction

Definition:

Reintroduction of deer predators into an area

Advantages:

- a) May be supported by some community members

Disadvantages:

- a) Predation is not sufficient to reduce high deer densities
- b) Coyotes currently occupy suitable habitat in and around many urban and suburban areas
- c) Large mammalian predators (bears, wolves, or cougars) have large home ranges
- d) Urban/suburban areas are unsuitable for large predators due to high human densities and safety concerns, extensive road networks, and inadequate habitat

Applications:

- a) Not approved for any area in Pennsylvania

Expectations for Success:

- c) Low

Literature Cited

- Connelly, N. A., D. J. Decker, and S. Wear. 1987. Public tolerance of deer in a suburban environment: Implications for management and control. *Proceedings of the Eastern Wildlife Damage Control Conference* 3:207-218
- Conover, M. R. 1995. What is the urban deer problem and where did it come from? Pages 11-18 in J. B. McAninch, editor. *Urban deer: A manageable resource?* Proceedings of the 1993 Symposium of the North Central Section, The Wildlife Society., 12-14 December 1993, St. Louis, Missouri, USA.
- Conover, M. R. 1997b. Wildlife management by metropolitan residents in the United States: practices, perceptions, costs, and values. *Wildlife Society Bulletin* 25:306-311.
- Conover, M. R. 1997a. Monetary and intangible valuation of deer in the United States. *Wildlife Society Bulletin* 25:298-305.
- deCalesta, D. S. 1994. Effect of white-tailed deer on songbirds within managed forests of Pennsylvania. *Journal of Wildlife Management* 58:711-718.
- deCalesta, D. S. 1997. Deer and ecosystem management. Pages 267-279 in W. J. McShea, H. B. Underwood, and J. H. Rappole, editors. *The science of overabundance: deer ecology and management*. Smithsonian Institution Press, Washington, D. C., USA.
- Etter, D.R., K.M. Hollis, T.R. VanDeelen, D.R. Ludwig, J.E. Chelsvig, C.L. Anchor, R.E. Warner. 2002. Survival and movements of white-tailed deer in suburban Chicago, Illinois. *J. Wildl. Manage.* 66: 500-510.
- Healy, W. M. 1997. Influence of deer on the development of forest structure and composition in central Massachusetts. Pages 249-266 in W. J. McShea, H. B. Underwood, and J. H. Rappole, editors. *The science of overabundance: deer ecology and population management*. Smithsonian Institution Press, Washington, D. C., USA.
- Kilpatrick, H.J., and S.M. Spohr. 2000. Movements of female white-tailed deer in a suburban landscape: a management perspective. *Wildl. Soc. Bull.* 28: 1038-1045.
- Marquis, D. A. 1981. Effect of deer browsing on timber production in the Allegheny hardwood forest of Northwestern Pennsylvania. Research Paper NE-475. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 10p.
- McCullough, D. R. 1979. *The George Reserve deer herd: population ecology of a k-selected species*. The Blackburn Press, Caldwell, New Jersey, USA.
- McShea, W. J., and J. H. Rappole. 1992. White-tailed deer as a keystone species within forested habitats of Virginia. *Virginia Journal of Science* 43:177-186.
- Perkins, S.E., I.M. Cattadori, V. Tagliapietra, A.P. Rizzoli, and P.J. Hudson. 2006. Localized deer absence leads to tick amplification. *Ecology* 87:1981-1986.
- Responsive Management. 2012. *Pennsylvania residents' opinions on and attitudes toward deer and deer management*. Harrisonburg, Virginia, USA.
- Ross, B. A., J. R. Bray, and W. H. Marshall. 1970. Effects of long-term deer exclusion on a *Pinus resinosa* forest in north-central Minnesota. *Ecology* 51:1088-1093.
- Swihart, R.K., P.M. Picone, A.J. DeNicola, and L. Cornicelli. 1995. Ecology of urban and suburban white-tailed deer. Pages 35-44 in J.B. McAninch, editor. *Urban deer: a manageable resource?* Proceedings of a

symposium of the North Central Section, The Wildlife Society, 12-14 December 1993, St. Louis, Missouri, USA.

Tilghman, N. G. 1989. Impacts of white-tailed deer on forest regeneration in Northwestern Pennsylvania. *Journal of Wildlife Management* 53:524-532.

Underwood, H. B. 2005. White-tailed deer ecology and management on Fire Island National Seashore (Fire Island National Seashore Science Synthesis Paper). Technical Report NPS/NER/NRTR-2005/022.

U.S. Department of the Interior, Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2008. *2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation: Pennsylvania*. U.S. Government Printing Office, Washington, D.C. 81pp.

