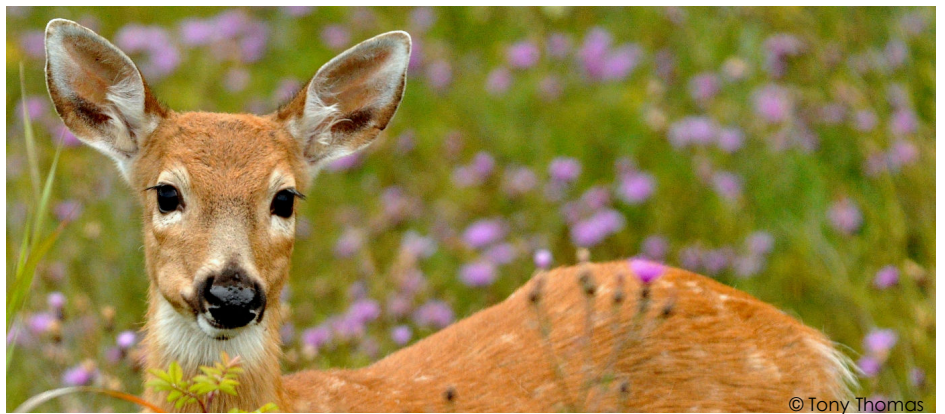




How to Create a Community-based Deer Management Plan



Developing a deer management plan is a challenging task. This guide can help make it simpler.

The Human Dimensions Research Unit (HDRU) in the Department of Natural Resources at Cornell University studies the social and economic aspects of natural resources and the environment and the application of social and economic insights in management planning and policy.

<https://hdru.dnr.cornell.edu/>

This guide, developed by Cornell University's Department of Natural Resources' Human Dimensions Research Unit, and Natural Resources Extension is intended to help community leaders, as well as wildlife professionals and educators, recognize the important components of a community-based deer management plan. If you are planning on writing a community-based deer management plan, then this guide is intended to provide you with the information you need to do so effectively. At the end of this guide, it is our intent that you will be able to:

- ✓ Identify and describe the main elements of a community-based deer management plan
- ✓ Evaluate deer management plans
- ✓ Feel confident that you may apply what you've learned for developing a plan of your own

If you have reviewed deer management plans before, such as the examples included on the Community Deer Advisor website (deeradvisor.org) you will find that they often do not follow a standard format. Some plans are hundreds of pages long with many appendices, whereas others are simple 10-page documents. Some states may require that communities undergo an environmental impact assessment process prior to implementing a program, which may affect the length and components of a plan. The components discussed in this guide reflect the minimum core elements that a deer management plan should include.

Throughout this guide, you will see that we provide examples for each plan component drawn from different community plans. If you would like to view more plans in their entirety, please visit the resources page on the Community Deer Advisor. The website also includes in-depth case examples where communities have contributed information about how they progressed through the CBDM cycle, which you may find useful as you progress through your own management process. Much of our advice is also drawn from an analysis of existing community-based deer management plans; the report for that analysis is available on the Human Dimensions Research Unit publications page (<https://hdru.dnr.cornell.edu/>).

You may have noticed that we have referenced the Community Deer Advisor website a number of times already. The Community Deer Advisor website, a collaboration between Cornell University's Department of Natural Resources (Human Dimensions Research Unit and Natural Resources Extension) and The Nature Conservancy, is our sister site, the purpose of which is to help provide guidance as communities progress through the CBDM cycle. The purpose of this guide is *complementary*—to help communities understand the components of a community-based deer management plan. So, this is *not* a “how-to” guide for progressing through the CBDM cycle, although in describing elements of a deer management plan we do provide rationale as to why those elements should be included. So, ideally, if you are beginning a CBDM process in your community soon, check out the Community Deer Advisor first, then come back here to learn more about writing a CBDM plan. For more on the CBDM cycle and for resources related to the CBDM process, please visit the Community Deer Advisor.

This guide is organized according to the different components which should be included in a deer management plan. While the elements of a community-based deer management plan are presented in what we believe to be a logical manner, the particular order of the elements in your plan is less important than the fact that you have included or addressed these elements in some manner. If you find a different order works better for your situation, please organize your plan accordingly!

CONTENTS

Introduction to Deer Planning....	3
Plan Summary & Background....	5
Problem Definition....	15
Goals....	46
Objectives....	40
Actions Recommended....	46
Actions Considered....	64
Plan for Monitoring....	99
Public Outreach....	105
Budget....	110
Timeline....	126
Responsibilities....	120
Supporting Documents....	126
References....	128
Making Your Plan Available....	132
Template....	133
Checklist..	138

Introduction to Community-Based Deer Management Planning

Community-based deer management (CBDM), a guided process for addressing deer-related problems, reflects the cycle that communities progress through in making and implementing decisions around deer overabundance. The website Community Deer Advisor (www.deeradvisor.org), with which this module is affiliated, provides support to community leaders, wildlife professionals, and educators to help communities navigate the cycle successfully. The CBDM cycle has four phases:

Phase 1, Problem Definition, is when community leaders task someone or some group of people, often in the form of a deer management committee, to determine the scope of the problem the community is facing to better understand the kinds of impacts that are occurring, who is experiencing those impacts, and to what degree.

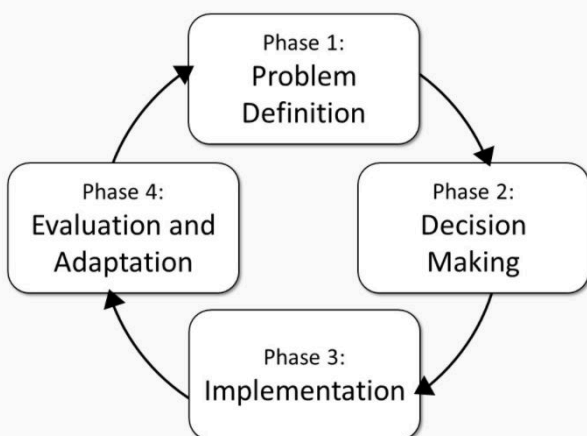
Phase 2, Decision Making, is when deer program goals and objectives are determined, and actions to address those objectives are considered.

Phase 3, Implementation, is when a community carries out the actions of their program.

Phase 4, Evaluation and Adaptation, is when communities assess progress towards their deer management goals and objectives, making changes when certain actions are not meeting their objectives. While this process is presented as a cycle with clear phases, it's important to recognize that progression through this process isn't always linear, and communities may move back and forth through phases as they deal with issues such as controversy over their recommended course of action, changes in municipal personnel, changing legal constraints, and more. Therefore, the process is not as straightforward and non-controversial as the structure of this guide may suggest. For more detailed information the CBDM process, please visit the Community Deer Advisor.

The deer management plan that this guide will help you develop will likely include descriptions of the work already done and the work your community plans to do as it progresses through all four CBDM phases. However, the development of a deer management plan begins at the start of Phase 3 (Implementation) before communities implement the actions decided upon during Phase 2 (Decision Making).

Not every community develops a formal deer management plan, but choosing to do so is one way not only to organize decisions made in Phase 2, but also to easily communicate to your community what actions will be taken with respect to deer, why those actions were selected, how those actions meet goals and objectives for your community's approach to management, and how progress on program goals will be tracked and evaluated. It is also a good way keep track of your timeline and budget.



Introduction to Community-Based Deer Management Planning, continued...

Some communities may be legally required to develop some type of deer management plan, for instance if they are required to go through a state environmental impact planning process. Often, a mayor or town board of trustees will ask a deer task force or committee specifically to develop a deer plan; they may ask a committee to recommend a specific course of action, but sometimes they may only ask them to describe and evaluate a number of potential options without recommending a particular action or set of actions. If the plan you are developing is serving as a point of discussion for potential options from which a municipal leader will be selecting, you may be developing the plan during the decision-making phase of the cycle instead of after. Besides deer committees, sometimes the responsibility for writing a deer management plan will fall to a municipal administrator, staff member (e.g., environmental planner), or even an outside consultant. For example, two city administrators authored the deer plan for Ann Arbor, Michigan, but a deer task force authored the plan for Rockville, Maryland.

Sometimes, communities may seek outside assistance from people, agencies, and organizations that have experience and knowledge useful in plan development. In addition, drawing on expert assistance is one way to support the legitimacy of your plan. Communities may often find that assistance from entities such as your state's wildlife or environmental agencies may be helpful, as they may have some guiding, state-level deer management objectives that may link to your own, municipal-level objectives. Some states may even have statewide programs specifically aimed at helping communities address their deer management needs. These programs may provide guidance necessary for helping communities develop a plan. For instance, New Jersey's Division of Fish and Wildlife has developed a Community-Based Deer Management Permit program and an associated manual for municipalities that communities may turn to in order to help guide their own plan development. Communities may also find assistance from some of their own departments, such as the police department (for instance, if your plan is being motivated by excessive deer-vehicle collisions). Other types of assistance we've observed communities relying upon include:

- City planning departments (e.g., Amherst, NY)
- Nonprofit organizations
- Federal land management agencies, for instance if you reside in a gateway community adjacent to a national park that is also dealing with deer overabundance issues, you may find some collaboration useful to aid in both your and the park's capacity to meet deer management objectives (e.g., Harpers Ferry, WV)
- Private consultants, if your community has the budget to account for this kind of assistance. (e.g., Cayuga Heights, NY)

This guide is a PDF version of the course, "How to Create a Community-based Deer Management Plan."

If you'd like to enroll in the course, you can do so at: <https://canvas.instructure.com/enroll/MJ3YWN>

Introduction to Community-Based Deer Management Planning, continued...

Finally, a note about controversy. There's usually no way to avoid the controversy that arises with deer management decision making. Controversy—and active opposition—can come from individuals or organized groups. Controversy typically arises around two issues: (1) whether or not deer impacts should be managed at all and (2) which methods of deer management are acceptable. Try and separate these two types of controversy. The first issue, whether or not deer impacts should even be managed, should be resolved before you tackle the acceptability of the approach taken to address those impacts. If you're at the stage where you're writing a deer management plan, you've hopefully already resolved the first issue. Engaging in well-designed stakeholder involvement efforts and informative communication can help communities constructively deal with these two sources of controversy. A well-reasoned plan that clearly articulates the rationale for selecting particular actions (supported with data or other sources of information) can help address the second source of controversy as well. But, expect controversy—and even legal challenges from those who may be opposed to the actions you've selected (especially if it includes a controlled deer hunt).

Plan Summary and Background

Many plans begin with an executive summary to serve as a helpful, quick reference for readers. You may include a brief description of the community-based deer management plan, such as actions selected and a general timeline for implementation. Some plans may be quite lengthy (especially if your plan is part of a larger environmental impact planning process; sometimes those plans are many hundreds of pages long), and a plan summary is a good idea for distilling the content of your plan.

In addition to a summary, many plans include a bit of background regarding the community as an introduction to the plan, such as a description of the area targeted for management (location, size, land ownership type, for instance). Including these kinds of simple details help readers better understand the area being managed. Background information may also include the history of the community's relationship with deer and how the development of a plan came to be needed. If a deer committee was convened to help create the deer management plan, include some information about:

- how committee members were selected (process, by whom, criteria for selection, etc.)
- committee members names and affiliations
- important dates or milestones
- the decision-making process used to create the deer management plan.

Some plans may also include the community's overall purpose in creating their deer management plan. Do you know your community's purpose? Some communities may describe their purpose as to mitigate some general deer impacts, or to provide planning guidance. In our review of deer management plans, we found that communities frequently focus their purpose on mitigating impacts of overabundant deer, addressing guidance and planning generally.

We do not recommend that your plan purpose focus on particular actions for deer management; jumping to actions is a common pitfall for CBDM planning—i.e., jumping to actions prior to identifying goals and objectives (see following sections on goals and objectives). The purpose of your plan should be a mirror of your goals. Often, a purpose statement may be quite broad. For example, Ann Arbor, Michigan's deer management plan includes the following broad purpose: "Determine the goal of the deer management program, the deer management area, and the preferred deer management methods." In reading this statement, we would expect the plan to therefore cover three main topics: deer program goals, the area that will be targeted for addressing those goals, and the management methods preferred to meet those goals.

After completing this module, you should be able to...

- ✓ Identify the components of a comprehensive background section
- ✓ Recognize an effective plan purpose

Plan Summary and Background, continued...

Beginning on the next page, you will find an excerpt of the executive summary from the Amherst, New York deer management plan, “Deer-Vehicle Accident Management Plan.” Read through this summary, and see if you can identify elements of the summary that make it effective. We believe this eight-page executive summary and background is a good example because it includes the following:

1. A comprehensive summary of a lengthy plan (74 pages total) that includes many of the major components of the deer plan, as we describe in this guide
2. A description of the area targeted for the plan, which you will find on the third page of the excerpt
3. A description of the history of deer in Amherst and the development of a plan
4. An example of a purpose, which they label a “mission statement”, found on the very first page:
“The Town of Amherst Deer-Vehicle Accident Management Plan provides a practical, systematic, integrated, and adaptive approach for managing deer-vehicle accidents (DVAs) at levels reflecting public involvement through the New York State Environmental Quality Review process”

When crafting your own plan, including a summary will help ensure a comprehensive review of your plan that is easily understandable to readers who just want the “highlights.” However, if your plan is very short, you may find it repetitive to include a lengthy summary—a brief outline of the contents of the plan may suffice. After your plan's summary—whether it's long or short—make sure you are able to include at least a bit of background information to introduce your plan, including some important information about the area targeted for management, and maybe a few important points about the history of the plan and its purpose.

While the summary and background section will come at the start of your plan, you may choose to write the summary component last. When you've reviewed your plan in its entirety, you may have a better sense of whether or not you need a longer or shorter summary. We would like to emphasize that a summary of some kind and the inclusion of a purpose are important components of any plan.

Amherst, New York's
complete deer
management plan can be
found at:
<http://www.amherst.ny.us/pdf/planning/deer/appa.pdf>

Example Summary: Pages 8 through 15

EXECUTIVE SUMMARY

Town of Amherst Deer-Vehicle Accident Management Plan

Cite As: Premo, Dean B. Premo and Elizabeth I. Rogers. 2001. Town of Amherst Deer-Vehicle Accident Management Plan. White Water Associates, Inc., Amasa, Michigan (<http://www.white-water-associates.com>).

Each year in New York, an estimated 60,000 to 70,000 deer related accidents occur with upwards of \$50 million in vehicle property damage. It is reported that an average of two people die and approximately 1,000 people are injured in New York each year in accidents involving deer. DVAs are a particular problem in Western New York, and Erie County (which contains the Town of Amherst) is among counties in the State with high DVA counts. For several years in the Town of Amherst, the Town Board, Planning Department, community stakeholders, university scientists, and consultants have confronted issues of white-tailed deer in the community. The stakeholders agree that the problem of deer-vehicle accidents (DVAs) is reason for concern and justification for action. White Water Associates, Inc. was contracted by the Town Planning Department to create a plan for DVA management.

This plan's focus is reducing DVAs. The primary measures of concern are the numbers of DVAs and the patterns of their distribution in the Amherst landscape. The plan relies on careful collection and analysis of data to understand the complex causes and solutions for DVAs.

Technically, the "action" to be taken by the Amherst Town Board is the adoption of the Deer-Vehicle Accident Management Plan and its implementation. Since this is a Type 1 action under the New York State Environmental Quality Review Act (SEQRA), the Town, as Lead Agency, has prepared an Environmental Assessment Form, has issued a "Positive Declaration" and must prepare a Generic Environmental Impact Statement (GEIS).

Through a public participation process, a mission statement was formulated to guide the development of the plan and provide focus for implementation:

The Town of Amherst Deer-Vehicle Accident Management Plan provides a practical, systematic, integrated, and adaptive approach for managing deer-vehicle accidents (DVAs) at levels reflecting public involvement through the New York State Environmental Quality Review process.

For the past decade, Amherst has compiled records of DVAs and the population of white-tailed deer. Evidence of DVAs (reported accidents and pick-ups of road-kill deer) shows that, although numbers of DVAs varied over the past ten years, the annual total always exceeded 250 and on occasion has climbed above 400. The average cost of vehicle damage from hitting a deer

is high and the total deer-vehicle collision costs for vehicle damage could approach \$750,000 annually in Amherst (estimates obtained from Technical Working Committee). The potential for human injury or death also exists with DVAs and adds associated costs. There is also an annual cost for removing deer carcasses from roadsides.

The Town of Amherst Deer-Vehicle Accident Management Plan defines a program of actions designed to provide control over DVAs. Its overarching goal is to reduce the number of DVAs given the many variables that influence when, where, and why they occur. Because numerous variables affect DVAs, establishing a discrete target number of DVAs is not reasonable. Nevertheless, DVAs can be readily counted and are the basis for setting goals and monitoring success of the plan.

Analysis of Amherst data shows that concentrated deer population control efforts (including bait and shoot and nuisance permits) in Amherst during the mid-1990s were associated with a statistically measurable decrease in DVAs in the last half of the decade. There is a likelihood that both numbers of deer and numbers of drivers will increase in Amherst. Development, another variable linked to Amherst DVAs, is also continuing. For these reasons, it can be predicted that Amherst DVAs will increase.

The DVA Management Plan establishes its initial goal at two spatial scales, whole town and hotspots. These scales are a natural division and useful since different DVA management tools can be applied at each scale. Tangible goals for each scale are defined as follows:

1. At the whole town scale, reduce DVA numbers to the lower levels experienced in the years after significant lethal control was conducted and an associated decrease in DVAs was experienced (1997-2000). If this goal is attained, more rigorous goals can be established through the adaptive planning process if this is deemed desirable.
2. At the hotspot scale, select specific DVA hotspots and diminish these with targeted approaches. Progress toward the hotspot goal will be measured with parameters such as intensity and extent of hotspots and DVA counts within the hotspots. Lessons learned from successfully treated hotspots could be applied to other hotspots through the adaptive management process.

Establishing numeric goals for DVAs requires this caveat: It is not the position or endorsement of the Town of Amherst or the plan writers that this, or any number of DVAs, is acceptable. It is simply a realistic view and a starting point for this adaptive plan. Through the public process in the creation of this plan and through the adaptive nature of the plan itself,

Amherst residents will influence the goals, implementation, tools, and outcomes by their direct participation and through their elected officials and Town administrators.

The geographic area to be encompassed by the plan is the Town of Amherst, New York. The total area is 54.2 square miles and is composed of a wide range of urban, suburban, and rural land uses. There is also deer habitat and a population of white-tailed deer. The town varies widely from one area to another in attributes such as land use/cover, deer habitat, the amount of development, and vehicle traffic patterns.

In 1997, the Amherst Supervisor's Deer Management Task Force (comprised of citizens, business people, and Town staff) proposed that the town be divided into seven management zones. For purposes of the DVA Management Plan, these seven zones were coalesced into six zones that provide a helpful way to examine landscape patterns relevant to DVAs. The zones are also useful in designing and implementing an adaptive DVA management program.

Twenty years ago it was rare to see deer in Amherst. Starting about 1987, however, people began to observe more deer and increases in DVAs and deer-related damage to agricultural crops (food and ornamental) and landscaping. Based on field observations and surveys conducted by the New York State Department of Environmental Conservation (NYSDEC), the current Amherst deer population does not appear to have exceeded a level where limitations of food or disease in the herd have become problematic. Some areas of the Town, however, show significant evidence of over-browsing. The trend of more deer and more deer-human interactions in Amherst, especially in the form of DVAs, has been commonly observed and publicized.

The Amherst Planning, Police, and Computer Services Departments have compiled historic DVA data dating back to January 1991. Primary data include DVAs reported to the Police Department and counts of dead deer carcasses removed from roadsides by an independent contractor. The Town has incorporated this information into its geographical information system (GIS) and as of December 31, 2000, about 3,300 reported DVAs and 3,320 carcass pick-up reports had been entered. Probing analyses have been possible with this database using DVA data, deer population estimates, land use, and other variables.

The analyses show that Amherst DVAs are influenced by multiple factors. Deer population density plays a significant role in DVA numbers and patterns. In the period after concentrated lethal control, DVAs decreased over the town as a whole and also in management zones closest to lethal control efforts. In addition, hot spot patterns of DVAs changed, with less intense (lower density DVAs) and less extensive (smaller affected area) hot spots occurring after lethal control. This change in patterns was most dramatic in Management Zone (MZ) 5 (northwest part of the

Town). Other hot spots persisted in spite of lethal control (even if reduced in intensity). These hot spots may result from traditional deer movement patterns. Other hot spots may occur because of a combination of increasing deer populations and development. Displacement of deer by development of previously vacant land may account for increased intensity of hot spots in MZ 2 (southeast part of Town) and the southern part of MZ 4 (eastern-central part of Town). MZ 6 (in the northeast corner of the Town) currently has high deer numbers and abundant vacant land. If development accelerates in this zone, displacing deer and increasing human use of the area, it is predicted that DVAs would increase.

The analysis of Amherst deer and DVA data support the contention that fewer deer would mean fewer DVAs. Nevertheless, controlling deer population size is a challenge, especially where urban and suburban areas are mixed with agriculture, forests, and wetlands. The plan emphasizes that the goal is not to manage the Amherst deer population, but to reduce the number of DVAs (relative to the many factors that influence them). Deer population control tools can play a part in accomplishing this goal, but it is not the number of deer in Amherst that is of principal importance to this plan, but the number of DVAs.

This DVA Management Plan describes twenty-eight tools for controlling deer-vehicle accidents. It evaluates the tools relative to their possible use in Amherst, placing the tools in three categories: good potential, intermediate potential, and little or no potential. Those with good potential include: eliminating artificial feeding, warning signs, limiting speed, driver education, public awareness, nuisance permits, and bait and shoot. Those with intermediate potential include: fencing, right-of-way clearing, and considerations of right-of-way vegetation/width. Those with little or no potential for current application in Amherst include: highway lighting, automotive technology, pass structures, deer guards and gates, reflectors, road salt use, agricultural/forestry activities, habitat modification, biological/chemical repellents, highway routing, deer whistles and sonics, lure crops, trap and transfer, bow hunting, poisons, parasites or disease introduction, predator introduction, and fertility control. The assessment of techniques was based on the effectiveness of currently available technology.

The Amherst DVA Management Plan has relied on carefully organized and analyzed data that is specific to Amherst DVAs. The plan rests on this foundation and integrates a variety of suitable tools applied in appropriate settings. The plan outlines four management alternatives, each applying a distinct combination of DVA management tools toward the whole town and hotspot goals. The alternatives include: (1) a No Action Alternative that calls for no targeted effort to be taken to reduce DVAs, (2) a Human Behavior Focus Alternative where emphasis is

placed on actions that affect human behavior, (3) a Deer Behavior and Population Focus Alternative that applies efforts to change deer behavior and reduce deer population, and (4) the recommended alternative - an Integrated Human–Deer Focus Alternative that combines DVA management actions from the Human Behavior Focus Alternative and the Deer Behavior and Population Focus Alternative. The recommended alternative is described in this executive summary.

The Integrated Human–Deer Focus Alternative combines promising DVA management tools in an integrated “adaptive” management plan. Adaptive management uses findings from planned monitoring activities to inform future management actions and periodic refinement of the plan. In Amherst, this allows for a staged approach to managing DVAs so that application of techniques in specific areas is influenced by specific findings. An integrated adaptive management plan minimizes potential environmental impacts by proceeding in a systematic way with ongoing monitoring designed to identify if the approach is effective and if undesirable outcomes develop.

In the integrated alternative, specific actions address both the “whole town” and “hot spot” goals. There is likely some overlap between the effects of these actions and some can be considered optional depending on budget, implementation strategy, and calendar.

Actions that support the “whole town” goal include:

1. Conduct a program of general public education via press releases, posters, pamphlets on the DVA Management Plan, DVAs in Amherst, and how to avoid DVAs.
2. Integrate a DVA component into Driver’s Education materials.
3. Publicize and enforce the no deer feeding law.
4. Work with the NYSDEC to encourage use of nuisance permits in targeted areas. Continue this use for 3-4 years with monitoring to determine effect on DVAs.
5. If after 3-4 years of aggressive nuisance permit deer harvest, DVA numbers do not meet the goal, then implement a three-year program of deer harvest using bait and shoot with a professional wildlife management service. Management zones with sufficient blocks of park and open land should be targeted (e.g., management zones 4, 5, and 6). After this, nuisance permit harvest may maintain deer numbers for a period of time in some areas.

Actions that support the “hot spot” goal:

1. Deploy special deer signs from October-January at selected “hot spot” locations.
2. Facilitate press coverage of special signs that advises people to lower speed and increase awareness and encourages them to assist in implementing the plan.
3. Encourage strict enforcement of existing speed limits in the vicinity of the hot spots and assign more traffic officer presence in these areas.

4. Install lit signs that instantaneously report driver speed to the driver at selected site(s).
5. Run TV and/or radio ads (or Public Service Announcements) that describe the DVA hotspot areas and alert people to take special care.
6. Select two hot spots where strategic application of fencing might influence the ability of deer to enter the roadway.

The potential environmental impacts of this alternative are small. Through both nuisance permit use and bait and shoot practices, the deer population of Amherst would be reduced. Since white-tailed deer is not a species at risk of regional extinction, adverse impacts to the species do not result from lethal control. If lethal methods are used, appropriate carcass use is required. If bait and shoot actions are implemented, the Town would suspend its firearms ordinance (Part II Chapter 198 Sections 1-9 of the Amherst Town Code) to accommodate this action.

The potential environmental advantages of this alternative include control of DVAs in Amherst and the associated advantages to Amherst residents and visitors. Increased drivers' awareness may not only avoid DVAs, but in the event of a DVA, may reduce severity of property damage and human health risk. Overall reduction in deer numbers in Amherst as a result of this alternative may provide a secondary benefit in the form of reduced pressure on native plants and animals in woods and parks where deer herbivory appears high. Similar benefit may be realized by agricultural and landscape interests.

A social benefit derived from use of bait and shoot is the donation of deer meat (venison) to the Western New York Food Pantry Organization. This organization provides food for poor and destitute people in the City of Buffalo area. If it is determined through the adaptive implementation of the DVA Management Plan, that deer need to be killed through bait and shoot, then every effort will be made to ensure that maximum public benefit is realized. Part and parcel of this process includes appropriate care of the killed deer (including proper field dressing, disposal of waste parts, and hygienic handling of venison). In addition, nuisance permit holders will also be informed of the option of venison donation to the Food Pantry.

Implementation of the DVA Management Plan does not require mitigation actions in a conventional sense, but will require careful planning and implementation. It will require appropriate permits and safeguards whenever tools such as nuisance permit or bait and shoot programs are used. This includes protection and enforcement for bait and shoot locations so that the process is not inadvertently or deliberately disrupted and the safety of the public and professional contractors is ensured.

The Integrated Human–Deer Focus Alternative requires monitoring to support adaptive management. Monitoring in support of the “whole town” goal should include DVA record

keeping that allows efficient analysis of data. In general, three years of data should be assembled during and after the implementation of actions and compared to the target data set using appropriate statistical tests. For example, in the case of nuisance permit use, the plan recommends that DVA data be collected for a minimum of three years and compared to target data set (years 1997-2000). If the “whole town” goal is not met, then the Town may choose to suspend its firearms ordinance and institute bait and shoot in appropriate areas. After at least three years, comparison of the DVA data set to the target data set will provide information necessary to determine if additional bait and shoot is required.

In support of the “hot spot” goal, the integrated alternative recommends DVA record keeping in a form suitable to efficient analysis of data. Again, a minimum of three years of data should be assembled in the GIS database and analyzed to view extent and intensity of each targeted hot spot. In addition to the visual-based analysis, the integrated alternative recommends that data for each hotspot be compared to the previous years of data for each hot spot using appropriate simple statistical tests.

The integrated alternative recommends that deer counts by NYSDEC be continued as an index of deer population. As another deer population index and a method of estimating herbivory effects of deer, it is recommended that native vegetation plots be established in various natural areas, including use of small fenced exclosures to demonstrate potential vegetation in absence of deer. This will also serve the purpose of an educational tool. It is recommended that records of number, location, time, approximate age, and gender be databased for deer harvested through nuisance permits and bait and shoot (if used) so that effects of these programs can be thoroughly understood.

Implementation of the integrated alternative lends itself readily to the DVA management zones that have been established and used for much of the analysis. The plan recommends specific actions in each zone.

The work of reducing DVAs in Amherst begins with the adoption of this plan. The plan lays out a specific approach, but implementation will require both existing information and new information gathered during monitoring. The phenomenon of DVAs in Amherst is dynamic and the plan must adapt to the changing environment.

The public will play an essential role in plan implementation. The successes of actions that target human behavior are fundamentally in the hands of Amherst residents. Actions that address deer behavior and population must be administered by public officials and with public acceptance. The SEQRA process recognizes the role of the public in protection of the

environment, and encourages communication between agencies, project sponsors, and the public. The plan recommends establishment of an Adaptive Management Committee whose membership includes representatives from the Planning Department and the public. This committee would ensure that ongoing management decisions are consistent with the plan.

The DVA Management Plan focuses on reducing DVAs through an integrated approach that adopts methods aimed at the desired outcomes. It attempts to minimize environmental impacts and be mindful of financial cost. It fosters public acceptance by providing scientific and practical rationale for the recommended actions.

The integrated plan is sensitive to the animal welfare perspective of some Amherst residents for whom lethal control of deer may be acceptable only as a last resort. It establishes human and deer behavior actions to reduce DVAs first, along with the existing program of nuisance permits. These actions will be monitored for a period of at least three years, prior to a decision to do more extensive lethal control of deer (bait and shoot).

The Integrated Human-Deer Focus Alternative rests on the premise that DVAs should be addressed and that the diversity of public concerns and viewpoints regarding deer and DVAs must be considered. For that reason, the integrated alternative begins with conservative approaches matched with careful monitoring of results. It does not recommend bait and shoot at the outset, but only after other means have been tried. If bait and shoot is implemented, this alternative recommends a cautious approach with suggested numbers of deer to kill based on statistical analyses of existing data from Amherst.

The plan recommends guidelines for implementation, but an adaptive plan allows for modifications based in economic and political reality. Reducing DVAs has large economic benefit, but one not directly realized by the Town government. Nevertheless, other benefits such as reduced risk from injury or inconvenience from a disabled vehicle would be realized. Outside funding sources for plan implementation should be explored.

The DVA Management Plan is unique in that it was designed using information about Amherst DVAs and environment. Adaptive management allows reasoned decisions regarding future plan refinements and implementation. The foundation for monitoring is the long-term DVA record and related information that has been analyzed in this effort. Although DVAs have long been a concern of the public throughout North America and Europe, an integrated and adaptive approach to managing DVAs is a new phenomenon.

Problem Definition

It is important to have a place in your plan to describe the deer management problem that your community is facing. While some communities may take some time to come to an agreement as to what the problem is (Phase 1 of the CBDM cycle), if your community is at the stage where you are ready to develop a deer management plan, there should be collective agreement that a problem is occurring. You've likely already begun the process of developing goals, objectives, action alternatives, and perhaps even selected or recommended an action (or set of actions) your community would like to pursue.

This part of your deer management plan is the place where you write down what your community found as it progressed through Phase 1 of the CDM cycle, "Problem Definition." As described on the CBDM site, in this phase of the process your community will try to answer the following questions:

- What kinds of deer-related problems are occurring?
- Where and when are these problems occurring?
- Who is experiencing these problems?
- How severe are the problems?

These problems can often be thought of as impacts. When we use the term "impact", we are referring to what Decker, Riley, and Siemer in their textbook, "Human Dimensions of Wildlife", define as "*the important effects of wildlife interactions, those that cause strong stakeholder interest and draw management attention*" (p. 3). By "stakeholder," the authors are referring to "*any person who is significantly affected by, or significantly affects, wildlife or wildlife management decisions or actions*" (p. 5). In the case of your plan, you are likely considering all of your community residents as stakeholders.

Impacts might be positive and negative, which is important to keep in mind; your community might be interested in ensuring opportunities for viewing deer along with mitigating deer-vehicle accidents, for instance. Please also note the emphasis in this definition of those effects that stakeholders *are interested in*. There may be a number of effects of deer overabundance in your community, but your plan is likely going to focus on those effects that are meaningful to the residents of your community; i.e., impacts. It is those impacts that your goals, objectives, and actions are going to be aimed at addressing.

After completing this module, you should...

- ✓ Understand what an "impact" is
- ✓ Know how to comprehensively describe the deer impacts occurring in your community
- ✓ Be able to evaluate plans' impact descriptions

Problem Definition, continued...

Describing the impacts that are driving the problem in your community will help readers of your plan understand the links between the management actions your committee selected or recommended, the objectives those actions help meet, and the impacts those objectives address. Therefore, it is important to include in your plan a discussion of the primary impacts that are driving the problem. These might include impacts to habitat, impacts to ornamental plantings around residences, or perhaps public health and safety impacts such as deer-vehicle collisions or increased Lyme disease cases. You may also want to start thinking about how to measure those impacts, or how you might measure changes in those impacts over time. We'll talk about this some more when we discuss measurable objectives as well as monitoring program effectiveness, but since the goals, objectives, and actions you select are all intended to address these impacts, starting to think about how you might measure changes in impact levels over time will be a useful exercise.

You may find it useful to organize your impacts by type, for instance human health and safety impacts, ecological impacts, economic impacts, and others (in our review of CBDM plans, we found that these four impact categories tend to receive a lot of attention). In addition, it can be helpful to identify *where or to whom the impacts are occurring, how severe they are, and if they have changed over time*.

Consider including the sources you relied upon to identify the impacts, if possible. For instance:

- Did you acquire numbers about rising deer-vehicle collisions from your local police department?
- Did you implement a resident survey to understand the impacts people are experiencing or the ones that they prioritize for management attention?
- Was there a deer population survey or forest monitoring project that helped to elucidate the ecological impact or deer health impacts occurring in your community?
- Did you do multiple surveys to help better understand impact change over time?

Including the information used to help you better understand the impacts in your community is important, as it demonstrates to readers how you determined that these impacts warrant attention in your plan. Citing sources may also provide useful information for other communities that perhaps haven't determined how they will understand impacts in their community—your approach may provide helpful guidance to others! For more information about developing a resident survey, see the section in this guide on supporting documents.

Problem Definition, continued...

Here we describe examples of well-described impacts from two plans. Excerpts from these two plans begin on the next page.

(Example #1). This is an example of thoroughly documented impacts excerpted from Hopewell Valley, New Jersey's Deer Management Plan. In reviewing this section of the plan, you'll note the section heading, "Deer Impacts in the Hopewell Valley"—so, it's very clear what we expect to find here! You'll also notice that the section begins with an explanation of the sources used to describe the impacts in their community: a public survey, interviews with farmers, data on Lyme disease, data on deer-vehicle collisions, and forest health monitoring data. You'll also see that they've determined there are three major categories in which their impacts fall: Human Health Impacts, Economic Impacts, and Ecological Impacts. After reading this section, do you think—as we did when we read it—that you have a good grasp of the impacts affecting this community?

(Example #2). For this example, we have an excerpt from Harpers Ferry, West Virginia's Urban White-Tailed Deer Management Plan. In discussing impacts, they do so in a section called "Current Assessment." They organize not by impact category, but rather by source for collecting information about the existing problem: a wildlife camera survey, a community survey, a deer plant preference assessment, and impacts on forests. From reading this assessment, you should be able to understand the impacts driving this plan: Lyme disease, deer-vehicle accidents, deer browse on gardens and plants, residents' fears of being hit by running deer, and heavy browsing in forested areas.

Finally, a note on the heading, "Problem Definition." You're probably not going to include this as a header in your plan, as understanding the meaning of the phrase likely depends on having some familiarity with the CBDM cycle, which you wouldn't expect most readers of your plan to have. More often, and as you've seen in the three examples included here, you'll include this information about impacts as part of the background section of your plan. You might even have a section header titled "Deer Impacts in My Community," like Hopewell Valley did for their plan.

In sum, here are some key points to remember:

- Early in your plan, be sure to outline the impacts that are occurring in your community; i.e., the important effects of overabundant deer that residents are interested in addressing
- Be sure to identify where or to whom impacts are occurring, how severe they are, and if they've changed over time
- Cite your sources

Example #1: Pages 19 through 28

Example #2: Pages 29 through 36

Hopewell Valley's full plan can be found at:

<http://hopewellwp.org/DocumentCenter/Home/View/501>

Harpers Ferry's full plan can be found at:

<http://harpersferrywv.us/misc/deermgmtfinal.pdf>

III. Deer Impacts in the Hopewell Valley

Introduction

The impacts of deer in the Hopewell Valley were determined through a public survey, interviews with local farmers and review of existing data on Lyme disease, deer-vehicle collisions and ecological monitoring of forest health. Public survey methods are described below. A brief literature review of impacts, along with Hopewell Valley data, is provided in three categories: Human Health Impacts, Economic Impacts and Ecological Impacts.

A recently completed, comprehensive study of the costs of deer impacts in Fairfield County can be found at <http://www.deeralliance.com/index.php?pageID=3&articleID=154>. Although this level of analysis has not been performed in Hopewell Valley, estimates for individual municipalities within Fairfield County ranged from \$1.9 to \$17 million per year (included Lyme disease, tick control efforts, deer vehicle collisions and vegetation damage).

Public Questionnaire Methods and Results Summary

The Task Force prepared a questionnaire to determine the impacts of deer to the general public (See Appendix A for a complete list of questions and responses and Appendix B for results presented as charts). An open-ended comment section was also provided with the questionnaire (See Appendix C for a complete set of comments). Particular sets of questions were specifically designed for farmers (impacts and issues related to agriculture) and hunters (hunting activity and constraints). A total of 5,000 questionnaires were printed by Hopewell Township and Task Force members made them available through several venues including Pennington Quality Market, Mercer County Library - Hopewell Branch, Rosedale Mills, and Pennington Farmer's Market. The questionnaire was also made available on-line through the Hopewell Township website (<http://www.hopewelltpw.org/current-topics.html>).

The questionnaire results cannot be considered a statistically valid representation of the entire Hopewell Valley because the questionnaires were not randomly assigned to recipients. In all cases, interpretation of the results is confined to respondents (e.g., 'a certain percentage of *respondents* have reported Lyme disease' as opposed to extrapolating the results by saying 'a certain percentage of *Hopewell Valley residents* have reported Lyme disease'). A total of 575 questionnaires were submitted to the Task Force between June 1 and July 10, 2010. Complete questionnaire responses are detailed in Appendices A and B and key results are categorized within this and subsequent plan sections. The majority of responses were received from Hopewell Township (74%), followed by Pennington Borough (19%) and Hopewell Borough (7%).

Overall, deer impacts were considered significant – 71% of respondents felt that “deer cause many problems and solutions are needed.” It is important to note that while the overwhelming majority of respondents are looking for action to reduce deer impacts, a minority of respondents were strongly opposed to hunting (See discussion of population control methods under Section IV).

Responding households reported deer impacts including Lyme disease (26%), deer-vehicle collisions (28%), landscape damage (24% reported severe damage and 31% reported moderate damage), and bird feeder damage (17%).

Households with hunters constituted 11% of the respondents. The majority of hunting households (80%) harvest less than four deer per year. The single largest factor restricting an increased harvest was “more places to hunt in Hopewell Valley, including public lands” (22%). An increased availability for venison

donation was also significantly limiting (18%), while increased time to hunt was least important (10% of responding hunting households).

Households with farmers constituted 12% of the respondents (60 responses), but only 8% of all questionnaire respondents were currently farming - 39 farming households). Ten percent of responding farmers stopped because of deer predation, while 25% stopped farming for other reasons. Crop losses from deer were common (52%). The majority of damage was less than \$5,000 per year (73%). Nineteen percent of damage cost between \$5,000 and \$25,000 per year. Approximately 8% of damage was greater than \$25,000 per year. Other impacts included stopping the production of particular crops due to deer damage (37%), planting of sacrificial crops that are used to deter deer from feeding on higher value crops (8%), and utilization of fencing (51% of responding farmers). The use of hunting on farmland may be impacted by land ownership / lease arrangements (11% of responding farmers do not own any land). Fifty eight percent of farmers that own their own land allow hunting. Sixty four percent of respondents that lease land have landowners that do not allow hunting on any of their leases – an additional 16% lease some lands where hunting is not allowed. Agricultural depredation permits are utilized by 17% of responding farmers (88% of these permits are utilized on lands owned by farmers).

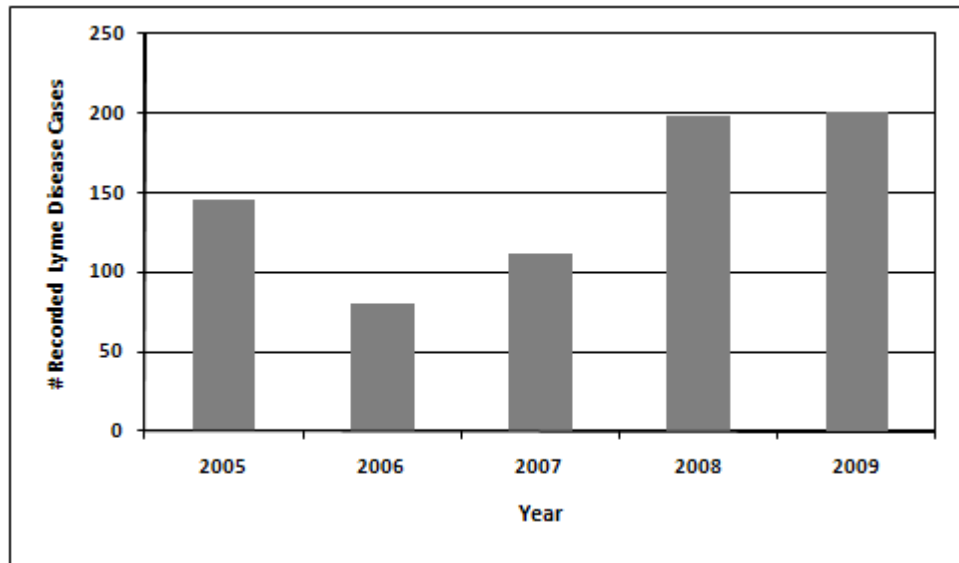
Human Health Impacts

Lyme Disease

Lyme disease has become a significant problem across the United States and is particularly prevalent in the Northeast (Centers for Disease Control 2010). New Jersey ranks fourth in the nation with over 35,000 reported cases between 1990 and 2007 (NY, PA, and CT reported the three highest number of cases). According to a study reported from Connecticut (Stafford 2007), deer population size is linked to incidences of Lyme disease. This relationship is dependent upon a threshold deer population size, requiring a population size of 10-12 deer per square mile to show substantial reduction in human cases of Lyme disease. Although deer do not directly transmit the disease bacteria (*Borellia burgdorferi*), they support large populations of the deer tick (*Ixodes scapularis*) that perpetuates the disease primarily through their other important host, white-footed mice (*Peromyscus leucopus*). In essence, deer act as an incubator to support tick population growth, which then become infected through contact with mice and subsequently transmit the disease to humans. Readers may refer to various sources for additional information on Lyme disease – See Fairfield County Deer Alliance, www.deeralliance.org or the Centers for Disease Control and Prevention, www.cdc.gov.

Hopewell Valley Lyme Disease data is reported in Figure 6. These cases include all residents from Hopewell Township, Hopewell Borough and Pennington Borough that were diagnosed with Lyme disease by their physician (and confirmed through blood testing). The average number of annual cases since 2005 was 147. It is important to note that many cases are unreported because physicians often diagnose and treat the disease without the blood testing required for formal tracking purposes. The public questionnaire results indicated that 26% of responding households had at least one case of Lyme disease over the last three years.

Figure 6. Reported Lyme Disease Cases in the Hopewell Valley
Source: Hopewell Township Health Department



Economic Impacts

Deer Vehicle Collisions

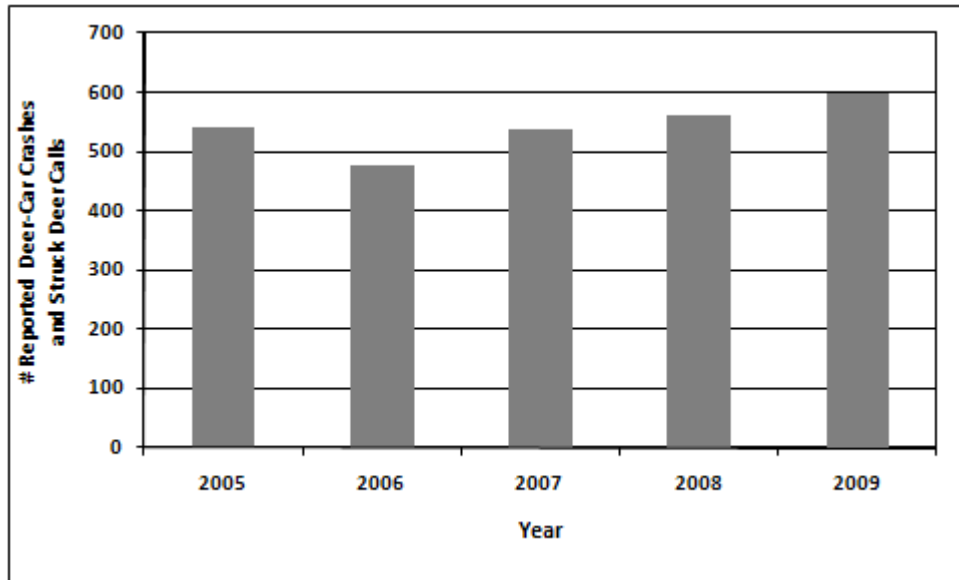
Deer Vehicle Collisions (DVC) occurred at the rate of 100,000 per month nationwide (State Farm Life Insurance Company 2009). Although New Jersey does not rank in the top ten for total DVC's, the state had a 54% increase in collisions over the last five years (highest in the nation). New Jersey has approximately 15,000 collisions per year at an approximate cost of \$3,050 per collision – total annual statewide cost is \$45,750,000 (J. Baldino, State Farm Life Insurance Company, personal communication).