Witham, J. H., and J. M. Jones. 1987. Deer-human interactions and research in the Chicago metropolitan area. Pages 155-159 in L. W. Adams and D. L. Leddy, editors. *Integrating man and nature in the metropolitan environment*. National Institute for Urban Wildlife, Columbia, Maryland, USA.

Whitney, G. C. 1984. Fifty years of change in the arboreal vegetation of Heart's Content, and old-growth hemlock-white pine-northern hardwood stand. *Ecology* 65:403-408.

Appendix A: Examples of Community Deer Management Plans

There are numerous examples of deer management plans posted on the internet. Several examples include:

Montgomery County, MD:

http://www.montgomeryparks.org/PPSD/Natural_Resources_Stewardship/Living_with_wildlife/deer/DeerManagement.shtm

Burnsville, MN:

<http://www.ci.burnsville.mn.us/index.asp?nid=379>

Hopewell, NJ:

http://www.hopewelltpw.org/deer_mgmt_comm_main.html

Meridian Charter Township, MI:

http://www.meridian.mi.us/index.asp?Type=B_BASIC&SEC={92211642-71E6-4B76-B022-B213E0F935B6}

Rochester Mills, MI:

<http://www.rochesterhills.org/index.aspx?NID=569>

Appendix B: Landscaping Alternatives, Repellants, and Fencing Resources

Further information regarding non-lethal mitigation techniques can be found at the websites listed below.

Northeast Wildlife Damage Management Cooperative website

<http://wildlifecontrol.info/pubs/Pages/default.aspx>

Resistance of Ornamentals to Deer Damage (Maryland Cooperative Extension)

http://extension.umd.edu/sites/default/files/_docs/articles/FS655-ResistanceDeer.pdf

Using Commercial Deer Repellents to Manage Deer Browsing in the Landscape (Maryland Cooperative Extension)

http://extension.umd.edu/sites/default/files/_docs/articles/FS810-A_UsingCommDeerReps.pdf

A Gardener's Guide to Preventing Deer Damage (California Department of Fish and Game)

<http://www.dfg.ca.gov/wildlife/hunting/deer/docs/gardenersguide.pdf>

Appendix C: Example Ordinance to prohibit deer or wildlife feeding

Feeding Wildlife Prohibited. It is unlawful for any person to feed a wild animal unless licensed to do so, with the exception of small seed eating birds, squirrels, and chipmunks. It is unlawful to place out mineral blocks or salt licks unless they are intended for authorized domestic livestock.

Violations and penalties. Any person, firm, or corporation violating any of the provisions in this title shall upon conviction thereof be fined a sum not to exceed XXX dollars or be imprisoned not to exceed XX days, or be both so fined and imprisoned.

This ordinance shall take effect and be in full force from and after its passage, approval, and publication in the official city newspaper of the City of XXXX, PA, as provided by law.

Other Examples

Hemlock Farms, PA:

<http://www.pixyjackpress.com/livingwithbears/images/stories/LivingWithBears-HemlockFarmsOrdinance.pdf>

Burnsville, MN – Deer Feeding Prohibition Code

<http://www.ci.burnsville.mn.us/index.asp?NID=381>

Mankato, MN – Feeding of Deer Prohibited

<http://www.mankato-mn.gov/CityCode/Section-9.76.aspx>

Morris Township, NJ – Prohibiting the Feeding of Wild Animals and Waterfowl

<http://www.morristwp.com/DocumentCenter/Home/View/108>

Eureka Springs, AK – Ordinance No. 2123

<http://www.cityofeurekasprings.us/images/stories/ordinance/ORDINANCE%20NO.%202123%20FEEDING%20OF%20NON-DOMESTICATED%20DEER.pdf>

Rochester Hills, MI – Ordinance No. 525, Deer Management

http://library.municode.com/HTML/13170/level3/SPAGEOR_CH14AN_ARTIIIDEMA.html#SPAGEOR_CH14AN_ARTIIIDEMA_S14-91DEFEP#TOPTITLE

Appendix D: Example of Community managed hunt information

Many communities have successfully implemented managed hunts. Initial coordination of this requires a fair amount of planning. However, once the groundwork is laid, the program can run smoothly from year to year.

Chester County, PA:

<http://www.chesco.org/index.aspx?nid=1069>

Monmouth County Park System, NJ:

<http://www.monmouthcountyparks.com/Page.aspx?ID=2771>

Fairfax County, VA:

<http://www.fairfaxcounty.gov/living/wildlife/managed-hunts.htm>

Dubuque, IA:

<http://www.cityofdubuque.org/index.aspx?NID=167>

Ames, IA:

<http://www.cityofames.org/index.aspx?page=461>