DeNicola and Williams (2008) report a one-to-one reduction in DVC's with reductions in deer density. Through the use of sharpshooting, deer herd size reductions led to DVC reductions in Iowa City, IA (76% population reduction, 78% DVC reduction), Princeton, NJ (72% and 75%, respectively), and Solon, OH (54% and 49%, respectively). In Princeton Township, the pre- and post-culling deer density was 114 and 32 per square mile, respectively (Culling activities were conducted from 2000 - 2006). Additional information on DVC's can be found at Deer Crash (<http://www.deercrash.com/index.htm>).

Hopewell Township tracks DVC's through two methods – reported deer-car crashes and struck deer calls. The average number of reported deer-car crashes over the last five years is 159 crashes per year. It is important to note that all deer-car crashes do not result in a formal police report (see discussion on 'Struck Deer Calls' below). In all years, reported deer-car crashes represent approximately 20% of the total number of reported car crashes (G. Meyer, Hopewell Township Police Chief, personal communication). The number of struck deer calls is drawn from dispatch records. A struck deer entry is made whenever a dispatcher receives a call for a struck deer on or near the roadway and there is no striking vehicle present. A struck deer entry is also made when a motorist comes to police headquarters and reports that they struck a deer (in such cases a police crash report is NOT filed, so they are not double counted). These people are provided with a State of New Jersey form so they can file their own report. This is done because there was no police response to the accident scene. The average number of struck deer calls is 375 over the last five years. It is reasonable to assume that the reported deer-car crashes and struck deer

calls can be added to better estimate the total number of deer car collisions in the Hopewell Valley. The combined average is 531 deer-car collisions per year since 2005 (Figure 7).

Figure 7. Sum of Reported Deer-Car Crashes and Struck Deer Calls for Hopewell Township
Source: Hopewell Township Police Department



Agricultural Losses

Deer overabundance impacts include direct annual crop losses, land abandonment (permanent loss of productivity), crop switching (reduction in profit by planting less palatable crops that are not as profitable as more palatable crops), sacrificial crops (loss of productivity by planting crops to attract deer without the intention of harvesting to avoid damage on more valuable nearby crops), and fencing costs. The Rutgers University Cooperative Extension conducted a statewide survey in 1998 (<http://njaes.rutgers.edu/pubs/deerdamage/>), which reported information on the impacts noted above.

Information on impacts collected from Hopewell Valley farmers through the public questionnaire are summarized in Section II.

Landscape Planting Losses

Residential landscapes are also subject to significant damage. Lists of deer resistant plants, deer repellants and fencing requirements are common topics among gardeners. Although deer impacts can be characterized as a quality of life issue, cost estimates for residential landscape damage are not available.

Persistent deer damage has led many gardeners to utilize unpalatable invasive species such as Callery Pear, Japanese Barberry and Chinese Silvergrass. These species, and many others, cause significant damage to natural areas in the Hopewell Valley.

Information on impacts collected from Hopewell Valley residents through the public questionnaire are summarized in Section II.

Ecological Impacts

Stewardship of Natural Lands

The broader view of ecological impacts must consider that direct human uses (e.g., homes, farms) have consumed about 50% of New Jersey's land area. Obviously, these human uses directly destroy natural systems and continued development remains the greatest statewide threat. The other 50% of New Jersey's land exists in a natural state. However, severe impacts on our remaining natural areas are indirect - i.e., they do not involve outright destruction, but are consequences of human activities. Examples include overabundant deer and invasive species. The goal of land stewardship is to restore ecological health by reducing human impacts. The ultimate desired outcome for our remaining natural areas is to maximize ecological health and natural functions to resist continuing human impacts.

Effective stewardship strategies are guided by science and are carefully formulated to maximize ecological health of plant communities that serve both rare and common species. Broad stewardship strategies involve the following prioritized list: 1) Deer herd reduction to facilitate robust native plant communities that exert ecological control over less palatable invasive species, 2) Early Detection & Rapid Response (ED/RR) to prevent establishment of newly emerging invasive species, and 3) Protection of sites with high conservation values by a) eradicating small, outlier populations of all invasive species, and b) intense, long-term control programs to reverse larger infestations. For some rare species, it may be necessary to formulate strategies on a species- and site-specific basis with the goal of promoting long-term, self-perpetuating survival of populations. Direct restoration of degraded lands is an important strategy that is employed on a case-by-case basis and can be considered after (or during) commitment to the stewardship activities outlined above.

Figure 8. Stewardship Philosophy

'Nature manages itself' is commonly heard from those that feel stewardship of natural resources is inappropriate. In some cases, this is based upon a simplistic understanding of natural systems and the forces that create or maintain them. Some proponents of this view fail to acknowledge that there are many indirect impacts of human activities on natural systems (e.g., introductions of non-native species, irreversible fragmentation of natural areas that support deer population growth, profound alteration of soils from past agricultural use, etc.). Other proponents of this view suggest that nature will have to balance itself within the framework established by human activities and that we should not intervene further. Finally, there are well-qualified experts including some experienced natural historians and research professors that understand that our knowledge of natural systems is incomplete and suggest that stewardship should not be practiced until we learn more about natural systems and how they will react to particular management regimes.

In contrast, proponents of stewardship proceed from the viewpoint that human activities directly and indirectly shape the remainder of our natural world and that there is an obligation to intervene to promote ecological health and avoid further losses to biodiversity. In short, stewardship may be defined as 'the mitigation of human impacts on natural systems'.

Stewards feel that action is required when human impacts severely threaten ecological health, thereby consciously reducing human impacts through management strategies and actions.

In most cases, stewards strive for short-term interventions that correct natural systems with declining trajectories. Examples of short-term interventions include significant reductions of the white-tailed deer population (i.e., culling) and control of nascent populations of invasive species. In other cases, the continuing needs of the human population require that active management be perpetual (e.g., creation and maintenance of early successional habitats because catastrophic wildfires must be suppressed or a continuing Deer Management Programs to maintain a smaller deer herd).

In general, there are relatively few compromises available to proponents of the extremes of these two opposing viewpoints.

However, most individuals realize that a balance is possible, especially when stewardship is coupled with careful monitoring or designed research experiments that provide greater insights to practice adaptive management. Overall, stewardship strategies should seek to utilize minimal human intervention to foster ecological health and stimulate research to provide a better understanding of the natural world.

Forest Health Degradation

Numerous studies and reviews have been conducted on the impacts of white-tailed deer on forest ecosystems. A comprehensive review was conducted in Pennsylvania (Latham et al. 2005, http://pa.audubon.org/deer_report.html); an overview of impacts throughout the Northeast is provided by Rawinski (2008), http://na.fs.fed.us/fhp/special_interests/white_tailed_deer.pdf. Other comprehensive sources include Warren 1997 and McShea et al. 1997.

In general, native species diversity / abundance and overall forest health drop significantly with increasing deer herd size. An often cited research project that provides quantitative guidance on deer population levels associated with ecological damage was performed by David deCalesta, based at the US Forest Service in Pennsylvania (deCalesta 1994, deCalesta 1997). Over the course of a 10-year study using forest enclosures with known densities of deer, deCalesta determined that native forest herbs and tree seedlings became less abundant with deer densities between 10 and 20 per square mile. At densities exceeding 20 per square mile, palatable native plant species disappear and forest shrub-nesting song birds drop in abundance with the loss of the shrub layer. Starvation of deer occurred when densities exceeded 65 per square mile. This study suggests that deer densities exceeding 10 per square mile have negative ecological impacts (Note: Independent historical studies determined that pre-European colonization deer densities were approximately 10 per square mile and breakage – McCabe and McCabe 1984 and breakage of the Lyme disease transmission cycle may occur at 8 deer per square mile – Stafford 2007).

Hopewell Valley forest health data has been collected by the Friends of Hopewell Valley Open Space utilizing the methodology established as part of a statewide ‘New Jersey Forest Health Monitoring System’ designed by Michael Van Clef (See Figure 11). This system for measuring deer browse on experimentally planted tree seedlings (“Sentinel Seedlings”) and current density of woody understory plants (“Forest Secchi”) has been utilized by 15 organizations at 38 sites since 2006.

A total of 16 sites in the Hopewell Valley were tested from 2006 - 2009 (data from an additional 13 sites in Northern New Jersey tested within the same time period are provided for comparison) (See Figure 9 and Table 1). The desired threshold value of 10% seedling browse over a 6-month period (December to June) has not been recorded at any site. The average deer browse measurement is 59% over a six month period. Because tree seedlings require at least several years to grow above the typical maximum deer browse height (ca. 4.5 feet), forests at all tested sites are not expected to be able to regenerate following the death of existing canopy trees.

The understory of most mature forests should be filled with tree saplings and shrubs that provide habitat for wildlife (Note: A forest begins to mature at 50-75 years old) (See Figures 12 & 13). This concept is expressed as the desired threshold of 70% native plant cover utilizing the “Forest Secchi” methodology. The average site measured in the Hopewell Valley has 21% native cover, which mimics the statewide average (See Figure 10 and Table 2). The cover of non-native invasive plants is 31% in Hopewell Valley (15% higher than the statewide average). The reason for the low levels of native understory plants (and relatively high levels of invasive plants) may be attributed to deer overabundance over a prolonged period of time.

Figure 9. New Jersey Forest Health Monitoring System - “Sentinel Seedlings”
Source: Michael Van Clef, Ph.D., Friends of Hopewell Valley Open Space

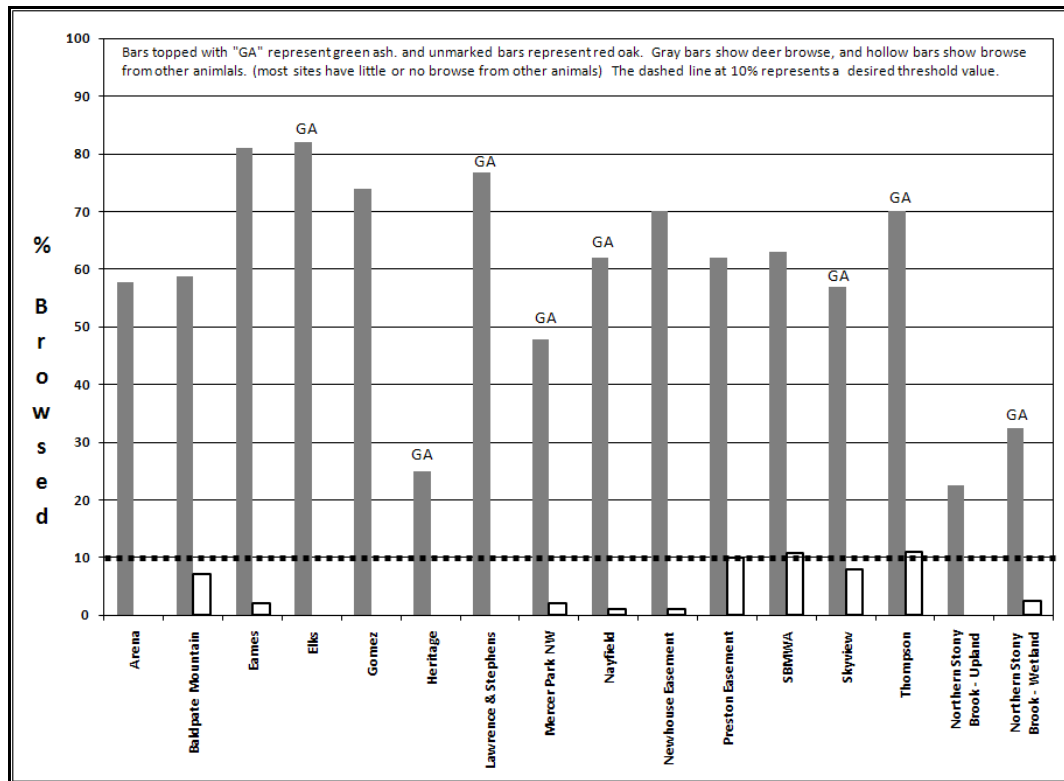


Table 1. Summary of Experimental Seedling Browse Measurements (“Sentinel Seedlings”)

Area	Average Deer Seedling Browse (%)	Range of Deer Seedling Browse (%)	Average Other Animal Seedling Browse (%)	Average Other Animal Seedling Browse (%)
Hopewell Valley Sites (16 sites)	59	23-82	3	0-11
Other New Jersey Sites (13 sites)	59	33-82	1	0-6
Combined Statewide Sites (29 sites)	59	23-82	3	0-11

Figure 10. New Jersey Forest Health Monitoring System - “Forest Secchi”
Source: Michael Van Clef, Ph.D., Friends of Hopewell Valley Open Space

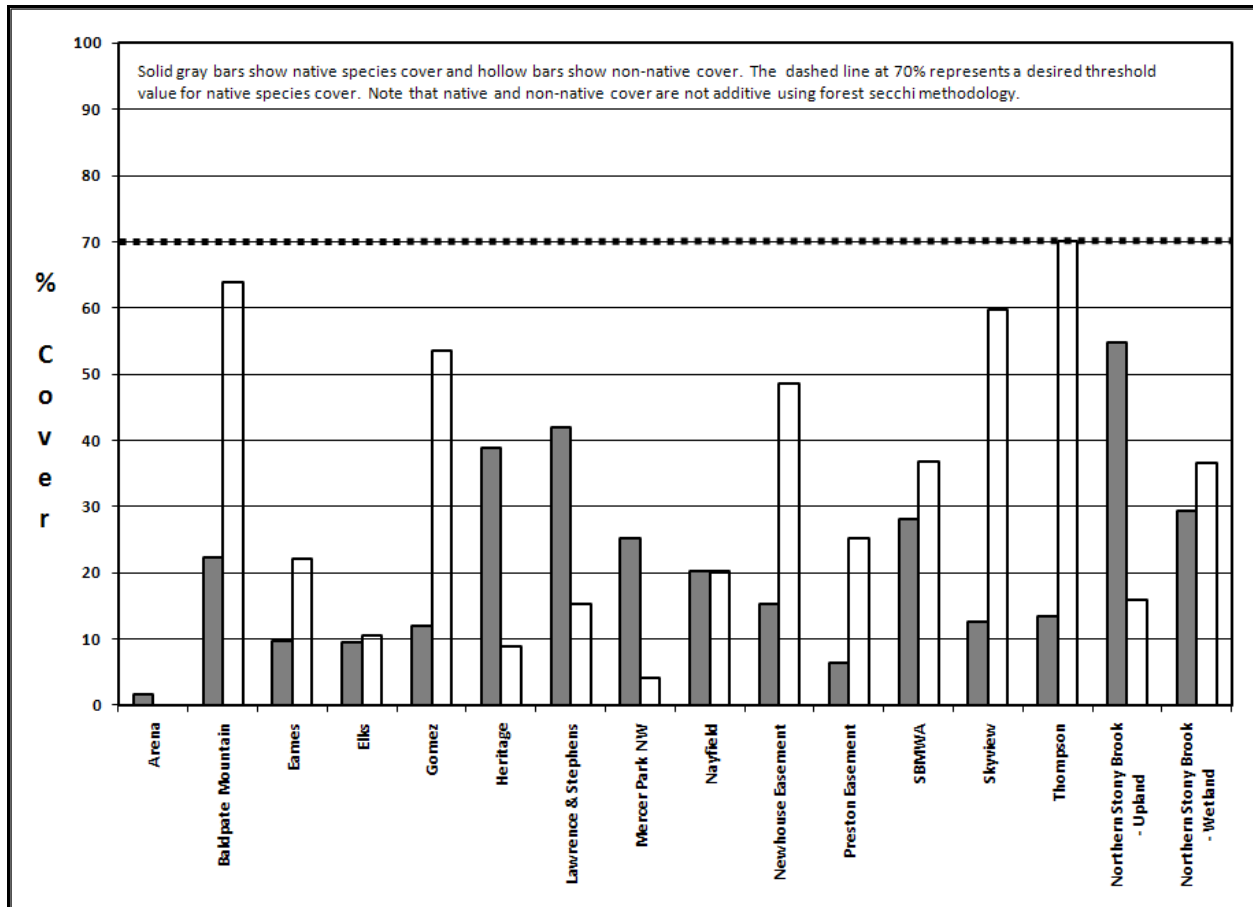


Table 2. Summary of Forest Understory & Canopy Measurements (“Forest Secchi”)

Area	Average Native Cover	Range of Native Cover	Average Non-Native Cover	Range of Non-Native Cover	Average Total Cover	Range of Total Cover	Average Canopy Cover	Range of Canopy Cover
Hopewell Valley Sites (16 sites)	21	2-55	31	0-70	47	2-80	93	82-98
Other New Jersey Sites (15 sites)	21	6-52	16	0-46	33	12-61	89	69-98
Combined Statewide Sites (31 sites)	21	2-55	24	0-70	40	2-80	92	69-98

Figure 11. New Jersey Forest Monitoring System Protocol Design

Left: Browse on planted oak seedling, note unbrowsed Japanese Stiltgrass (an invasive species) in background, Center: Sentinel Seedling Plot Design, Top Right: Forest secchi board – the number of grid cells with vegetation are counted to estimate understory cover, Bottom Right: Unbrowsed invasive Japanese Barberry at a site with very high deer density (photo taken adjacent to the browsed oak seedling at left).



Figure 12. Forest Degradation Series Photographs

Top: Healthy forest containing dense understory growth, Middle: Understory browsed away by deer, Bottom: Canopy gaps fill with unpalatable invasive species and native trees cannot grow because of excessive deer browse



Figure 13. Forest Recovery at Ted Stiles Preserve at Baldpate Mountain

Left: Photo of native spicebush thicket within the core of the Preserve – this area harbors forest birds such as Kentucky and Hooded Warblers not found in most places in the Hopewell Valley, Right: Close-up photo of thicket showing spicebush (larger leaves) overtopping the invasive Japanese barberry. This is an example of “ecological control” of invasive species by native species. Although the Deer Management Program at Baldpate has produced significant improvements within the core of the Preserve, additional deer herd reduction is required to restore large portions of the site.



PART II

Current Assessment

Part 2 documents the problems associated with the current deer population levels within the town of Harpers Ferry.

A. Study Area

The study area includes the town limits of Harpers Ferry, as well as the unincorporated area of Bolivar Heights. Harpers Ferry is a small community of about 285 residents on a peninsula bordered by the Potomac River to the north and the Shenandoah River to the south. It is 0.6 square miles in land area. The Harpers Ferry National Historical Park takes up part of the incorporated area of Harpers Ferry.

The adjoining town of Bolivar, West Virginia, did not elect to participate in the study or current assessment program. However, the town is currently seeking property owners who would consider participating in an Urban Archery Hunt.



Study Area Map

Red line: Incorporated areas of Bolivar to left, Harpers Ferry to right.

Light green area: Harpers Ferry National Historical Park land.

#1-#8: Wildlife Camera Survey positions.

B. Wildlife Camera Survey

Procedure Description

The study area map shows the 8 camera positions on the Potomac River or north side of town where six volunteers set out wildlife cameras April 6-8, 2012. Human interaction with deer is widespread throughout the community, but the north side of town has more notable damage reports.

These camera positions were selected after consulting with local hunters for purposes of this study and to assess potential hunt sites. The author visited each site, took GPS coordinates, and noted adjacent property and proximity to housing and public buildings. Site selection was excellent and coverage of the peninsula was good.



No sites were located on the south side of town or around Boundary Street or Union Street. The housing density in this area is tight and the hunters did not consider this an appropriate potential hunt site. The community survey shows that Union Street has vehicle “near misses” turning off the main highway, and Washington Street has deer trails and movement from one side of town to the other.

Equipment was donated by the local hunters and included both video style and movement sensitive style cameras. Corn bait from a local grower (to avoid inadvertent contamination) was used to bait the camera positions on the afternoon of April 6. The cameras were in use until the afternoon of June 8. Cameras were removed on June 8 and 9.

Ideal study conditions would have been during the fall months, with antlered deer, and when the deer are most active. But, the program got underway during the spring months, and to facilitate a program being implemented in 2012, the camera survey was done in April.

Results

Volunteers and the author reviewed hundreds of photos. A spreadsheet, set up with the time and date and camera position for each photo, showed simultaneous hits, and deer movement from one position to another. Within the first hours of the cameras being placed, six of the seven camera positions had simultaneous hits with a total count 26 deer at the six cameras. Five camera positions typically had six deer photographed at one time during the 3-day period. Position 6, off Putnam Street, showed nine deer bedded down the afternoon of June 7.

Of interest were deer that were undersized or in poor condition (pictured below). With many of the pictures at night or at a distance it was hard to determine the number of bucks. Two bucks in antlerless phase could be identified.



Also of interest and some concern, were people walking through the photographed areas. The deer, comfortably bedded down for the afternoon, suddenly ran off, a person appeared and left. Within 10 minutes, the deer were back and bedded down. The author later learned that a dog had gone missing in this area and several residents were involved in the hunt for the missing dog. This likely accounts for the high foot traffic.

Other wildlife photographed included raccoon, fox, squirrels, turkey vultures and a possible bear cub.

Details of the camera survey by camera position are found in Attachment B. This attachment also includes volunteers and property owner information. Results for Bolivar Heights sites, positions 1 and 2, were combined because of their close proximity.



In summary, while not used to obtain an accurate deer count, the Wildlife Camera Survey conducted by the volunteers, demonstrates that deer exist in significant numbers and are comfortable bedding down within the town limits. Given the high cost of thermal imaging, the author believes it is not warranted since the wildlife cameras showed deer population numbers well in excess of a healthy deer to land area ratio. The high deer numbers were also evident in the data received in the Community Survey.

C. Community Survey

Description

A community survey form was distributed to the members of the community in April and May of 2012. The survey form was published in the Harpers Ferry town newsletter distributed online, left on the desk at the town hall reception window and on the post office table. A total of 33 voluntary responses were obtained. In 2010, the Town of Bolivar had 23 residents report deer problems on their complaint form. Using Water Department household service accounts (812 for Bolivar and Harpers Ferry and immediately adjoining unincorporated area) as a base, the combined total (56) answering the surveys indicates a rate of response as high as 7%.

A copy of the Survey form is found in Attachment C. This survey is not a representative sample because it was a voluntary submission, and because of the low sample size, but nevertheless has good information provided by community members.

Results: Incidence of Lyme Disease

Eleven households reported 13 cases of Lyme disease within the last two years on the 2012 Community Survey. In other words, 33% of the households participating in the survey have been treated for Lyme disease.

The Center for Disease Control publishes data on confirmed cases that are reported to them. For 2010, there were 7.3 confirmed cases per 100,000 population nationally. The local health department does not have data on Lyme disease.

In 2011, the Center for Disease Control came to Harpers Ferry National Historical Park and collected and tested 13 ticks in six different parts of the Park. None of the ticks tested positive for Lyme. It is not possible to determine where our residents are contracting Lyme. But, the incidence rate is high in our community, and we do have a public health issue in Harpers Ferry.

The Center for Disease Control's website shows the White Tailed Deer as a host of the tick that carries Lyme disease and states that the risk of greatest human infection is in late spring and summer, prime outdoor times for humans in this area.

Results – Deer in Yards

All 33 of the Survey respondents reported having deer in their yards. A summary of where the deer are concentrated is as follows:

Location	Average Number of Deer in Yard	Number of Households Reporting
Church Street	5.0	2
Washington Street	6.0	8
East Ridge	4.5	4
Union Street	13.0	3
West Ridge	11.0	2
All other	7.7	6

This information was consistent with the Camera Survey data obtained in April 2012. We had an average of 6 deer in the cameras, but there may have been more due to the limited range of the photographs. The table also shows the risk of having a collision with a deer on Union Street.

Results – Automobile Encounters

The Survey asked about encounters with deer while in an automobile. Drivers going the posted speed limit of 25 (or 15) miles per hour will likely have time to stop in most cases. Of the respondents, six reported having no incidents, while 26 did. One resident reported a vehicle-deer collision on State Highway 340 (which passes Harpers Ferry) resulting in \$4,000 in damages, and a Harpers Ferry police cruiser was in a collision with a deer in 2010.

State Farm Insurance reports on deer-vehicle collisions annually. As headlined on their website (www.statefarm.com) in October, 2011, "U.S. Deer-Vehicle Collisions Fall 7 Percent; Mishaps Most Likely in November And in West Virginia." West Virginia, according to their report, leads the nation for the fifth year in a row, for where an individual driver is most likely to run into a deer.

Lastly, Survey comments on automobile encounters in this area included the following:

- "Deer stand in road and face cars down."
- "Ran in front of me and glanced off bumper."
- "Dodged them running across Washington Street."
- "Two near misses on Washington Street."
- "We observe many close calls on Union Street."

Results – General Comments

The Survey form included blank lines at the bottom for open comments. The possibility of having a hunt to reduce the herd was not mentioned, but 7 of 33 respondents said specifically that they were in favor of such a program, while one was not. Generally, the following comments summarize the current culture regarding deer in Harpers Ferry:

- "The deer are a part of the charm of our community."
- "As much as I like to see the deer, there are too many for the area."

There are a few individuals who spoke to the author against an urban hunt program, and there are also residents who are angry and frustrated over the loss of expensive and carefully tended gardens to hungry deer. One resident, after learning of another resident being knocked out by a spooked deer in his yard, said she no longer walked after dark on West Ridge Street for fear of being hit by a running deer.

D. Deer Plant Preference Assessment

The community reported 62 varieties of urban plants being browsed by deer. Rutgers University and the New Jersey Agricultural Experimental Station have developed a Deer Browsing Desirability Rating Chart to indicate plant preference by browsing deer. Plants range from A, least desirable and rarely damaged by deer browsing, to D, most desirable and most often damaged by deer browsing.



Deer browse line on yews at 900 Fillmore Street

Plants Most Reported Damaged by Deer in the Survey

Plant Type	Rutgers Rating	Responses
Hostas	D	14
Tulips	D	8
Roses	C	8
Hydrangeas	C	7
Impatiens	C	6
Azaleas	D	5
Day Lilly	D	5

In addition to the plants with desirability rated by Rutgers, seven survey respondents reported damage on garden vegetable plants which are not rated. (See Attachment D for more details on plant species and browsing desirability rating.) The following plants with the low desirable rating of B were reported by two or more households as being browsed by deer: 3 households reported Black-Eyed Susan and Forsythia; 2 households reported Columbine, Crocus and Witch Hazel.

The deer are browsing the most desirable plants, but also are starting to take B-rated or Seldom Browsed plants. While it is possible some reported damage may have been caused by other species (groundhogs and rabbits are common in town), many residents witnessed the deer actually browsing the plants reported.

Increasingly, fencing is going up around gardens in the community. This may keep the deer out, but the fencing can also make for a less appealing urban landscape, as well as being costly to install.



Newly Fenced Garden on Washington Street

E. Impact on Forested Areas

Harpers Ferry has within its town limits natural forested areas including private property, paper streets and flood zones. Heavy browsing in these areas is adversely impacting the health of the forests as young seedlings are browsed and non native species move in. The picture below shows the browse line found throughout the area and a forest floor covered with invasive garlic mustard with no forest regeneration occurring.



Forested Area near Cedar Hill Cemetery

Goals

Up to this point in your deer management plan, you've mostly been writing up content that reflects Phase 1 of the CBDM cycle, "Problem Definition." Now, we're going to move on to content that covers Phase 2 of the cycle, "Decision Making." During this phase, your community will be developing goals for your deer management program, developing objectives, exploring action alternatives to address those objectives, and determining which action or actions to take.

After completing this module, you should...

- ✓ Know the attributes of good goals
- ✓ Understand why including goals is important
- ✓ Know the difference between goals and objectives

The development of broad goals that you hope to achieve with your deer management program is important for establishing a vision for your community's deer situation. Unfortunately, goals are often missing from plans, which is a problem because goals help drive the rationale for the actions selected to address a community's deer problem. This oversight is not surprising, given that many communities (for many public issues!) tend to focus on actions right away, leaving goals and objectives unspoken.

Readiness to take action to address a problem is a great condition to be in, but it is important that your plan provides clarity as to why you're taking a particular action. So, this is an important caveat to the note about order earlier. While the order of elements of your plan is not as important as the fact that you have included these plan elements, discussing your goals (and objectives) prior to discussing actions really is important for making clear the rationale for your plan.

Goals might be expressed as a list of general outcomes or reflect a desired future condition. Often, goals and objectives may be confused, because colloquially we use them interchangeably. However, when writing your deer management plan, distinguishing between goals and objectives *is* meaningful. Goals, as we just defined, reflect a *vision for desired future conditions*—they are not inherently measurable without a connection to objectives. You may feel that goals were already described in the purpose or mission statement of your plan—and that's fine. If not, including them clearly in a "Goals" or "Goals and Objectives" section can be very helpful to readers. Objectives, in contrast to goals, reflect the *specific outcomes needed to achieve goals*. Objectives are *measurable* and have a *time element*. But, more on objectives in the next section.

So, what kinds of goals might you include in your plan? In our review of CBDM plans, we found that many communities included goals related to decreasing deer-related problems, community outreach and education, deer reduction, or managing deer. Specifically, some example goals might be:

- Maintaining a socially-acceptable level for the deer population
- Preserving healthy, local forests
- Supporting a community that is well-educated on how to live with deer while reducing human-deer conflicts

Your goals should be *realistic* and *achievable*. Some communities may find it helpful to connect their community-level goals to statewide goals established for deer management (i.e., does your state wildlife agency have a deer management plan you may review to help refine your own community's goals?).

Goals, continued...

To better understand how you might write up clear goals for your plan, let's look at a few examples.

(Example #1). This first example is an excerpt from Burnsville, Minnesota's deer management program overview.

5.0 MANAGEMENT OPTIONS

A citywide Deer Management Program should start with the identification of a goal and objectives as well as a summary of the problems. Then the management strategies or options can be tailored to fit the specific needs of the city and its residents.

5.1 Goals and Objectives

The following goal, objectives and problems have been revised from the DNR's long range plan for the management of white-tailed deer in the metro region (DNR 1996) to fit the expected needs of Burnsville.

Goal

Manage white-tailed deer populations within the city at socially acceptable levels that provide recreational and educational opportunities as well as provide opportunity for maintaining healthy (natural regeneration) woodland habitat.

Before discussing potential management options, the plan identifies the goals and objectives of their program. Burnsville has very clearly defined the goal of their program, which includes both social and ecological components. They've also noted that they have developed their goal by first considering the state's Department of Natural Resources' goals for managing white-tailed deer in metropolitan areas.

Burnsville, Minnesota's
complete deer management
plan can be found at:
<http://www.burnsville.org/DocumentCenter/Home/View/1338>

338

(Example #2). This next example is an excerpt from Amherst, New York's plan.

2.4. The Goals of the Plan

This plan defines a program of actions designed to provide control over DVAs in Amherst. Its overarching goal is to reduce the number of DVAs given the many variables that influence when, where, and why they occur. Because numerous variables influence the number of DVAs in Amherst, establishing a *discrete target number* of DVAs in Amherst is not reasonable. Nevertheless, DVAs are what we can, and do, most readily count and are the basis for setting goals and monitoring success of the plan.

Analysis of Amherst data (described later) shows that population control efforts on deer in the mid-1990s were associated with a statistically measurable decrease in DVAs in the last half of the decade. There is a likelihood that both numbers of deer and numbers of drivers will increase in Amherst. Development, another variable linked to Amherst DVAs, is also continuing. For these reasons, it can be forecast that Amherst DVAs are on the verge of increasing. This plan establishes the initial goal at two spatial scales, *whole town* and *hotspots*. These scales represent a natural division and are useful since different DVA management tools can be applied at each scale. Tangible goals for each scale are defined as follows:

1. At the *whole town* scale, reduce DVA numbers to the lower levels experienced in the years after significant lethal control was conducted and an associated decrease in DVAs was experienced (1997-2000). If this goal is attained, more rigorous goals can be established through the adaptive planning process if this is deemed desirable (see section on Monitoring and Adaptive Management).
2. At the *hotspot* scale, select specific DVA hotspots and diminish these with targeted approaches. Progress toward the hotspot goal will be measured with parameters such as intensity and extent of hotspots and DVA counts within the hotspots. Lessons learned from successfully treated hotspots can be applied to other hotspots through the adaptive management process.

Goals, continued...

The focus of the plan in Amherst, obvious from the plan's title, "Town of Amherst Deer-Vehicle Accident Management Plan" is on deer-vehicle collisions. So, it makes sense that their overarching goal, *highlighted* in the excerpt above, is to "reduce the number of DVAs [deer-vehicle accidents] given the many variables that influence when, where, and why they occur." We would say that what Amherst describes as an "overall goal" is what we mean by goal in this guide, and when they proceed to discuss tangible goals (at the town level and hotspot level), they are discussing what we would call measurable objectives. When you read the next section on objectives, look at this excerpt again and see if you agree.

In sum, here are some key points to remember:

- Goals reflect a desired future condition, whereas objectives are specific, measurable outcomes needed to achieve goals
- Goals and objectives should be identified prior to actions
- Goals need to be realistic and achievable

Amherst, New York's
complete deer management
plan can be found at:
<http://www.amherst.ny.us/pdf/planning/deer/appa.pdf>

Objectives

The objectives your plan seeks to achieve are arguably the most important aspect of your plan, as your objectives should be the major driver of the actions taken. Outlining your objectives clearly in your deer management plan is important, as your community will go back and revisit them many times to track progress towards achieving them. When outlining your objectives, it is most important that those objectives be *measurable* and have a *time component*. Basically an objective needs to communicate what you hope to achieve and state an explicit deadline for doing so. Otherwise, how are you supposed to know if you've achieved your objective(s)? The Community Deer Advisor provides some advice on what makes a good objective. It provides a handy acronym to help you remember the attributes of good objectives: "S.M.A.R.T."—

After completing this module, you should...

- ✓ Know the attributes of good objectives
- ✓ Be able to describe the importance of including objectives
- ✓ Understand how to develop measurable objectives

- Specific—Are your objectives focused?
- Measurable—Are there indicators that will confirm whether they have been achieved?
- Attainable—Are they realistic given available resources?
- Relevant—Are they a good fit for your community's situation?
- Time-related—By when will the results be achieved?

When describing your objectives in your deer management plan, it is important that you ensure that these five elements of objectives are included in your plan. The Community Deer Advisor also includes some references for helping you to develop goals and objectives.

It may be helpful to think about your objectives in terms of categories, such as: objectives directed towards the number/behavior of deer, objectives directed towards increasing community knowledge about deer/deer management, and objectives intended to change individuals' behaviors that influence impacts from deer (e.g., driving behavior, deer-resistant plantings, etc.). Example objectives might be:

- To reduce the number of deer-vehicle collisions to a certain amount per year
- To reduce deer damage to ornamental plantings around homes to a certain amount
- To increase or maintain stems of certain forest plant species to some density

Whatever objectives you have identified, as we stated before it is important that they be *measurable* and have a *time component* (a target date for achievement), meaning that there is a way for you to track progress towards meeting these objectives. Your objectives should also be related to your goal, as objectives reflect the specific outcomes needed to achieve goals.

For example: if you have a goal of preserving healthy forestland, your community might have an objective linked to that goal, such as seeing a 25% increase in native plants in four city parks over the next five years. Now, important to measuring this objective—which we'll discuss when we get to monitoring later in the guide—is having some baseline measurement of what your community means by native plants and their current understory cover in your city parks.

Objectives, continued...

In the following sections of your deer plan, you will identify your selected management actions as well as selected indicators for monitoring progress on your plan, both of which need to reflect these objectives. As you identify your objectives, be aware of the kinds of actions you might need to take to make progress towards these objectives as well as the kinds of data that you might need to collect to evaluate that progress. Including measurable objectives that are tied to indicators and actions is the most important component of your plan. It is critical to know *what you are making progress towards* so you can judge success of your program. It is also important that you start with identifying objectives, not with actions. Actions selected should be matched to goals and objectives, not the reverse.

Measurable objectives are often missing from plans, though plans that do address them tend to focus on reduction of Lyme disease cases, deer vehicle collisions, crop loss, and landscape damage; herd size or density goals (deer per square mile); or wildlife acceptance capacity. Most commonly, if objectives are reported, they tend to focus on deer population objectives or deer-vehicle collision reduction objectives.

One strategy you may consider in helping you developing your objectives (and goals, for that matter) is to take a look at the impacts people care about and determine how your plan might help directly address those impacts. The main reason for developing a deer management plan is that your community has identified some problem with respect to the interaction between deer and people; those problems take the form of impacts, so it is logical for your objectives to address those impacts.

As discussed earlier in the “goals” section of this guide, there is a difference between goals and objectives, so it's important to be aware of that difference when outlining goals and objectives in your plan. Sometimes, in other community's plans you might see an action labeled as an objective. Hypothetically, a statement such as “Develop an educational program to provide residents with information about deer biology and methods to minimize wildlife conflicts on their property” may be reported as an objective in a plan, *but it's really an action*—not an objective or goal. Let's say this action was selected to mitigate impacts such as deer damage on residential property. A goal related to this impact might be something like, “To support a community well-educated about how to live with deer while reducing deer-human conflicts”—a desired future condition. An associated objective might be, “To ensure that 75% of residents report being highly knowledgeable about methods to reduce deer damage on their property by 2020”, which could be measured by a resident survey. Therefore, the action initially described in this hypothetical example—developing an educational program—would be carried out in support of this objective.

Objectives, continued...

So, what do some well-developed, measurable objectives look like? Below you'll find three examples from different community plans.

(Example #1). The first example is an excerpt from Hopewell Valley, New Jersey's Deer Management Plan.

Recommended Goals

Goal #1: Reduce Lyme Disease Cases

There has been an average of 170 reportable cases of Lyme disease from 2007-2009. The Task Force recommends a 25% reduction goal by 2013 (128 cases) and a 75% reduction goal by 2019 (43 cases).

Stafford (2007) reviewed studies exploring the link between deer / tick abundance and human cases of Lyme disease. It is suggested that deer densities lower than 8 per square mile could interrupt the life cycle of the Lyme disease organism and nearly eliminate transmission to humans. However, reductions in Lyme disease could be expected at higher deer densities – for example, there was a 90% reduction in Lyme disease at Bluff Point Coastal Preserve in Connecticut when deer densities were reduced from 200 to 30 per square mile (85% reduction).

Goal #2: Reduce Deer Vehicle Collisions

There has been an average of 567 deer-vehicle collisions from 2007-2009. The Task Force recommends a 25% reduction goal by 2013 (425 collisions) and a 75% reduction goal by 2019 (142 collisions).

Data linking deer herd reduction with reduced deer vehicle collisions is sparse. However, Princeton Township experienced a 75% reduction in deer vehicle collisions (from 342 to 85 per year) following a six-year deer management program that resulted in a 72% reduction of the deer population (from 114 to 32 deer per square mile) (DeNicola and Williams 2008).

Goal #3: Reduce Agricultural Losses

The public questionnaire results suggested that 27% of respondents had crop losses exceeding \$5,000 per year. The Task Force recommends a 25% reduction goal by 2013 (20% of respondents) and a 75% reduction goal by 2019 (7% of respondents).

Agricultural losses are a significant concern in the Hopewell Valley and complete results of the public questionnaire are provided in Section III and Appendix A. There are no published guidelines linking particular deer densities with agricultural losses, but continual tracking of the above stated goal is expected to act as a proxy for the variety of deer impacts to agricultural viability in the Hopewell Valley.

Goal #4: Reduce Landscape Planting Losses

The public questionnaire results suggested that 55% of respondents had severe or moderate landscape damage. The Task Force recommends a 25% reduction goal by 2013 (41% of respondents) and a 75% reduction goal by 2019 (14% of respondents).

Landscape planting losses are a quality of life issue in the Hopewell Valley. There are no published guidelines linking particular deer densities with landscape planting losses, but continual tracking of the above stated goal is expected to act as a proxy for a range of deer-related impacts within planted landscapes.

Objectives, continued...

You see that that these objectives are labeled according to their overarching goals, and you don't see the word "objective" as a heading. But let's look at their first recommended goal: "Reduce Lyme Disease Cases." If you read the paragraph that follows, you'll see two measurable objectives in support of that goal: a 25% reduction in Lyme disease cases by 2013, a 75% reduction in cases by 2019. You'll also see a statement about reducing deer densities and their link to reduced Lyme cases. We'll talk about this more when we get to actions, but these data are presented as support for the actions taken in their community—the lethal control of deer. But, as they state within the plan, "...success should be measured by stated impact reduction goals and not based upon measured deer population size" (p. 24). This statement emphasizes that what they are interested in measuring is reduced Lyme disease cases—the success of their program is not based on number of deer taken (their actions implemented), but on the reduction of the impact they care about (Lyme).

Before we get to the next two examples, let's briefly discuss deer population reduction objectives. The most common type of measurable objective we see in plans tends to be related to reducing the deer population to a certain amount on a certain timeframe. The two examples we are about to show you do just that—they describe a deer population objective that is specific, measurable, time-related, and likely achievable. However, when selecting your management objectives, think about whether or not your objectives are tied directly to your impacts. Do you have data on the relationship between the impacts your community members care about and what the deer population has to be in order to see a decrease in those impacts? If not, reducing the deer population to a specific number might not solve your community's problems—and you may want to reconsider whether or not a deer population objective is right for your program. Focusing your objectives on reducing impacts (rather than deer numbers) might be more appropriate. If you do know the relationship between deer population reduction and the impacts you care about, you might consider nesting objectives—first, identify your desired impact management outcomes and then identify the appropriate amount of change in the deer population you'd like to see in order to achieve those impact outcomes.

Hopewell Valley's full
plan can be found at:
[http://hopewelltp.org/
DocumentCenter/Home/
View/501](http://hopewelltp.org/DocumentCenter/Home/View/501)

Objectives, continued...

(Example #2). The second example is from Greenwich, Connecticut's "Report on Managing Greenwich's Deer population."

Greenwich Conservation Commission's Recommendations

Subsequent to presentations by Kilpatrick to the Conservation Commission, and after additional research and discussion, the Conservation Commission reached a consensus to support the preliminary recommendations made by Kilpatrick. The Commission firmly believes that for reasons of public health and safety and for the retention of the town's ecological heritage and biodiversity, the town's deer population must be drastically reduced in size and that a long-range deer management plan should be implemented which includes population management, monitoring and assessment, and education/outreach. It is the Conservation Commission's belief that the most cost-effective, morally defensible, and operationally practical population management program would involve two phases: 1) immediate herd reduction by increased hunting within the hunting regulations and/or culling of the herd by means of managed sharp shooting on both public and private lands; and 2) long-term population management through hunting (and/or birth-control when and if it gets state and federal approval). Specifically, the first phase would begin this year, with a goal of reaching a deer herd size of less than 26/mi² across Town within three to five years. The second phase would begin once an acceptable herd size is realized.

This example provides a measurable objective with a clear timeline (*highlighted* above): A herd size/density goal of less than 26 per square mile, to be achieved within the next three to five years from the time of plan publication.

(Example #3). The last example (*highlighted* below) is from Helena, Montana's "Urban Deer Management Environmental Assessment", which provides a measurable objective: 25 deer per square mile in the city, to be achieved through the removal of 350 deer

In 2007, the City of Helena's Urban Wildlife Task Force developed an Urban Deer Management Plan. The Task Force confirmed the findings of the Plan that the predominate urban wildlife problem in the City of Helena was an overpopulation of mule deer due to the ample forage, water, and general habitat conditions. After extensive meetings that included city officials, members of the public, and wildlife specialists who reviewed existing urban wildlife plans, the Task Force presented its recommendations to the City Commission. This Plan was adopted by the City Commission and included the following actions to address increasing public health and safety, real and personal property damage, and wildlife welfare: 1) public education, 2) review of zoning ordinances and laws, 3) promotion of deer resistant landscaping and barriers, and 4) reduction of the existing mule deer population from within the city limits. The deer reduction plan proposed an initial removal of 350 deer to reduce the resident population's growth rate. The recommended deer population density for the City was 25 deer/mi² based on information from other cities that have established an urban deer density objective. As reported in the City of Helena's 2007 Urban Deer Management Plan, the deer density as of 2007 was estimated at an average 33 deer/mi² throughout the city.

Objectives, continued...

In sum, good objectives should be:

- Specific, not general (in contrast with goals)
- Tied to your plan's goals and the impacts those goals are meant to address (i.e., relevant)
- Measurable
- Have a target date for achievement
- And of course, attainable. If your community can't achieve the objectives you've set—if they're not realistic—you're setting your community up for disappointment. While community-based deer management is a long-term process, it's important to still be able to achieve objectives in a timely fashion.

Greenwich, CT's deer plan
can be found at:
[http://www.greenwichct.org/
upload/medialibrary/b8e/cc
DeerReport2004finalcorrecte
dl.pdf](http://www.greenwichct.org/upload/medialibrary/b8e/ccDeerReport2004finalcorrectedl.pdf)

Helena, MT's deer plan be
found at:
[http://www.ci.missoula.mt.us/
DocumentCenter/Home/View
w/18805](http://www.ci.missoula.mt.us/DocumentCenter/Home/View/18805)

Actions Recommended

Likely the section of the plan that readers are most interested in will be your outline of the various management actions recommended or selected for your community-based deer management program. These actions may include strategies for population control; strategies directed at deer behavior; strategies directed at human behavior, public outreach, education or communication; local ordinance changes; or perhaps others. Your plan will probably include a suite of management actions, so you may choose to organize them according to type (such as deer population control, deer-feeding ordinances, etc.).

For each action selected, it is important that you explain:

- How this action will contribute towards meeting your objectives
- Identify who will carry out the action and on what timeline
- Describe the site targeted for management, if applicable

For instance, if you will be installing deer-proof fencing around various natural areas in your community, which natural areas will be protected and if not all at once, then in what order? And who will be doing the installation? Indicating how actions contribute to objectives is also important, as this forms part of the rationale for selecting a particular action or set of actions. It is likely that multiple actions will contribute to meeting your objectives, so if there's some reason such as effectiveness, public support, feasibility, cost, or timing that also contributed to your selection of a particular action it's important to say so.

It is also important to support your rationale for selecting actions, be it by citing studies, resident surveys, budget estimates, or expert opinion. Whatever data, input, or logic you've used to select an action or set of actions needs to be clearly outlined. You may find resources to help guide the selection of actions in a number of places: your state wildlife agency will provide guidance as to rules and regulations that may limit what actions are possible in your community (e.g., see [Pennsylvania's Guide to Deer Management](#); New Jersey's [Community Based Deer Management Manual for Municipalities](#); and the Community Deer Advisor website has a resources section on management actions and alternatives as well). You may also be interested in reviewing [An Integrated Approach For Managing White-Tailed Deer In Suburban Environments](#), developed by Cornell University Cooperative Extension and the Northeastern Wildlife Damage Management Cooperative—you'll find some good recommendations for landowners, residents, and policy-makers, as well as an overview of options for deer population control. Similarly, the technical guide, [Managing White-Tailed Deer In Suburban Environments](#), developed by Cornell University Cooperative Extension, the Wildlife Society's Wildlife Damage Management Working Group, and the Northeast Wildlife Damage Research and Outreach Cooperative. In this guide you'll find useful information on deer biology, ecology, and management, guidance on how to develop an integrated deer management strategy, as well as an overview of nonlethal and lethal management options, and contacts for state wildlife agencies.

After completing this module, you should....

- ✓ Understand how to comprehensively describe the actions recommended
- ✓ Understand how to provide rationale for the actions recommended

Actions Recommended, continued...

It is essential that this section is complete and clear, as controversy around deer management in communities is often focused on management actions. As we described at the beginning of the course, controversy—and active opposition—can come from individuals or organized groups, and often around which methods of deer management are acceptable. Sometimes communities will only produce a short document outlining the actions in their plans. We do not recommend this “bare bones” approach, unless it is paired with other easily accessible documents, perhaps on your community's website, that give an overview of reasons why those actions were selected.

As we've discussed before, jumping to actions is a common impulse, and if residents are going to be most interested in the actions you select, then it is understandable why you may want to just list the actions and be done, as writing up a complete plan requires a lot of time. However, for the actions you've selected to be understood as reasonable and defensible (and to inform community leaders in the future), linking them to specific objectives and their associated impacts is crucial. Otherwise, you may be inviting even more controversy than you may have anticipated, now or in the future.

Let's review three examples of how communities have outlined their recommended actions.

(Example #1). This first example is from Hopewell Valley, New Jersey. The excerpt from this plan begins on the next page. First, you'll see that prior to discussing actions, this plan outlines the goals of the plan and its associated objectives (e.g., goal to reduce Lyme disease cases, objective to reduce by 25% by 2013).

On the second page of the excerpt, you'll see they identify the data sources that provided the rationale for selecting the subsequent recommendations, organized into three categories: Strategy 1: Improving Hunting Access, Strategy 2: Improving Hunting Efficacy, and Strategy 3: Avoiding Deer Impacts. Each of these three strategies include a number of associated actions, many of which indicate responsible parties for these actions.

Example #1: Pages 49 through 53

Hopewell Valley's full plan can be found at:
<http://hopewelltp.org/DocumentCenter/Home/View/501>

Recommended Goals

Goal #1: Reduce Lyme Disease Cases

There has been had an average of 170 reportable cases of Lyme disease from 2007-2009. The Task Force recommends a 25% reduction goal by 2013 (128 cases) and a 75% reduction goal by 2019 (43 cases).

Stafford (2007) reviewed studies exploring the link between deer / tick abundance and human cases of Lyme disease. It is suggested that deer densities lower than 8 per square mile could interrupt the life cycle of the Lyme disease organism and nearly eliminate transmission to humans. However, reductions in Lyme disease could be expected at higher deer densities – for example, there was a 90% reduction in Lyme disease at Bluff Point Coastal Preserve in Connecticut when deer densities were reduced from 200 to 30 per square mile (85% reduction).

Goal #2: Reduce Deer Vehicle Collisions

There has been an average of 567 deer-vehicle collisions from 2007-2009. The Task Force recommends a 25% reduction goal by 2013 (425 collisions) and a 75% reduction goal by 2019 (142 collisions).

Data linking deer herd reduction with reduced deer vehicle collisions is sparse. However, Princeton Township experienced a 75% reduction in deer vehicle collisions (from 342 to 85 per year) following a six-year deer management program that resulted in a 72% reduction of the deer population (from 114 to 32 deer per square mile) (DeNicola and Williams 2008).

Goal #3: Reduce Agricultural Losses

The public questionnaire results suggested that 27% of respondents had crop losses exceeding \$5,000 per year. The Task Force recommends a 25% reduction goal by 2013 (20% of respondents) and a 75% reduction goal by 2019 (7% of respondents).

Agricultural losses are a significant concern in the Hopewell Valley and complete results of the public questionnaire are provided in Section III and Appendix A. There are no published guidelines linking particular deer densities with agricultural losses, but continual tracking of the above stated goal is expected to act as a proxy for the variety of deer impacts to agricultural viability in the Hopewell Valley.

Goal #4: Reduce Landscape Planting Losses

The public questionnaire results suggested that 55% of respondents had severe or moderate landscape damage. The Task Force recommends a 25% reduction goal by 2013 (41% of respondents) and a 75% reduction goal by 2019 (14% of respondents).

Landscape planting losses are a quality of life issue in the Hopewell Valley. There are no published guidelines linking particular deer densities with landscape planting losses, but continual tracking of the above stated goal is expected to act as a proxy for a range of deer-related impacts within planted landscapes.

Goal #5: Reduce Ecological Damage

Forest health has been monitored through two science-based protocols called the ‘sentinel seedlings’ (measuring deer browse on planted tree seedlings) and ‘forest secchi’ (measuring the density of forest understory vegetation). The average browse on planted tree seedlings has been 59%. The average amount of native understory vegetation was 21%. The Task Force recommends a 25% improvement by 2013 (44% browse on planted seedlings & 26% native understory cover) and a 75% improvement by 2019 (14% browse on planted seedlings & 37% native understory cover).

The ultimate forest health goals using the above protocols are subjectively set at 10% seedling browse and 70% native understory cover. Additional work is planned to set forest health goals that are tied to habitat use by sensitive forest birds (i.e., Kentucky Warbler, Hooded Warbler). Reference sites for this work will be located within the Hopewell Valley and measurements will include understory cover and abundance of native herbs. This information can be used to refine forest health guidelines in the future. Literature suggests that pre-European deer densities were approximately 10 per square mile (McCabe and McCabe 1984) and modern studies suggest that densities above 10 deer per square mile are associated with degradation of forest health (deCalesta 1994).

Recommended Strategies for Goal Implementation

The Task Force recommends three sets of proposed strategies to reach stated goals: 1) Improvement of Hunting Access, 2) Improvement of Hunting Efficacy, and 3) Avoidance of Deer Impacts. Brief explanations of control options and avoidance methods are provided in Section IV.

A comprehensive review of many ecological and social issues regarding hunting is provided by McShea et al. 1997, Warren 1997, Drake 2000, and Latham et al. 2005. These documents are especially relevant to meeting ecological goals, which are the most sensitive to deer overabundance (i.e., human health and economic impact reduction goals are likely to be met prior to reaching ecological goals). Quality Deer Management (QDM) is a critical, overarching concept with associated strategies that are necessary to meet all stated goals within the context of recreational hunter satisfaction, which will be required to avoid the need to hire costly professional deer managers. Adherence to QDM principles by Hopewell Valley hunters would result in a smaller, healthier herd featuring large bucks. Multiple documents published by the Quality Deer Management Association (www.qdma.com) explore QDM and should be reviewed by those implementing this plan.

Based upon the 2010 Hopewell Valley deer survey, population growth scenarios were estimated by using a methodology established by Duke Farms in Hillsborough Township (T. Almendinger, personal communication). This method is periodically vetted by wildlife biologists including A. DeNicola of White Buffalo, Inc. and L. Wolgast of the NJ Fish & Game Council. The measured deer density in Hopewell Valley was 37 deer per square mile (total population size approximately 2,300 deer). Based upon population growth calculations, the post-birthing deer density is 54 per square mile (approximately 3,400 deer). A 25% and 75% population reduction goal would result in post-winter deer densities of 28 and 9 deer per square mile, respectively. This is equivalent to deer populations of 1,750 and 560 deer throughout the Hopewell Valley (post-birthing / pre-hunting season deer populations would be approximately 2,600 and 830, respectively). Recent statewide deer population reduction was associated with harvesting greater than 40% of the deer population with greater than 60% of the harvest being antlerless deer (See Figure 2). In order to achieve stated goals within the defined timeframes, Hopewell Valley harvests must exceed these figures. The Task Force should devise annual harvest goals necessary to meet stated goals in consultation with wildlife biologists (e.g., NJ Division of Fish & Wildlife or other wildlife professionals).

Strategy Set #1: Improvement of Hunting Access

1A) Encourage and facilitate hunting access on public and private lands

There are several large public and corporate properties that do not allow hunting access or have limited hunting access. The Task Force, supported by municipal officials and staff, should conduct outreach to support deer management programs on these parcels and any parcels (including private lands) that do not allow hunting access (See Figure 15).

Hopewell Township owns approximately 200 acres of open space that require hunting access to help meet stated goals. Deer Management Programs utilized by other Hopewell Valley land managers, including Mercer County, Friends of Hopewell Valley Open Space, and D&R Greenway Land Trust should be considered models for a program implemented by Hopewell Township (See Section IV). Ideally, Hopewell Township should develop and implement deer management programs on their owned lands as soon as possible to serve as an example for other land owners that do not currently have hunting access.

A possible strategy to pursue is participation from the Hopewell Township Police Department, which could conduct training (e.g., review firearm regulations, test shooting accuracy for bow and firearms) and provide background checks (e.g., verify license, safety record) for interested hunters that could participate in deer management programs on both public and private lands. This effort could ease concerns of neighbors / residents that are hesitant about hunting near or on their properties and provide structure to the program. The cost of such a program would be approximately \$500 per training event to pay for police officer overtime (G. Meyer, personal communication) and costs would be assumed by hunters participating in the program (e.g., 25 hunters pay \$20 each). A similar program has been utilized in Fairfield County, Connecticut (www.deeralliance.org) to match hunters with prospective property owners and Mendham Township, New Jersey. At a minimum, hunters that may manage deer on Hopewell Township properties could be required to participate in the program.

1B) Develop strategies to access “pocket deer” in residential areas

One of the more challenging aspects of deer management in the Hopewell Valley will be obtaining access to “pocket” or “yard” deer. Some municipalities have utilized contracted professionals under special state permits to reduce deer populations where typical recreational hunting is not feasible (e.g., Princeton Township, Millburn Township). These methods can be expensive and should not be considered the first option in Hopewell Valley. The expected passage of legislation that will increase hunting land near structures may ease this problem (bow hunting will be allowed within 150 feet as opposed to the previous 450 feet safety zone that will continue to apply to firearm hunting). Additionally, lands accessible to hunters that are adjacent to residential developments may consider cooperative efforts to either ‘push’ (i.e., coordinated deer drives) or ‘pull’ (i.e., baiting strategies) deer from areas inaccessible to hunting (Strategy Set #2). If these efforts appear inadequate, then municipalities of the Hopewell Valley should consider hiring professional contractors to reduce the deer herd in order to meet stated goals.

Strategy Set #2: Improvement of Hunting Efficacy

2A) Encourage and facilitate coordinated hunting activities among neighboring landowners

The ‘pushing’ of deer from one parcel to another is a perennial problem in Hopewell Valley. This occurs when one parcel is hunted, but a neighboring parcel does not allow hunting access. It also occurs when hunting occurs at different times on two adjacent parcels that are both hunted. Coordination is critical to meeting stated goals. Land owners that do not allow hunting should be approached by the Task Force and asked to consider hunting access that is coordinated with neighboring parcels. If hunting access is still not acceptable, then the land owners could be asked whether they would allow hunters without weapons to drive deer onto neighboring parcels that allow hunting access. When adjacent parcels both have hunting access, the respective hunters could consider hunting simultaneously – this would increase deer movements and potentially increase harvest numbers for all hunters.

The use of coordinated drives toward strategic culling locations should be developed at multiple locations throughout the Hopewell Valley. Drives could be conducted by individuals passing Hopewell Township Police Department safety training (see above) and be registered for each particular drive before it is initiated. Drive ‘teams’ should provide a written plan including a map and date/time that drives will

occur. The map should include an indication of safety zones (or have written permission from appropriate landowners if conducted within safety zones).

The strategic use of baiting and deer food plots could also be considered as a means of pulling deer off of lands that are not hunted and/or concentrating deer in areas where they can be hunted. As with coordinated deer drives, spatially explicit planning among local hunters will be critical to success of this effort. The Task Force should facilitate both coordination and baiting/food plot among local hunters. As necessary, consultations with wildlife biologists should also be considered.

2B) Encourage and facilitate use of Agricultural Depredation Permits by farmers

The use of agricultural depredation permits should be increased in Hopewell Valley (See Appendix A – Public Questionnaire questions 10F, 10G & 10H). Although it is unclear why use of depredation permits is not more extensive, reasons may include lack of permission on leased farmlands and issues with nuisance complaints from neighbors because of off-season gunfire. Other factors such as use of deer exclosure fencing or crop type (e.g., hay isn't generally over browsed by deer) may also have a bearing the use of depredation permits. A more extensive utilization of this permit can be beneficial toward reducing the deer population in the Hopewell Valley. The Task Force, supported by municipal officials and staff, should work with the agricultural community to increase the use of Agricultural Depredation Permits.

2C) Encourage and facilitate Deer Management Programs that focus harvests on female deer

Deer Management Programs (DMP) are utilized locally by Mercer County Parks, D&R Greenway Land Trust and Friends of Hopewell Valley Open Space (See <http://deerinbalance.org/deer-management-program-resources/>). The implementation of DMP's by all land managers / property owners that provide access to hunters would significantly reduce the Hopewell Valley deer population. The incorporation of Quality Deer Management (QDM) principles into DMP's should be encouraged to produce a healthier herd structure in addition to reducing the overall herd size. The Task Force should provide outreach to public and private land owners that allow hunting access to increase the use of DMP's containing QDM principles.

2D) Encourage and facilitate program for venison donation to local food banks

The Task Force should assist with a creation of a Hopewell Valley venison donation program. This would include transportation, processing and distribution with a network of hunters, butchers, and food banks. Hopewell Valley hunters that responded to the public questionnaire cited a lack of outlets for venison restricted their harvesting of deer (See Appendix A – Question 9b). The Task Force recommends that Hopewell Valley municipalities contribute \$5,000 annually to the program. This amount would accommodate the donation of approximately 50 deer, which translates to 5,000 pounds of venison or 20,000 meals. The Task Force should seek additional contributions from the public and private sector to enhance the program once the program is established with a recurring annual contribution from the municipalities.

A partnership could be formed with Hunters Helping the Hungry (HHH) - www.huntershelpingthehungry.org. HHH is a non-profit organization that facilitates venison donations. In 2009, HHH was able to process 15,000 pounds of venison (ca. 60,000 meals) utilizing \$15,000 of funding (ca. \$1 per pound of venison). Jack Chellew and John Person are HHH contacts.

The Task Force (via Morton Rosenthal) has conducted research toward establishing a relationship with local food banks, butchers and HHH. The closest food bank to the Hopewell Valley is the Trenton Soup

Kitchen (Denis Micai, CEO). The butcher that provides meat to the Trenton Soup Kitchen is City Beef. Unfortunately, USDA regulations do not allow City Beef to process game in the same building as agriculturally-produced meats and they would be unable to participate in any future program. [Note: Butchers of venison must meet the following standards: 1) Walk-in cooler with temperatures of 38 degrees or lower, 2) Two tracks or other ways to segregate venison from other meats, 3) Freezer that is at zero degrees, and 4) Pass sanitary inspections by State Board of Health.] HHH lists eight participating butchers in New Jersey. The closest participating butcher is John Person, located on State Highway 31 South in Lebanon, NJ (ca. 30 minutes north of Hopewell Valley). Mr. Person is capable of processing venison that could be supplied to the Trenton Soup Kitchen.

An additional avenue to explore might involve coordination of private landowners and hunters. Research should be conducted to determine the feasibility of allowing private residents that would like to consume venison and hunters that might otherwise limit their hunting activity because they do not have an outlet for harvested deer. As an example, private residents might pay for butchering costs and keep processed venison that a hunter drops off with a participating butcher. The Task Force should work with the Fish & Game Council and Division of Fish & Wildlife to determine whether this strategy is acceptable under current game code and explore options toward modifying the code to allow this strategy in the future.

2E) Consult with the NJ Division of Fish & Wildlife to conduct strategies listed above

The Fish and Game Council and NJ Division of Fish & Wildlife are critical partners in all efforts regarding deer management. Their Community Based Deer Management Program (CBDMP) can allow strategies such as season extensions in particular high deer density areas to increase harvests and special rules to access pocket deer.

A request for changes to the game code for Deer Management Zones in the Hopewell Valley that facilitate Quality Deer Management is seen as critical toward attainment of all stated goals. The Task Force, along with interested Hopewell Valley hunters, has begun to discuss QDM concepts and plan to approach the Division of Fish & Wildlife in fall 2010. Potential changes could include requirements for antlerless deer harvest through licensing incentives and restrictions on buck harvests (e.g., allowance of only one buck per hunter per year, prohibiting the harvest of bucks with less than 6 antler points).

Strategy Set #3: Avoidance of Deer Impacts

3A) Improve awareness of methods that reduce Deer Vehicle Collisions

Research on road-related countermeasures does not suggest any effective methods that could be utilized in the Hopewell Valley. However, increased outreach via public service announcements or other methods should be conducted during the fall to coincide with the deer breeding season when animal movement is generally at its peak and deer vehicle collisions are most likely to occur. For example, electronic traffic message boards can be placed along roadways with the highest risk for collisions during the fall deer mating season. The Task Force should work with Hopewell Valley municipalities to increase outreach and education about deer vehicle collisions.

3B) Improve awareness of methods that reduce Lyme disease

There are multiple strategies that can be carried out by individuals to reduce their risk of contracting the disease. Awareness of ticks and the need to search for ticks following likely exposure activities is critical. The use of repellents, wearing socks over the bottom of pants, wearing of light clothing to detect ticks, etc. are all useful prevention strategies. The Task Force should work with Hopewell Valley municipalities to increase outreach and education about Lyme disease prevention.

Actions Recommended, continued...

Excerpts from these next two examples begin on the next page.

(Example #2). This excerpt is from Amherst, New York. In reviewing this document, you'll see that it's organized a bit differently. The recommended action begins at the bottom of the first page of the PDF, and is included as the last potential action alternative after a discussion of a variety of potential approaches. The full plan is available [here](#).

First, the plan gives a quick summary of the approach. Then, it lists all of the actions included in this approach, organized by which actions are in support of the whole-town goal or the more focused hot-spot goal. As a reminder, here are the goals Amherst identified for their plan:

The DVA Management Plan establishes its initial goal at two spatial scales, whole town and hotspots. These scales are a natural division and useful since different DVA management tools can be applied at each scale. Tangible goals for each scale are defined as follows:

1. At the whole town scale, reduce DVA numbers to the lower levels experienced in the years after significant lethal control was conducted and an associated decrease in DVAs was experienced (1997-2000). If this goal is attained, more rigorous goals can be established through the adaptive planning process if this is deemed desirable.
2. At the hotspot scale, select specific DVA hotspots and diminish these with targeted approaches. Progress toward the hotspot goal will be measured with parameters such as intensity and extent of hotspots and DVA counts within the hotspots. Lessons learned from successfully treated hotspots could be applied to other hotspots through the adaptive management process.

The plan then reviews environmental impacts and advantages of this approach, how monitoring the effectiveness of this approach could be carried out, as well as the associated costs with implementing this approach. Finally, it concludes with a discussion of how the recommended set of actions would support the plan's goals.

(Example #3). This last example is from Burnsville, Minnesota. This plan has organized its actions by whether or not they support monitoring, education, ordinances, or deer population control. It presents citywide approaches, as well as recommended actions for specific management units within the city. For example, Table 9 identifies the objective (purpose) for managing the Northwest Management Unit of the city, some information about the unit, and unit-specific management actions. The full plan is available [here](#).

In sum, when listing your plan's recommended actions:

- Be sure to link the actions to objectives
- Identify who is responsible for carrying out those actions and when
- Identify the area targeted by particular actions
- Cite sources to support your rationale for selecting particular actions

Example #2: Pages 55 through 59

Example #3: Pages 60 through 64

Records of number, location, time, approximate age, and gender should be kept by contractors or volunteers for deer harvested through nuisance permits and bait and shoot so that effects of these programs can be more thoroughly understood. These should be databased in a way that permits efficient and accurate analysis.

5.4.6. Costs - Cost categories for this alternative include (note, some of these can be considered optional):

1. Fencing
2. Monitoring
3. Nuisance permit
4. Bait and shoot
5. Vegetation control
6. Vegetation plots and exclosures (could be done with graduate student assistance)
7. Contractual Deer Counts
8. Consulting assistance for analysis of data
9. Public awareness materials that inform the public regarding various DVA management actions.

5.4.7. Support of the Goal - This alternative would support the “whole town” goal through deer population reduction. It would support the hot spot goal in areas where hot spots are close to the area of population control.

5.5. Integrated Human – Deer Focus Alternative (Recommended Alternative)

A practical approach to reducing DVAs in Amherst combines the techniques from the previously described alternatives in an integrated adaptive management plan. Adaptive management uses findings from planned monitoring to trigger specific management actions and inform the periodic refinement of the plan. In Amherst, this would allow for a staged approach to managing DVAs so that application of techniques in specific areas is influenced by carefully

collected and analyzed information. An adaptive plan minimizes potential environmental impacts by proceeding in a systematic way with ongoing monitoring designed to identify both whether the approach is working and if any unanticipated or undesirable outcomes develop.

5.5.1. Actions - Specific actions can be used to address both the “whole town” and the “hot spot” goals. There is likely some overlap between the effects of these actions and some can be considered optional depending on budget, implementation strategy, and calendar.

Actions that support the “*whole town*” goal include:

1. Conduct a program of general public education via press releases, posters, pamphlets on the DVA Management Plan, DVAs in Amherst, and how to avoid DVAs.
2. Integrate a DVA component into Driver’s Education materials.
3. Publicize and enforce the no deer feeding law.
4. Work with the NYSDEC to encourage use of nuisance permits in targeted areas. Continue this use for 3-4 years with monitoring to determine effect on DVAs.
5. If after 3-4 years of aggressive nuisance permit deer harvest, DVA numbers do not meet the goal, then suspend the firearms ordinance and implement a three-year program of deer harvest by suspending the firearms ordinance and using bait and shoot with a professional wildlife management service. Management zones with sufficient blocks of park and open land should be targeted (e.g., management zones 4, 5, and 6). After this, nuisance permit harvest may maintain lower deer numbers for a period of time in some areas.

Actions that support the “*hot spot*” goal:

1. Deploy special deer signs from October-January at selected “hot spot” locations.
2. Facilitate press coverage of special signs that advises people to lower speed and increase awareness and encourages them to assist in implementing the plan.
3. Encourage strict enforcement of existing speed limits in the vicinity of the hot spots and assign more traffic officer presence in these areas.
4. Install lit signs that instantaneously report speed to the driver at selected site(s).
5. Run TV and/or radio ads (or Public Service Announcements) that describe the DVA hotspot areas and alert people to take special care.

6. Select two hot spots where strategic application of fencing might influence the ability of deer to enter the roadway.

5.5.2. Potential Environmental Impacts - Through both nuisance permit use and bait and shoot practices, the deer population of Amherst would be somewhat reduced. Since white-tailed deer is not a species at risk of regional extinction, adverse impacts to the species do not result from lethal control. There will be some reduction of local subpopulations. If lethal methods are used, appropriate carcass use is required.

5.5.3. Potential Environmental Advantages - More aware drivers may reduce DVAs or severity of property damage and human health risk. A considerable reduction of the Amherst deer population carried out through nuisance permits and bait and shoot in the early 1990s had a demonstrable effect on DVAs. A similar response is forecast in this case. Overall reduction of deer numbers would benefit native biota in woods and parks where deer herbivory is quite high. Similar benefit would be realized by agricultural and landscape interests.

A social benefit derived from use of bait and shoot is the donation of deer meat (venison) to the Western New York Food Pantry Organization. This organization provides food for poor and destitute people in the City of Buffalo area. If it is determined through the adaptive implementation of the DVA Management Plan, that deer need to be killed through bait and shoot, then every effort will be made to ensure that maximum public benefit is realized. Part and parcel of this process includes appropriate care of the killed deer (including proper field dressing, disposal of waste parts, and hygienic handling of venison). In addition, nuisance permit holders will also be informed of the option of venison donation to the Food Pantry.

5.5.4. Mitigation - Carefully researched and planned nuisance permit and bait and shoot programs with appropriate safeguards must be used. This includes protection and enforcement for bait and shoot locations so that the process is not inadvertently or deliberately disrupted and the safety of the public and professional contractors is ensured. Deer fencing areas should be carefully selected.

5.5.5. Monitoring and Adaptive Management - In support of “whole town” goal, the plan recommends that monitoring efforts include DVA record keeping in a form suitable to efficient

analysis of data. Three years of data should be assembled during/after the implementation of specific actions. These data should be compared to target data set using appropriate statistical tests. In the case of aggressive nuisance permit application, DVA data should be evaluated after a minimum of three years. These data should be compared to target data set (years 1997-2000) using appropriate statistical tests. If “whole town” goal is not met, the plan recommends that bait and shoot harvest of deer be implemented in areas where appropriate. After three years, monitoring should compare the DVA data set to the target data set using appropriate simple statistical tests to decide whether more bait and shoot is required or if nuisance permit use can maintain the lower deer population.

In support of “hot spot” goal, monitoring efforts should include DVA record keeping in a form suitable to efficient analysis of data. Three years of data should be assembled in the GIS database and analyzed to view extent and intensity of each targeted hot spot. In addition to the visual-based analysis, data for each hotspot should be compared to the previous years of data for each hot spot using appropriate statistical tests.

Contractual deer counts by NYSDEC should be continued as an index of deer population. If possible, this should be done on an annual basis, as it allows for a more rapid determination of change. If for budgetary reasons the counts are done on a two or three year basis, population changes cannot be statistically detected as quickly. As another deer population index and a method of estimating herbivory effects of deer, it is recommended that native vegetation plots be established in various natural areas, including use of small fenced exclosures to demonstrate potential vegetation in absence of deer. This would also serve the purpose of an educational tool, informing the public of deer effects.

Records of number, location, time, approximate age, and gender should be kept by contractors or volunteers for deer harvested through nuisance permits and bait and shoot so that effects of these programs can be more thoroughly understood. These should be databased in a way that permits efficient and accurate analysis.

The Town Board might consider establishing an *Adaptive Management Committee* whose membership includes representatives from Amherst Planning Department and the public. The committee’s role would be to implement the management plan and make ongoing decisions.

5.5.6. Costs - Cost categories for this alternative include (note, some of these can be considered optional):

1. Program of general public education via press releases, posters, pamphlets on the DVA Management Plan, DVAs in Amherst, and how to avoid DVAs.
2. Integrating a DVA component into Driver's Education materials.
3. Publicizing and enforcing the no deer feeding law.
4. Special "hot spot signs" (design, manufacture, deployment/retrieval, and storage).
5. "Hot spot" press releases and public education information.
6. Special lit signs that instantaneously report driver speed to the driver.
7. Increased police effort to manage speed in hot spot areas.
8. Monitoring "whole town" efforts (including some professional assistance).
9. Monitoring "hot spot" efforts (including some professional assistance).
10. Fencing
11. Monitoring
12. Nuisance permit
13. Bait and shoot
14. Vegetation control
15. Vegetation plots and exclosures (could be done with graduate student assistance)
16. Contractual Deer Counts
17. Consulting assistance for analysis of data

5.5.7. Support of the Goal – This integrated alternative is the most likely to support both "whole town" and "hot spot" goals. Although it is potentially more complex and costly, it also has the greatest opportunity to reduce DVAs that at average cost of \$2,500 (estimates obtained from Technical Working Committee). This integrated alternative also is likely to enjoy broader public support than the other alternatives.

The integrated alternative also lends itself readily to the management zones that have been established and used for much of the DVA analysis. Given the diversity of the town and variety of factors involved with DVAs, use of management zones facilitate plan implementation.

5.6. Environmental Consequences of Alternatives and Mitigation Measures

The Amherst Town Board (Lead Agency) and the Planning Department (SEQRA Coordinators) identified potentially significant adverse impacts of a DVA management plan in a

7.0 RECOMMENDATIONS

Based on the information collected regarding the various management strategies, city regulations, and safety considerations, a comprehensive Deer Management Program is being recommended for the City of Burnsville. The components recommended to be included in the Program are outlined in the following sections.

Citywide Management Strategies

Monitoring

- The city will continue to use the DNR annual aerial survey to document annual population size.
- The city has created a Deer Monitoring Report Form (Attachment A) that will be made available to residents to aid in monitoring of deer.
- Coordination of crash data will be initiated with other agencies to improve data tracking.
- In conjunction with the removal options described later in this section, age and sex information will be collected on harvested deer.
- The City will partner with the STOP group to implement a deer exclosure demonstration project in Terrace Oaks Park.

Education

- Inform residents, especially in problem areas, regarding the impact of deer feeding on deer and on adjacent parcels. This can be achieved through news articles, use of local cable program, and neighborhood workshops.
- Educate residents about the available methods to protect their property from deer damage including repellents, fencing and unpalatable plants. This can be achieved through news articles, cable programming and neighborhood workshops.
- Inform residents of deer management needs and goals (density trends, crash rates, complaints, habitat impacts).
- Inform residents of designated areas, times, special provisions and restrictions when special archery hunts are utilized. Specific participant orientation and proficiency tests will also be part of any hunting removal option.
- Install signage along city roadway segments where car/deer crashes are concentrated, which warn motorists of potential for deer crossings, and recommend sign locations to the state and county for roads in their jurisdiction.

Ordinances

- Implement a Feeding Ban Ordinance

The purpose of a feeding ban is to discourage residents from placing corn or other grains in amounts and locations that would attract deer to the area. Deer are opportunistic foragers, meaning they don't do all their eating in one place. However, they can also be very routine in their travel and eating patterns. What this means with regard to residential feeding areas is that generally deer will have a travel pattern they will use for foraging and will eat vegetation along the way, they won't just limit their feeding to feeding sites left by residents. It also explains why one neighborhood can have a high number of deer damage complaints and others may rarely see deer.

The purpose of the feeding ban is to eliminate these deer attractions, which should reduce, over time, the depredation impacts to adjacent residents. The following language was recommended and approved September 17, 2001, for a Feeding Ban Ordinance (See Attachment B for complete ordinance):

Prohibition. No person may place or permit to be placed on the ground, or within five (5) feet of the ground surface, any grain, fodder, salt licks, fruit, vegetables, nuts, hay or other edible material (including feed for birds), which may reasonably be expected to intentionally result in deer feeding, unless such items are screened or protected in a manner that prevents deer from feeding on them. Living fruit trees and other live vegetation shall not be considered as deer feeding.

- Revise the Current Firearms Discharge Ordinance

The City of Burnsville will consider amending this ordinance to facilitate revised distance requirements (200' rather than the current 500') for private landowners operating outside of a "special hunt", and to require a permit to discharge a firearm, so deer removal information can be collected by the City. This revision should occur prior to the fall 2003 archery hunting season.

Population Control Strategies

- Sharpshooting will be utilized as the initial method for controlling the deer population in the first two years of the Program (2001/2002 and 2002/2003). It will be phased in over a two-year period, starting in winter of 2001/2002 in the East Central, Northeast and Northwest Units. During the second year of sharpshooting, the West Central, Southwest and Southeast Units would be added as necessary to meet density goals. Sharpshooting will primarily occur on public lands in management units with high deer density. Initially, the deer population will be reduced to the upper end of the established population range (25 deer per square mile of deer habitat), however additional removal will be conducted down to the lower end of the range (15 deer per square mile) in special cases where a resident demonstrates a hardship due to problem deer, or in priority habitat areas as deemed necessary by the Director of Natural Resources.
- Archery hunting will be utilized to maintain the management goals after they are achieved through sharpshooting. Archery hunting would be allowed on commercial and private lands as outlined in Attachment G. This strategy would not be employed until the fall of 2003, after evaluating the effectiveness of the sharpshooting program. In the event that archery hunting alone is not able to maintain the goals identified in the Management program (goals are exceeded by 20 percent), sharpshooting will be used as a supplemental control method, as needed.

A review and evaluation of new population control strategies would be conducted annually by the PNRC along with the other parts of the program. The PNRC would recommend any changes to the population control strategies for City Council consideration following that

review.

Specific program recommendations for each management unit are described in Tables 9-14 in the following pages. The management units are illustrated in Figures 5 through 10.

[Figure 5: Northwest Management Unit \(73 KB\)](#)

Table 9: Northwest Management Unit Recommendations

Purpose: Manage for a population density of 15 to 25 deer per square mile of preferred habitat within the Northwest Management Unit.	
Problems/Issues	Recommended Management Option
<p><u>Land Use:</u> primarily commercial development.</p> <p><u>Preferred Habitat:</u> is concentrated in wooded area along the river corridor.</p> <p><u>NRMP priority</u>¹: lowland forest areas in this unit identified as high priority.</p> <p><u>Unit Population Goal:</u></p> <ul style="list-style-type: none"> 12 to 19 deer <p><u>2001 Unit Statistics</u>²:</p> <ul style="list-style-type: none"> January Deer Count: 68 deer within unit. Projected December Deer Numbers: 82 deer Crashes: 6, with all but one occurring on TH 13 and I-35W Complaints: 0. Removal Needed: 63 to 70 deer 	<ul style="list-style-type: none"> Investigate potential removal options with landowners along the river. The recommended management goal would be 15 to 25 deer per square mile of preferred habitat, however a lower goal may be more appropriate for the high priority floodplain forest areas identified in the NRMP. The potential for an exclosure device should be discussed with the landowners in the area of question to determine how deer populations are affecting the high priority woodland. Inform landowners of ordinance that allows archery hunting, during the regular DNR archery season under the special provisions designated by the city, as well as inform them of availability of Deer Management and Intensive Harvest Permits. Coordinate with private landowners to implement sharpshooting option to reduce the population density in this area to a long-term density of 15 to 25 deer per square mile, as needed to meet goal.

Notes: ¹ NRMP refers to the Burnsville Natural Resource Master Plan

² Complaint and crash data totals are from 1998 through 2000. Deer Numbers and Removal Needed are based on 2001 DNR aerial counts, projections and the density goal range proposed for each unit.

[Figure 6: West Central Management Unit \(251 KB\)](#)

Table 10: West Central Management Unit Strategies

Purpose: Manage for a population density of 15 to 25 deer per square mile of preferred habitat within the West Central Management Unit.	
Problems/Issues	Recommended Management Option
<p><u>Land Use:</u> primarily residential, except for the commercial strips along the north and south unit boundaries.</p> <p><u>Preferred Habitat:</u> is associated with the Kraemer Nature Preserve</p> <p><u>NRMP priority</u>¹: willow swamp within the nature preserve identified as high priority.</p> <p><u>Unit Population Goal:</u></p> <ul style="list-style-type: none"> 4 to 6 deer <p><u>2001 Statistics</u>²:</p> <ul style="list-style-type: none"> January Deer Count: 17 deer within unit. Projected December Deer Numbers: 20 deer Crashes: 21 with highest numbers along TH 13 and county road 5. Complaints: 1. Removal Needed: 14 to 16 	<ul style="list-style-type: none"> Implement sharpshooting option to reduce the winter population in this area to a long-term density of 15 to 25 deer per square mile, as needed. Archery hunting in this unit is not likely feasible due to the sparse tree cover within Kraemer park. Modified hunting provisions for this area along with coordination with adjacent residents and businesses would be required to accommodate archery hunting in this unit.

Notes: ¹ NRMP refers to the Burnsville Natural Resource Master Plan

² Complaint and crash data totals are from 1998 through 2000. Deer Numbers and Removal Needed are based on 2001 DNR aerial counts, projections and the density goal range proposed for each unit.

[Figure 7: Southwest Management Unit \(296 KB\)](#)

Table 11: Southwest Management Unit Strategies

Purpose: Manage for a population density of 15 to 25 deer per square mile of preferred habitat within the Southwest Management Unit.	
Problems/Issues	Recommended Management Option
<p><u>Land Use:</u> primarily residential development near the preferred habitat, with commercial development concentrated along the north and east unit boundary.</p> <p><u>Preferred Habitat:</u> is associated with Murphy-Hanrehan and CamRam parks as well as the large lot residential areas</p>	<ul style="list-style-type: none"> Remove deer within this management unit to maintain a winter population density of approximately 15 to 25 deer per square mile with focus on Murphy-Hanrehan, CamRam and Judicial parks and residential areas as needed. A lower goal may be more appropriate for the high priority

<p>to the east.</p> <p><u>NRMP priority</u>¹: woodland within Judicial park is identified as high priority.</p> <p><u>Unit Population Goal</u>:</p> <ul style="list-style-type: none"> 25 to 42 deer <p><u>2001 Statistics</u>²:</p> <ul style="list-style-type: none"> January Deer Count: 89 deer within unit. Projected December Deer Numbers: 107 deer Crashes: 22 with many occurring on county road 5. Complaints: 5. Removal Needed: 65 to 82 	<p>areas as identified in the NRMP.</p> <ul style="list-style-type: none"> Implement sharpshooting option to reduce the population density in this area to a long-term density of 15 to 25 deer per square mile, as needed to meet goal (January-March). Efforts would be concentrated initially in Cam Ram and Judicial Parks. Allow expansion of Hennepin Parks sponsored archery removal program into Cam Ram Park from adjacent Murphy-Hanrehan park. Use opportunity to coordinate with Capable Partners and Metro Bowhunters Resource Base for participation. Inform neighborhood of ordinance that allows archery hunting, during the regular DNR archery season under the special hunting provisions designated by the city (September-December), as well as inform them of availability of Deer Management and Intensive Harvest Permits.
--	---

Notes: ¹ NRMP refers to the Burnsville Natural Resource Master Plan

² Complaint and crash data totals are from 1998 through 2000. Deer Numbers and Removal Needed are based on 2001 DNR aerial counts, projections and the density goal range proposed for each unit.

[Figure 8: Northeast Management Unit \(347 KB\)](#)

Table 12: Northeast Management Unit Strategies

<p>Purpose: Manage for a population density of 15 to 25 deer per square mile of preferred habitat within the Northeast Management Unit, in cooperation with MVNWR.</p>	
Problems/Issues	Recommended Management Option

Actions Considered

It is likely that your community reviewed a variety of potential action alternatives prior to recommending a specific course of action. If so, an explanation of which actions were considered and why they were not recommended provides an important part of the rationale for your implementation plan. Be as specific as possible. For example, if deer immunocontraception was a popular choice among residents but the deer committee found it not to be feasible in your community, make sure you clearly explain why. Was it cost? Effectiveness? Time expected for results? If a management action was considered and rejected, the reasons why should be communicated in this part of your plan. You may consider supporting your choices with data from scientific studies, recommendations from your state wildlife agency, or examples from other communities.

Including these kinds of considerations is an important part of communicating the rationale for your plan; as mentioned earlier, controversy around deer management is often focused on the actions selected. Presenting a clear rationale as to why particular actions were not suitable for your community is an important part of developing a sound, acceptable deer plan.

Sometimes communities may describe all the potential lethal and nonlethal problems for addressing their deer management concerns in their plan prior to indicating which they have selected, reviewing all of the potential costs and benefits as well as opportunities and constraints to implementing those options. This can be effective ordering technique as well, as long as when the selected actions are described the rationale for selecting that particular action in contrast to the other action alternatives is clear.

You may find some guidance regarding the feasibility of particular deer management action alternatives in consulting your state wildlife agency. For example, Pennsylvania's Game Commission has produced a [guide to community deer management](#) that outlines some of the advantages and disadvantages of particular actions communities might take, as well as the state guidelines and regulations applicable to those actions.

After completing this module, you should....

- ✓ Understand why it is important to include the actions your community considered but did not select
- ✓ Know how to provide rationale for why actions were not suitable

Actions Considered, continued...

Amherst's full plan can be found at:
<https://deeradvisor.dnr.comell.edu/resource/amherst-new-york-deer-vehicle-accident-management-plan>

Table 8. Alternatives, Environmental Impacts, Information Sources, and Mitigation

Alternative	Potential Environmental Impacts	Information Sources	Mitigation
No Action	DVAs continue at high numbers Disposal of carcasses (from DVAs) Deer-related property/resource damage would continue or increase	Available information from Amherst database Available information from resource agencies and scientific literature	None possible
Human Behavior Focus	No adverse environmental impacts	None required	None necessary
Deer Behavior & Population Focus	Very limited adverse environmental impacts from tools that affect deer behavior. If fencing is used, potential impacts involve interruption or relocation of deer or other mammal movement patterns Since white-tailed deer is not at risk of regional extinction, no adverse impacts to the species result from population control. Deer carcasses from lethal control (Note: If immunocontraception (IC) or other fertility control is considered in the future, additional information required.)	Available literature on devices and ecological literature to predict and address effects Secondary measures of deer population (e.g., native vegetation) might be useful (Literature on IC and results from research)	Well-planned placement of devices Carefully researched and planned programs with appropriate precautions and safeguards Proper use of deer carcasses
Integrated Human – Deer Focus	Since this alternative draws from the human behavior focus and the deer behavior/population focus alternatives, potential impacts are same as above	Same as information sources listed in cells above	Same as listed in cells above

5. PLAN ALTERNATIVES

5.1. Introduction

This plan's focus is reducing DVAs and the primary metrics are the numbers of DVAs and the patterns of their distribution in the landscape. The scientific rationale for management plans has been criticized for being founded on dogma rather than data (Rutberg 1997). In contrast, the Amherst DVA Management Plan has relied on carefully organized and analyzed data that is specific to Amherst DVAs. The plan rests on this foundation and integrates a variety of suitable tools applied in appropriate settings. As discussed in earlier sections of this plan, the causes and solutions for DVAs are complex. The previous section discussed available tools for addressing DVAs. This section of the plan outlines four plan alternatives, each applying a distinct combination of DVA management tools toward the *whole town* and *hotspot* goals. In each alternative, tools are applied that are judged as having the best chance of success in Amherst. The description of each alternative contains seven subheadings (*Actions*, *Potential Environmental Impacts*, *Potential Environmental Advantages*, *Mitigation*, *Monitoring and Adaptive Management*, *Costs*, and *Support of Goal*) that characterize the alternative and facilitate comparisons between alternatives. Following this introduction, the next subsection presents a **No Action Alternative** that calls for no targeted effort to be taken to reduce DVAs. The next subsection presents a **Human Behavior Focus Alternative** where emphasis is placed on actions that affect human behavior. The next subsection presents a **Deer Behavior and Population Focus Alternative** that applies efforts to change deer behavior and reduce deer population. The final subsection presents the recommended alternative: an **Integrated Human–Deer Focus Alternative** that combines DVA management actions from the **Human Behavior Focus Alternative** and the **Deer Behavior and Population Focus Alternative**. Some details of implementation of any of the alternatives will need further development by Town Planning Staff during the implementation phase.

5.2. No Action Alternative

The “No Action Alternative” implies that no steps would be taken to influence the number of DVAs in Amherst. DVAs would continue to be influenced by deer population size and distribution, traffic distribution and speed, and other related variables.

5.2.1. Actions - No actions toward DVA management would be established and implemented in this alternative.

5.2.2. Potential Environmental Impacts - Number of DVAs is likely to increase as deer population, numbers of drivers, and development all increase. Deer population may increase and place greater stress on agricultural lands, landscaping, and native vegetation.

5.2.3. Potential Environmental Advantages - No advantages to the environment.

5.2.4. Mitigation - No mitigation is necessary.

5.2.5. Monitoring and Adaptive Management - No monitoring is necessary, unless the Town sees reason to continue to monitor DVAs and/or deer counts. Other monitoring could include measures of herbivory on native vegetation as an indicator of deer impacts on habitat.

5.2.6. Costs - No additional costs of implementing a plan, but DVA costs will continue and may rise because of inflation and likely increase in numbers of deer and traffic (and therefore, DVAs). Currently, costs per DVA are estimated at \$2,500 and total annual costs approach \$750,000 to \$1,000,000 (estimates obtained from Technical Working Committee).

5.2.7. Support of the Goal - Unless unforeseen events causes a large reduction in the deer herd (such as disease or diminished habitat quantity or quality), this alternative is extremely unlikely to support the goal of the plan.

5.3. Human Behavior Focus Alternative

Although it is recognized that DVAs result from a variety of causes, in this alternative, the emphasis is placed on actions that will affect human behaviors.

5.3.1. Actions – In this alternative, specific actions can be used to address both the “whole town” goal and the “hot spot” goal.

Actions that support the “whole town” goal include:

1. Conduct a program of general public education via press releases, posters, pamphlets on DVA Management Plan, Amherst DVAs, and how to avoid DVAs.
2. Integrate a DVA component into Driver’s Education materials.
3. Publicize and enforce the no deer feeding law.

Actions that support the “hot spot” goal include:

1. Deploy special deer signs during October, November, December, and January at selected hot spot locations.
2. Facilitate press coverage of these special signs that advises people to lower speed and increase awareness and encourages them to assist in implementing the DVA management plan.
3. Encourage strict enforcement of existing speed limits in the vicinity of the selected hot spots.
4. Install lit signs that instantaneously report driver speed to the driver in selected hot spots.
5. Run TV and/or radio ads (or Public Service Announcements) that describe the DVA hotspot areas and alert people to take special care.

5.3.2. Potential Environmental Impacts - Deer population may increase, placing greater stress on agricultural lands, landscaping, and native vegetation (as opposed to alternatives where some population control may occur).

5.3.3. Potential Environmental Advantages – Increased drivers’ awareness may reduce number of DVAs or severity of property damage and human health risk.

5.3.4. Mitigation - No mitigation is necessary.

5.3.5. Monitoring and Adaptive Management - In support of the “whole town” goal, the plan recommends that monitoring include DVA record keeping in a form suitable to efficient data analysis. It may benefit accuracy if the reporting police officer or the deer carcass pick-up contractor marked DVAs with a hand-held GPS unit (global positioning system). A minimum of three years of data should be assembled during/after the implementation of specific Actions. These data should be compared to the target data set (years 1997-2000) using appropriate statistical tests. (Note: Rationale for this target is provided in Sections 2.4 and 3.4.) In support of “hot spot” goal, monitoring efforts should include DVA record keeping in a form suitable to efficient data analysis. As with the “whole town” goals, a minimum of three years of data should be assembled in the GIS database and analyzed to view extent and intensity of each targeted hot spot and any changes it displays. In addition to the visual-based analysis, data for each hotspot should be compared to previous years of data for each hot spot using appropriate statistical tests.

5.3.6. Costs - Cost categories for this alternative include:

1. Program of general public education via press releases, posters, pamphlets on the DVA Management Plan, DVAs in Amherst, and how to avoid DVAs.
2. Integrating a DVA component into Driver’s Education materials.
3. Publicizing and enforcing the no deer feeding law.
4. Special “hot spot signs” (design, manufacture, deployment/retrieval, and storage).
5. “Hot spot” press releases and public education information.
6. Special lit signs that instantaneously report driver speed to the driver.
7. Increased police effort to manage speed in hot spot areas.
8. Monitoring “whole town” efforts.
9. Monitoring “hot spot” efforts.

5.3.7. Support of the Goal - Since analysis has shown that deer behavior and population sizes play a role in DVA numbers, relying solely on altering human behaviors may not have as great an effect as a more integrated approach (that also includes deer behavior and population management tools). This is perhaps especially true at the “whole town” scale as deer populations may have a more significant influence overall. At the “hot spot” level, targeted education and human behavior modification may be able to show an effect.

5.4. Deer Behavior and Population Focus Alternative

As has been previously described, deer behavior and population are important factors in the numbers and distribution (in time and space) of DVAs. This alternative emphasizes actions that will influence deer behavior and population.

5.4.1. Actions - Specific actions can be used to address both the “whole town” goal and the “hot spot” goal. There is likely some overlap between the effects of these actions.

Actions that support the “whole town” goal include:

1. Work with the NYSDEC to encourage use of nuisance permits in targeted areas. Continue this use for 3-4 years with monitoring to determine effect on the number of DVAs and support of goals.
2. If after 3-4 years of aggressive nuisance permit deer harvest, DVA numbers do not meet the goal, then suspend the firearms ordinance and implement a 3-year program of bait and shoot with professional wildlife management service. Approximately 200 deer per year should be taken during this period. This would approximate the number of deer taken during the bait and shoot and nuisance permit programs of the mid-1990s (1994, 1995, and 1996) that resulted in a reduced number of DVAs in subsequent years (1997-2000). After this kind of population reduction, nuisance permit harvest may maintain lower deer numbers

for a period of time in some areas. The recommendation represents a conservative approach that is sensitive to community concerns regarding a bait and shoot action. Two hundred is a minimal number of deer taken that would predictably demonstrate a significant reduction in DVAs. In addition, establishing a recommended number allows accurate estimation of cost.

Actions that support the “hot spot” goal include:

1. Select hot spots where strategic application of fencing might influence the ability of deer to enter the roadway.

5.4.2. Potential Environmental Impacts - Through both nuisance permit use and bait and shoot practices, the deer population of Amherst would be somewhat reduced. Since white-tailed deer is not a species at risk of regional extinction, adverse impacts to the species do not result from lethal control. There will be some reduction of local subpopulations. If lethal methods are used, appropriate carcass use is required.

5.4.3. Potential Environmental Advantages - A considerable reduction of the Amherst deer population carried out through nuisance permits and bait and shoot in the early 1990s had a demonstrable effect on DVA numbers. A similar response is expected in this case. An overall reduction of the deer herd would benefit native flora and fauna in woods and parks where deer herbivory is currently high.

A social benefit derived from use of bait and shoot is the donation of deer meat (venison) to the Western New York Food Pantry Organization. This organization provides food for poor and destitute people in the City of Buffalo area. If it is determined through the adaptive implementation of the DVA Management Plan, that deer need to be killed through bait and shoot, then every effort will be made to ensure that maximum public benefit is realized. Part and parcel of this process includes appropriate care of the killed deer (including proper field dressing, disposal of waste parts, and hygienic handling of venison). In addition, nuisance permit holders will also be informed of the option of venison donation to the Food Pantry.

5.4.4. Mitigation - Carefully researched and planned nuisance permit and bait and shoot programs with appropriate precautions and safeguards. This includes protection and enforcement for bait and shoot locations so that the process is not inadvertently or deliberately disrupted and the safety of the public and professional contractors is ensured. Make certain that deer fencing is not detrimental to other wildlife movement patterns.

5.4.5. Monitoring and Adaptive Management - In support of “whole town” goal, the plan recommends that monitoring efforts include DVA record keeping in a form suitable to efficient analysis of data. DVA data should be assembled after 3-4 years of aggressive nuisance permit use. These data should be compared to target data set (years 1997-2000) using appropriate statistical tests. If “whole town” goal is not met, the plan recommends that bait and shoot harvest of deer be implemented in areas where appropriate. After three years, monitoring efforts should compare the DVA data set to the target data set using appropriate statistical simple tests to decide whether more bait and shoot is required or if nuisance permit use can maintain the deer population numbers.

In support of “hot spot” goal, the plan recommends that monitoring efforts include DVA record keeping in a form suitable to efficient analysis of data. Three years of data should be assembled in the GIS database and analyzed to view extent and intensity of each targeted hot spot. In addition to the visual-based analysis, data for each hotspot should be compared to the previous years of data for each hot spot using appropriate statistical tests.

Contractual deer counts by NYSDEC should be continued as an index of deer population. If possible, this should be done on an annual basis, as it allows for a more rapid determination of change. If budget or time constraints dictate that counts are done on a two or three year basis, population changes cannot be statistically detected as quickly.

As another deer population index and a method of estimating herbivory effects of deer, it is recommended that native vegetation plots be established in various natural areas, including use of small fenced exclosures to demonstrate potential vegetation in absence of deer. This would also serve the purpose of an educational tool, informing the public of deer effects.

Records of number, location, time, approximate age, and gender should be kept by contractors or volunteers for deer harvested through nuisance permits and bait and shoot so that effects of these programs can be more thoroughly understood. These should be databased in a way that permits efficient and accurate analysis.

5.4.6. Costs - Cost categories for this alternative include (note, some of these can be considered optional):

1. Fencing
2. Monitoring
3. Nuisance permit
4. Bait and shoot
5. Vegetation control
6. Vegetation plots and exclosures (could be done with graduate student assistance)
7. Contractual Deer Counts
8. Consulting assistance for analysis of data
9. Public awareness materials that inform the public regarding various DVA management actions.

5.4.7. Support of the Goal - This alternative would support the “whole town” goal through deer population reduction. It would support the hot spot goal in areas where hot spots are close to the area of population control.

5.5. Integrated Human – Deer Focus Alternative (Recommended Alternative)

A practical approach to reducing DVAs in Amherst combines the techniques from the previously described alternatives in an integrated adaptive management plan. Adaptive management uses findings from planned monitoring to trigger specific management actions and inform the periodic refinement of the plan. In Amherst, this would allow for a staged approach to managing DVAs so that application of techniques in specific areas is influenced by carefully

collected and analyzed information. An adaptive plan minimizes potential environmental impacts by proceeding in a systematic way with ongoing monitoring designed to identify both whether the approach is working and if any unanticipated or undesirable outcomes develop.

5.5.1. Actions - Specific actions can be used to address both the “whole town” and the “hot spot” goals. There is likely some overlap between the effects of these actions and some can be considered optional depending on budget, implementation strategy, and calendar.

Actions that support the “*whole town*” goal include:

1. Conduct a program of general public education via press releases, posters, pamphlets on the DVA Management Plan, DVAs in Amherst, and how to avoid DVAs.
2. Integrate a DVA component into Driver’s Education materials.
3. Publicize and enforce the no deer feeding law.
4. Work with the NYSDEC to encourage use of nuisance permits in targeted areas. Continue this use for 3-4 years with monitoring to determine effect on DVAs.
5. If after 3-4 years of aggressive nuisance permit deer harvest, DVA numbers do not meet the goal, then suspend the firearms ordinance and implement a three-year program of deer harvest by suspending the firearms ordinance and using bait and shoot with a professional wildlife management service. Management zones with sufficient blocks of park and open land should be targeted (e.g., management zones 4, 5, and 6). After this, nuisance permit harvest may maintain lower deer numbers for a period of time in some areas.

Actions that support the “*hot spot*” goal:

1. Deploy special deer signs from October-January at selected “hot spot” locations.
2. Facilitate press coverage of special signs that advises people to lower speed and increase awareness and encourages them to assist in implementing the plan.
3. Encourage strict enforcement of existing speed limits in the vicinity of the hot spots and assign more traffic officer presence in these areas.
4. Install lit signs that instantaneously report speed to the driver at selected site(s).
5. Run TV and/or radio ads (or Public Service Announcements) that describe the DVA hotspot areas and alert people to take special care.

6. Select two hot spots where strategic application of fencing might influence the ability of deer to enter the roadway.

5.5.2. Potential Environmental Impacts - Through both nuisance permit use and bait and shoot practices, the deer population of Amherst would be somewhat reduced. Since white-tailed deer is not a species at risk of regional extinction, adverse impacts to the species do not result from lethal control. There will be some reduction of local subpopulations. If lethal methods are used, appropriate carcass use is required.

5.5.3. Potential Environmental Advantages - More aware drivers may reduce DVAs or severity of property damage and human health risk. A considerable reduction of the Amherst deer population carried out through nuisance permits and bait and shoot in the early 1990s had a demonstrable effect on DVAs. A similar response is forecast in this case. Overall reduction of deer numbers would benefit native biota in woods and parks where deer herbivory is quite high. Similar benefit would be realized by agricultural and landscape interests.

A social benefit derived from use of bait and shoot is the donation of deer meat (venison) to the Western New York Food Pantry Organization. This organization provides food for poor and destitute people in the City of Buffalo area. If it is determined through the adaptive implementation of the DVA Management Plan, that deer need to be killed through bait and shoot, then every effort will be made to ensure that maximum public benefit is realized. Part and parcel of this process includes appropriate care of the killed deer (including proper field dressing, disposal of waste parts, and hygienic handling of venison). In addition, nuisance permit holders will also be informed of the option of venison donation to the Food Pantry.

5.5.4. Mitigation - Carefully researched and planned nuisance permit and bait and shoot programs with appropriate safeguards must be used. This includes protection and enforcement for bait and shoot locations so that the process is not inadvertently or deliberately disrupted and the safety of the public and professional contractors is ensured. Deer fencing areas should be carefully selected.

5.5.5. Monitoring and Adaptive Management - In support of “whole town” goal, the plan recommends that monitoring efforts include DVA record keeping in a form suitable to efficient

analysis of data. Three years of data should be assembled during/after the implementation of specific actions. These data should be compared to target data set using appropriate statistical tests. In the case of aggressive nuisance permit application, DVA data should be evaluated after a minimum of three years. These data should be compared to target data set (years 1997-2000) using appropriate statistical tests. If “whole town” goal is not met, the plan recommends that bait and shoot harvest of deer be implemented in areas where appropriate. After three years, monitoring should compare the DVA data set to the target data set using appropriate simple statistical tests to decide whether more bait and shoot is required or if nuisance permit use can maintain the lower deer population.

In support of “hot spot” goal, monitoring efforts should include DVA record keeping in a form suitable to efficient analysis of data. Three years of data should be assembled in the GIS database and analyzed to view extent and intensity of each targeted hot spot. In addition to the visual-based analysis, data for each hotspot should be compared to the previous years of data for each hot spot using appropriate statistical tests.

Contractual deer counts by NYSDEC should be continued as an index of deer population. If possible, this should be done on an annual basis, as it allows for a more rapid determination of change. If for budgetary reasons the counts are done on a two or three year basis, population changes cannot be statistically detected as quickly. As another deer population index and a method of estimating herbivory effects of deer, it is recommended that native vegetation plots be established in various natural areas, including use of small fenced exclosures to demonstrate potential vegetation in absence of deer. This would also serve the purpose of an educational tool, informing the public of deer effects.

Records of number, location, time, approximate age, and gender should be kept by contractors or volunteers for deer harvested through nuisance permits and bait and shoot so that effects of these programs can be more thoroughly understood. These should be databased in a way that permits efficient and accurate analysis.

The Town Board might consider establishing an *Adaptive Management Committee* whose membership includes representatives from Amherst Planning Department and the public. The committee’s role would be to implement the management plan and make ongoing decisions.

5.5.6. Costs - Cost categories for this alternative include (note, some of these can be considered optional):

1. Program of general public education via press releases, posters, pamphlets on the DVA Management Plan, DVAs in Amherst, and how to avoid DVAs.
2. Integrating a DVA component into Driver's Education materials.
3. Publicizing and enforcing the no deer feeding law.
4. Special "hot spot signs" (design, manufacture, deployment/retrieval, and storage).
5. "Hot spot" press releases and public education information.
6. Special lit signs that instantaneously report driver speed to the driver.
7. Increased police effort to manage speed in hot spot areas.
8. Monitoring "whole town" efforts (including some professional assistance).
9. Monitoring "hot spot" efforts (including some professional assistance).
10. Fencing
11. Monitoring
12. Nuisance permit
13. Bait and shoot
14. Vegetation control
15. Vegetation plots and exclosures (could be done with graduate student assistance)
16. Contractual Deer Counts
17. Consulting assistance for analysis of data

5.5.7. Support of the Goal – This integrated alternative is the most likely to support both "whole town" and "hot spot" goals. Although it is potentially more complex and costly, it also has the greatest opportunity to reduce DVAs that at average cost of \$2,500 (estimates obtained from Technical Working Committee). This integrated alternative also is likely to enjoy broader public support than the other alternatives.

The integrated alternative also lends itself readily to the management zones that have been established and used for much of the DVA analysis. Given the diversity of the town and variety of factors involved with DVAs, use of management zones facilitate plan implementation.

5.6. Environmental Consequences of Alternatives and Mitigation Measures

The Amherst Town Board (Lead Agency) and the Planning Department (SEQRA Coordinators) identified potentially significant adverse impacts of a DVA management plan in a

positive declaration and through consultation with involved agencies and the public. Table 8 identifies aspects of the environmental setting that may be impacted. Table 8 addresses information sources and possible mitigation relating to potential adverse environmental impacts.

Table 8. Alternatives, Environmental Impacts, Information Sources, and Mitigation			
Alternative	Potential Environmental Impacts	Information Sources	Mitigation
No Action	DVAs continue at high numbers Disposal of carcasses (from DVAs) Deer-related property/resource damage would continue or increase	Available information from Amherst database Available information from resource agencies and scientific literature	None possible
Human Behavior Focus	No adverse environmental impacts	None required	None necessary
Deer Behavior & Population Focus	Very limited adverse environmental impacts from tools that affect deer behavior. If fencing is used, potential impacts involve interruption or relocation of deer or other mammal movement patterns Since white-tailed deer is not at risk of regional extinction, no adverse impacts to the species result from population control. Deer carcasses from lethal control (Note: If immunocontraception (IC) or other fertility control is considered in the future, additional information required.)	Available literature on devices and ecological literature to predict and address effects Secondary measures of deer population (e.g., native vegetation) might be useful (Literature on IC and results from research)	Well-planned placement of devices Carefully researched and planned programs with appropriate precautions and safeguards Proper use of deer carcasses
Integrated Human – Deer Focus	Since this alternative draws from the human behavior focus and the deer behavior/population focus alternatives, potential impacts are same as above	Same as information sources listed in cells above	Same as listed in cells above

The preponderance of environmental effects of a DVA management plan will be positive. For example, deer population reduction has positive outcomes of a smaller deer herd including fewer DVAs, less ecological damage by deer (for example, impacts on wildflowers and shrubs), and reduced agricultural and ornamental damage.

The DVA Management Plan is in itself a mitigation plan. It seeks to mitigate the economic, social, and human health impacts of DVAs in Amherst. In a conventional sense of

“mitigation” for an action (e.g., mitigation for filling of a wetland by a development project), it is more difficult to identify specific mitigation that might be necessary as part of the implementation of the plan. The plan is designed to minimize potential environmental impacts by proceeding in a systematic, staged approach with monitoring designed to identify not only if the approach is working, but if any unanticipated or undesirable outcomes develop. If such a circumstance is realized, the adaptive management approach allows for refinement or change in direction.

The Integrated Human-Deer Focus Alternative rests on the premise that DVAs should be addressed and that the diversity of public concerns and viewpoints regarding deer and DVAs must be considered. For that reason, the integrated alternative begins with conservative approaches matched with careful monitoring of results. It does not recommend bait and shoot at the outset, but only after other means have been tried. If bait and shoot is implemented, this alternative recommends a cautious approach with suggested numbers of deer to kill based on statistical analyses of existing data from Amherst.

Actions Considered, continued...

Excerpts from the next two examples begin on the next page.

(Example #2). This next example comes from Montgomery County, Maryland. The last two pages of the excerpt include a table reviewing the expected results of a particular action, the cost of implementing that action, time required to get to results, what area the action would cover, and some evaluative comments regarding that action.

(Example #3). This last example is from Burnsville, Minnesota. This section of their plan called "Management Options" outlines the goals and objectives of their plan prior to reviewing potential management strategies. The plan includes options for monitoring, education, ordinances, and population control. After looking at the first three pages of the excerpt, skip down to the bottom of the page 93. Beginning here and through the remainder of the excerpt, you'll see that the plan revisits in more detail the population control action alternatives outlined earlier. It reviews the costs and benefits of various actions, the legal feasibility of those actions, associated costs, and then identifies whether or not that action is recommended in the plan. The plan supports their evaluation of action alternatives by citing a variety of studies.

With respect to the CBDM cycle, once you've weighed your action alternatives and selected among them during the decision-making phase, you'll probably write your CBDM plan. The next two major sections of this course—a plan for monitoring and public engagement—reflect steps you're likely intending to implement but have not yet. To learn more about the next phase of the CBDM Cycle, Implementation, see the Community Deer Advisor's discussion of Phase 3.

In sum, when listing the actions your plan considered but ultimately rejected, be sure to:

- Outline the reasons why certain actions were deemed unsuitable: cost, effectiveness, time for expected results, or others
- Cite sources to support your rationale for rejecting certain action alternatives

Example #2: Pages 82 through 87

Example #3: Pages 88 through 99

Montgomery County's full plan can be found at:
<http://www.montgomeryparks.org/caring-for-our-parks/wildlife/deer-management/>

Burnsville's full plan can be found at:
<http://www.ci.burnsville.mn.us/index.aspx?nid=379>

Part III

Deer Management Alternatives and Implementation

There is no single alternative that will resolve the various impacts of deer being experienced throughout the county. One alternative may work well in one situation and be ineffective or inappropriate in another. For example, certain types of fencing and the use of repellents, are appropriate for homeowners protecting small gardens but might be ineffective or prohibitively expensive if applied to agricultural crops. Other alternatives that involve population controls are most appropriate on large parcels of land including farms and parks.

Management Alternatives

The Task Force described eleven management alternatives, discussing both existing and potential means of managing deer impacts in Montgomery County. Some of these techniques are traditional and are known to produce measurable effects. Others are experimental and have unknown consequences. Some are not considered viable alternatives at all under the present circumstances, but are included and discussed to document their having been considered. It will often be the case that no single alternative eases or resolves a problem and that a combination of management alternatives may be required.

The alternatives are listed and described below. Following the descriptions an alternatives matrix is presented that identifies the practicability of implementing alternatives, identifies general magnitude of costs, and describes the likely consequences of implementing each alternative.

- | | |
|------------------------------|------------------------------------|
| - Maintain Status Quo | - Modify Legal Harvest |
| - Repellents/Scare Devices | - Agricultural Depredation Permits |
| - Fencing/Physical Exclusion | - Direct Reduction |
| - Habitat Management | - Contraception |
| - Supplemental Feeding | - Trapping and Removal/Relocation |
| - Restoration of Predators | |

Maintain Status Quo - This alternative implies that no change occurs in current management strategies or actions involving deer. No active manipulation of deer habitat or populations would be undertaken. No changes in hunting limits or the permitted area in which hunts are allowed would occur. All current data collection, inventory, and monitoring activities would continue.

Repellents or Scare Devices - A variety of chemical (taste, odor) and mechanical (noise or visual alarm) devices have been tested and under some conditions proven effective in repelling deer from areas in which they are undesired. A fairly extensive literature exists on this subject and many products are readily available. Consumer information exists and could be readily tailored to meet specific requirements and timing considerations in Montgomery County. Restrictions would exist on some products and devices (e.g. incendiary noise-makers). Repellents are not effective in all situations, can be costly, may require frequent reapplication, and may diminish in effectiveness as deer adapt to them.

Fencing or Physical Exclusion - Fencing or other barriers can be highly effective in providing permanent protection to resources threatened by deer or by excluding deer from access to areas

where they are not desired. Small screens can be effective where protection of individual plants is needed. In natural areas, small fenced plots could protect rare plant species and encourage their reproduction, but would have to be permanently installed unless deer density decreased. Fencing to prevent deer access to roadways has been documented as an effective strategy, provided that design is adequate and that maintenance is routinely performed. Application of fencing is restricted primarily by the varying cost of installation and maintenance and by aesthetic drawbacks. However, it should be noted that over the long term this alternative can be cost-effective depending on the size of the area treated and the value of the product being protected.

Habitat Management - This alternative could involve any of a number of as yet incompletely understood actions to conserve, improve, remove, or otherwise manipulate existing or potential deer habitat to cause populations or behaviors to change in ways that might mitigate human-deer conflicts. The goal of habitat management could be either to raise or to lower the capability of given areas to sustain deer populations (i.e. to change biological carrying capacity), or to alter specific landscape elements, such as roadside vegetation, to produce desired changes.

Specific habitat requirements of deer must be identified before this alternative could be applied. Changes in land use must be planned, programmed, and assessed in a context which allows effect on deer populations to be estimated. Comprehensive, area-wide planning and development impacts on deer populations must be conducted within a context that recognizes that many different objectives will occur as regards land use, some of which can conflict with deer management objectives.

Supplemental Feeding - Supplemental feeding would involve either the private (homeowner) or corporate (agency, County government, interest group) use of acceptable deer foods (e.g. whole corn) to provision deer at problem sites or selected locations within the County, either on a year-round basis or during certain annual periods when browsing activities might be anticipated to have the most severe

impacts on natural plant communities, landscape plantings, or agricultural crops. Artificial feeding would maintain deer population levels and might even promote increases. No long-term decrease in deer impacts to natural plant communities or landscape plantings would be guaranteed, and conflicts, such as deer-vehicle accidents, likely would increase. In addition, once implemented, feeding would probably be required continuously as the deer populations remained at a high level.

Modify Legal Harvest - This option involves making changes to the number of deer that hunters can harvest during the legal deer hunting season. Such changes might allow for the taking of more does in an effort to reduce population growth. This is effective only where problem areas are open to legal hunting or may be open to hunting in the future. This alternative will probably not be an effective tool in most problem areas of the county because these areas are in general closed to hunting. Bag limits for deer are set by DNR and are evaluated and adjusted annually in response to harvest data and public input.

Deer depredation permits - These permits are issued by DNR to land owners experiencing excessive deer damage to crops or other plantings. The permit allows for the landowner to kill a specified number of deer outside of the regular hunting season. The effectiveness of this alternative is limited to the extent that the taking of deer is permitted or possible by private landowners.

Direct Reduction - This alternative involves the use of specially tested and permitted shooters through a controlled hunt or other management action to remove deer from areas where hunting is presently not allowed or permitted. Due to differences in cost, and application, this plan will consider direct reduction as two separate options:

- 1) Direct reduction using special or managed hunts - This option involves taking land that has been closed to hunting and holding a managed hunt under strict guidelines (Appendix IV) and for limited duration. Hunters participating in these managed hunts must pass special training and marksmanship tests. The goal is to reduce the deer population in the most cost effective and safest manner possible, with minimal disruption to the primary land-use of the area. This method has proven to be a very effective tool in reducing deer numbers in areas where regular hunting is not permitted. It is most appropriate where fairly large parcels of land, such as parks, are found. Deer taken under this management action could be donated to charitable food bank programs such as the local "Hunter Harvest" if the hunter chooses not to keep it.
- 2) Direct Reduction using Sharpshooters - Under this option specially tested sharpshooters are hired to shoot deer, often over bait, and usually from elevated platforms. In this way, a high level of safety can be assured even in densely populated areas. This option can be effective in reducing deer numbers where the above mentioned methods are not possible do to close proximity to housing or other safety concerns. The drawback to this method is the relatively high cost involved. Deer taken under this management action could be donated to charitable food bank programs such as the local "Hunter Harvest".

Implementation of either option would require coordination and cooperation with natural resource as well as law enforcement agencies for the State of Maryland as well as the County. While similar programs are underway and have been successfully applied in other parts of the country, the use of this technique in Montgomery County would require careful analysis and implementation. Deer taken under this management action could be donated to charitable food bank programs such as the local "Hunter Harvest".

Initiate Use of Contraceptives - The use of contraceptives falls into four basic categories: oral contraception, implantation of microencapsulated hormones, surgical sterilization, and immunosterilization (the use of contraceptive vaccines). These methods have proven to be generally successful with captive deer, but currently present significant complications when dealing with deer that are free-ranging. Use of contraceptives in free-ranging deer herds would require approval from the State DNR - Wildlife Division after the necessary approvals had been obtained from the U.S. Food and Drug Administration.

These complications (depending upon method used) include the need for frequent application to achieve physiological effectiveness, the requirement to capture and handle animals, the need for precise annual timing in administering contraceptives, the current cost of contraceptive programs, and the potential for liability relating to consumption of meat from animals treated with contraceptives or exposure of the public to unrecovered delivery devices (e.g. darts which miss their target and contain viable product). Other concerns involve the as yet unproven system for delivery of sterilants to wild, free-ranging deer, developing adequate monitoring and assessment techniques to determine program effectiveness, and the unknown behavioral (and ecological) effects of sterilization relative to altering natural deer regimens and ecosystem roles. Under controlled

conditions current contraceptive technologies may be successfully applied. Rapid developments in this field suggest broader potential for application in the future.

Trapping and Removal/Relocation - This alternative would provide for the live capture and relocation of deer out of areas in which they pose problems to other predetermined locations. Live capture and relocation would be labor intensive, would in all likelihood have to be undertaken annually in order to be effective, and would be costly (\$400/animal). Deer populations elsewhere are high, and finding suitable habitat into which deer could be relocated without affecting established herds would at this time be unlikely. Physiological trauma and deer mortality in capture and handling would be unavoidable, and predicted loss of transported animals after relocation would be high.

Restore Predators - Restoration of the predators that once were native, such as the eastern cougar, would occur as an attempt to restore ecological balance where altered by the activities of man. Where taking place, restorations have usually occurred in relatively large undisturbed or isolated areas that are not experiencing significant use or adjacent land development pressures. Most deer predators require both suitable habitat as well as large natural areas in which to establish viable populations. These conditions would not be satisfied within Montgomery County.

Alternative Matrix

The following matrix is presented to give the reader a brief encapsulation of alternatives in comparison with one another, and is not intended to comprehensively represent or suggest all possible consequences of doing so.

Deer Management Alternatives Matrix

Deer Management Alternative	Likely Result	Cost of Implementing	Time Required to Get Results	Area of Coverage	Comments
Maintain Status Quo	Unknown.	None to County, costs borne by county residents that experience garden damage and crop losses, auto damage, and loss of natural resources.	Unknown.	County-Wide.	If deer population decreases from natural causes deer-human conflicts will decrease; if population remains stable or increases conflicts will remain or increase.
Repellents	Limited, restricted to small areas.	None, but material may be costly to user. \$12 - \$100 per acre per application	Possibly immediate; requires frequent reapplication.	Specific problem areas.	Displaces but does not decrease deer.
Fencing	May achieve some results in limited areas.	Varying initial and yearly maintenance costs. \$185 - \$5,000 per acre plus \$0 - \$200 annual repairs	Possibly immediate	Specific problem areas.	Restricts/excludes deer in specific areas. May increase impacts in other areas.
Habitat Alterations	Alter deer behavior.	Low/high depending on scope. highly variable	Long term.	Most likely site-specific.	Useful in limited area. Would impact wildlife other than deer.
Supplemental Feeding	In absence of other actions can increase number of deer locally.	Costly, depending on scope. approx. \$6.50 per deer per month	No result in terms of reducing numbers of deer.	Few, if any areas where it would be desirable.	Does not reduce number of deer. May concentrate deer, creating disease or parasite problems.
Modify Legal Harvest	Lower deer density: extent and rate depends on State regulation of bag limits, season lengths, sex restrictions, areas open.	Minor if any costs, since process is already accommodated in system.	Immediate and long term, if conducted regularly.	County-wide on lands open to hunting	Minor beneficial impact on closed to hunting. Major elsewhere.
Agricultural Damage Permits	Can reduce deer depredation on agricultural lands.	None to Montgomery County. Cost borne by MD-DNR.	Immediate and long term, if conducted regularly.	County-wide on lands where operators participate.	Deals mainly with deer caused damage problems

Actions Considered
Example: Montgomery County, MD

Deer Management Alternative	Likely Result	Cost of Implementing	Time Required to Get Results	Area of Coverage	Comments
Direct Reduction	Reduced numbers of deer in specific areas.	Costly, depending on manpower and methods used. special hunt - \$43 - \$60 per deer selective culling - \$74 - \$235 per deer	Immediate and long term, if conducted regularly. Will require periodic use.	County-wide on lands where operators participate.	Effective in specific problem areas.
Contraception	May achieve some results in limited areas.	Currently costly in materials and manpower. \$150 - \$1000 per deer	Long term.	Small Problem areas with confined animals.	Techniques/materials not standardized. Still in research/experimental stages. Requires Federal and State approval.
Trapping/relocating	Potentially can reduce deer.	Very high. \$113 - \$570 per deer	Immediate and long term with continuing removal.	Problem areas and problem animals.	Unsatisfactory and costly on broad scale. Requires State approval. Few/no release sites available.
Restore Predators	Unknown.	Costly, physically & socially.	Long term.	Unknown.	Require Federal/State approval. Difficult, likely impossible to implement given urbanized nature of most of the County.

Actions Considered
Example: Montgomery
County, MD

5.0 MANAGEMENT OPTIONS

Actions Considered
Example: Burnsville, MN

A citywide Deer Management Program should start with the identification of a goal and objectives as well as a summary of the problems. Then the management strategies or options can be tailored to fit the specific needs of the city and its residents.

5.1 Goals and Objectives

The following goal, objectives and problems have been revised from the DNR's long range plan for the management of white-tailed deer in the metro region (DNR 1996) to fit the expected needs of Burnsville.

Goal

Manage white-tailed deer populations within the city at socially acceptable levels that provide recreational and educational opportunities as well as provide opportunity for maintaining healthy (natural regeneration) woodland habitat.

Objectives

- Maintain breeding populations within biologically and/or socially desired limits within each deer management unit;
- Where feasible utilize public hunting to maintain populations within acceptable limits;
- Reduce the number of car/deer crashes to acceptable levels;
- Reduce the number of deer depredation complaints;
- Develop a framework for an operational management program to be implemented by the city in cooperation with the DNR, Hennepin Parks, and USFWS; and
- Educate residents as to the value of deer and deer habitat as a resource, as well as to ways to minimize nuisance deer problems through plantings and fencing.

Problems

- Unplanned feeding often causes deer concentrations which develop into depredation or public safety problems;
- Depredation of garden crops and landscaping plants is increasing as deer habitat decreases and deer populations increase;
- Woodland plant communities can change as a result of high deer populations;
- Increased car/deer crashes raise public safety concerns; and
- Data collection needs to be refined to more effectively manage the population.

5.2 Management Strategies

There are a variety of strategy options that can be used for controlling deer populations. Not all options can be implemented in every area due to certain physical and sociological parameters. For example, the option of re-introduction of timber wolves or mountain lions is not a feasible option in Burnsville due to a lack of appropriate habitat for these predators. However, there are several options available that can help manage the local deer herd. It may be best to use a combination of several options depending on the situation, or to prioritize options, so that if the first option does not achieve the density goal, another option can be implemented to

supplement the initial results.

The following management tools have been considered thoroughly to come up with the best management strategies possible:

Monitoring Options

1. Continue to conduct yearly winter aerial counts to maintain a status of the population, measure program progress and calibrate models.
2. Require uniform reporting of complaints from residents regarding deer. This would include creating a form with spaces for all information to be recorded, as well as identifying a single point person or coordinator to track/record the complaints. See Attachment A for proposed Deer Monitoring Report Form.
3. Require uniform reporting of car/deer crashes that occur within the city limits. This would include identifying a consistent process for data collection and tracking with the City, County and State data, as well as a monitoring coordinator.
4. Under any removal and/or reporting program, require documentation of sex and age of individuals removed. Also determine pregnancy status of females when feasible.
5. Collect browse data in preferred habitat areas to assess habitat condition. This option is only necessary if habitat restoration is a specific objective of the program. Surveys would be needed annually, conducted in spring prior to new growth, for a period not less than three years.
6. Create exclosure areas with fencing to keep deer from feeding in specific areas. This option is to be used around habitat restoration areas identified in the City Natural Resource Management Plan or to demonstrate habitat changes to be expected with reduce deer populations.

Ordinance Options

1. Pass ordinance to restrict deer feeding by residents.
2. Modify existing firearms discharge ordinance (Attachment D) to allow expanded opportunity for archery hunting within the city and to allow for the city to collect harvest data through implementation of a city archery hunting permit.

Education Options

1. Inform residents, especially in problem areas, regarding the impact of deer feeding on deer and on adjacent parcels. This can be achieved through news articles, use of local cable program, and neighborhood workshops.
2. Educate residents about the available methods to protect their property from deer damage including repellents, fencing and unpalatable plants. This can be achieved through news articles, cable programming and neighborhood workshops.
3. Inform residents of deer management needs and goals (density trends, crash rates, complaints, habitat impacts).
4. Inform residents of designated areas, times, special provisions and restrictions if special hunts are used in the overall program. Specific participant orientation and proficiency tests would also be part of a hunting removal option.
5. Install signage along city roadway segments where car/deer crashes are concentrated, which warn motorists of potential for deer crossings, and recommend sign locations to the state and county for roads in their jurisdiction.

Population Control Options

1. Regulated hunting – This option, when possible within existing regulations can be an effective deer population management tool. It is probably the most efficient and least expensive management technique. Due to local ordinances and safety concerns, this would need to be done on a very regulated basis. In Burnsville the hunting method would be limited to archery only, for public safety reasons.
2. Allow nature to take its course – This option takes no action to reduce local deer numbers. This option depends on car collisions, poaching, emigration and natural mortality to control population size.
3. Trap and transfer – This option is generally labor intensive and expensive due to efforts needed to trap and then relocate/release deer in a new area. It may seem like the humane thing to do but research has shown otherwise. Many captured deer are released in sites that appear to be ideal only to die a short time later due to stress related issues. Also, most areas have their own deer problems and release sites would be difficult to delineate.
4. Birth Control – The intent of fertility control agents is to reduce the reproductive output so that it is equal to or less than the mortality rate. In urban deer populations the mortality rates are generally very low, requiring that 70 to 90 percent of the does be treated to effectively reduce population growth (Rudolph et al. 2000). Additionally, a significant amount of population data is necessary to effectively manage long-term population growth using contraceptives (Rudolph et al. 2000, Hobbs et al. 2000).
5. Trap and dispatch – Trapping and then killing deer has been used in the cities of North Oaks, Edina and Minnetonka and appears to be an effective method of population control in fully developed areas. However, it may not be as efficient as sharpshooting, as trapping is more labor intensive and can be more expensive. The trap and dispatch option can be most effective in areas where other options cannot feasibly be employed or where individual deer are identified as the problem.
6. Sharpshooting – Sharpshooting has been used in Bloomington since 1991. It is an effective method of population control in areas where hunting is not feasible. Safety is a primary consideration. This method can be implemented through private contractor or through volunteers trained under the program. It has been successfully implemented both ways in neighboring areas including Bloomington and the MVNWR (volunteers) as well as Minnetonka and Eden Prairie (contractors).
7. Introduce Natural Predators – This option is intended to restore natural deer predators to an area to cause a reduction in the population due to predator mortality.
8. Increase Size of Habitat – This option is intended to add additional deer habitat to an area to decrease the overall deer density. Without corresponding population controls however, this method would be effective only short-term and that effectiveness would be dependent on the amount of additional habitat added.
9. Provide Supplemental Feeding – This option is intended to deter deer from sensitive feeding areas to other less sensitive areas through provision of designated feeding stations.
10. Install deer-proof fencing around city natural areas – This option also is intended to deter deer from sensitive areas, however, this option uses fencing to keep deer out of large natural areas.

Any single option or combination of options for population control, must include monitoring options. Deer populations in areas adjacent to Burnsville are also high and

growing, and deer do not observe artificial boundaries. Therefore, monitoring is required to determine when management goals and population stability are achieved.

5.3 Current Management Actions in Neighboring Areas

There are a number of areas adjacent to Burnsville that are currently managing deer populations within their jurisdiction using some of the options described above. It should be noted that these adjacent management programs could have both positive and negative impacts on Burnsville’s deer populations. To some degree, management in the adjacent areas will reduce the number of deer that may potentially migrate into the city. However, during the actual removal programs that occur in other areas, deer may use areas in Burnsville as a refuge, thereby making the removal efforts of adjacent areas potentially less effective. The following is a brief description of a few of the adjacent programs.

Murphy-Hanrehan Regional Park Reserve

Hennepin Parks has been conducting special archery hunts within Murphy-Hanrehan Park since the early 1980’s. They have also sponsored shotgun hunts, but only on a periodic basis, and are used only when additional deer removals are necessary to maintain density goals. The density goal for the park as a whole is 30 to 35 deer for the winter population. Shotgun hunts have occurred in 1993, 1994, 1996 and 2000. Both the archery and shotgun hunts are administered and coordinated by park staff and are conducted within the regulatory framework of the DNR.

A portion of Murphy-Hanrehan Park is located in Burnsville’s Southwest Management Unit. Since about 1990, the park hunts have included the 116-acre portion of Murphy-Hanrehan Park that lies within the Burnsville City limits. However, the adjoining 160-acre CamRam Park has not been included in any of the hunts conducted to date.

Even with the population management occurring in Murphy-Hanrehan Park, the deer population in the residential area of Burnsville east of the park continues to grow at a steady rate. Hennepin Parks has counted deer in this residential area for the past eight years. These counts are shown in Table 7.

Table 7: Deer Counts in Southwest Unit excluding M-H and CamRam Parks

Year of Count	Deer Observed	Year of Count ^a	Deer Observed
1992	15	1996	75
1993	13	1997	39
1994	33	1999	76
1995	54	2000	60

^a No snow in 1998 precluded aerial surveys in that year.

Minnesota Valley National Wildlife Refuge and Fort Snelling State Park

A portion of the Minnesota Valley National Wildlife Refuge (MVNWR) lies within the city limits of Burnsville, within the city’s Northeast Management Unit. Fort Snelling State

Park (FSSP) lies to the northeast of the city's northeastern boundary. The US Fish and Wildlife Service (USFWS) in cooperation with the DNR, have conducted deer removal with both archery hunting and sharpshooting methods within the MVNWR and FSSP in the past. Their current removal program has been limited to sharpshooting. Within the Black Dog Lake Unit of the Refuge, up to four removal sites have been used. The current deer population density in the MVNWR and FSSP is 23 to 28 deer per square mile. Their goal has been to maintain the deer population in the range of 15 to 25 deer per square mile. In 2001, 17 deer were removed from the Black Dog Lake unit of the MVNWR, 26 deer removed in 2000, 10 in 1999, and 23 in 1998.

Lebanon Hills Regional Park

Lebanon Hills Regional Park (LHRP) is a 2,000 acre park located in the cities of Eagan and Apple Valley, approximately 1.5 to 2.0 miles due east of Burnsville's Terrace Oaks Park. Dakota County, in cooperation with the DNR, has conducted deer removal via archery hunting within the park as part of their deer management program. Since 1995, the Metro Bowhunters Resource Base (MBRB) has participated in the removal program and administered the logistics of training and identifying competent and responsible bowhunters for the hunts. MBRB is an organization that provides a framework for a number of bowhunting groups in the metro area to demonstrate their proficiency and ethics commitment (See Attachment E). The park has effectively used this method of deer control since 1995. The goal of the park is to maintain a population of 15 to 25 deer per square mile.

Deer Management Plans in Other Communities/Areas

Population reduction methods for deer management have been used by numerous cities and agencies within the metropolitan area. Plans have been implemented in these various areas as each city recognized the problems associated with high deer densities. All of these programs have been successful in lowering population sizes, even though some may not have yet achieved their management goals. Table 8 shows a summary of many of the different cities that currently have an active Deer Management Program approved by the DNR.

Table 8: Deer Management Plans in Other Areas

Community	Area Managed	Started	Methods used
Blaine	Airport	1997	Archery with MBRB
Bloomington	City (in cooperation with USFWS)	1991 1994	Trap and Dispatch Supplement w/ Sharpshooting
Cottage Grove	Bailey Nursery		Regular hunting season
Dakota County Parks	Lebanon Hills, Spring Lake, and Miesville Ravine	1995	Archery with MBRB

Deephaven	City	2000	Trap and Dispatch
Eden Prairie	City	1993	Sharpshooting
Edina	City	1994	Trap and Dispatch; Sharpshooting
Fridley	Springbrook Nature Center	1993	Trap and Dispatch; Sharpshooting
Gem Lake	City		Regular hunting season
Hennepin Parks	Several regional parks	1980's	Archery with MBRB and regular season
Maple Grove	City		Regular hunting season
Maplewood	Pigs Eye Island		Archery with MBRB
Mendota Heights	City	1995	Archery with MBRB
Mn Valley NWR	Refuge	1990's	Sharpshooting
Minnetonka	City	1994	Trap and Dispatch; Sharpshooting
North Oaks	City	1984	Trap and Dispatch; Sharpshooting
St. Louis Park	Westwood Nature Center	1994	Trap and Dispatch
St. Paul	Hyland Bluffs	1995	Trap and Dispatch
Wayzata	City	1995	Trap and Dispatch; Sharpshooting

Source: DNR Urban Wildlife Specialist

5.4 Considerations for Building a Management Plan

A good management program must utilize a comprehensive approach to managing deer including the education of the public regarding deer ecology, deterrents to

minimize conflicts with deer, monitoring of the deer population for changes and trends, regulating the feeding of deer within the city limits, and methods to control the size of the deer herd.

Deterrent versus control

This management plan should include tools for residents to use that will help deter conflicts with deer and help minimize deer damage. Deterrents can include things such as fences, repellents, noise makers, and other gadgets that are intended to keep deer out of landscaped areas and gardens. Deterrents work best in problem areas when deer densities are low to moderate; they direct deer away from areas that will clash with human uses. However, deterrents do nothing to control the number of deer.

As the number of residents that use deterrents increases they may become less effective if the deer population stays the same size or increases. This results because if the deer cannot physically get to one garden they will move to another area until they find enough food. Many residents have reported that they used to feed the deer because they liked seeing wildlife in their backyard. However, deer consume landscaping and gardens as well. Some started deterring deer from landscaping and gardens by planting plants deer typically prefer less. As the deer started to eat those plants too, repellents were applied. In some cases fences were constructed around yards or gardens to keep deer out, forcing deer to other neighbor's yards, only shifting the problem to a new location. If this continues to a large scale entire neighborhoods could be fenced-off limiting not only the mobility of deer, but also that of other wildlife species and residents. Forcing deer out of neighborhood habitat will increase browsing/grazing pressure on public spaces with higher densities.

Reflectors for public roadways are another form of deterrent that may minimize the potential of conflicts between deer and cars. According to DNR Research at Madelia, deer reflectors have had mixed results. Their understanding of reflector effectiveness is that they are generally effective initially (1st year), but they become virtually ineffective after that, probably due to habituation by the deer and maintenance issues (very expensive and time consuming to maintain, because they have to be regularly repositioned and cleaned). As with other deterrent methods, it cannot be expected that reflectors will provide long-term results.

MnDOT has started a two-year trial period, at three rural locations, to test a new deer alert system that includes motion sensors and an amber beacon mounted on top of the traditional deer crossing caution signs. The system is designed to provide drivers a visual warning when it detects deer or other large animals approaching the roadway. If the system is proven to be effective in reducing the number of car/deer crashes, it could be tried in other locations.

Deterrents can treat some of the symptoms of high deer densities, however, they do not address all of the problems associated with too many deer (e.g. impact on natural areas). Therefore, a comprehensive plan also includes options for managing deer numbers or density.

Population Control Strategies

Each of the population control options described in Section 5.2 were thoroughly discussed as part of the review process. Following are some of the key considerations utilized in formulating the population control portion of the program.

1. Archery Hunting

The City of Burnsville lies within the DNR's deer hunting permit area 337. This permit area allows a person with a regular archery license to purchase a Deer Management Permit for one additional antlerless deer and up to three additional Intensive Harvest Permits for antlerless deer during the regular deer season, each at one-half the cost of a regular license. Permits are available from the DNR for archery hunting under the regular archery season (typically mid-September to late December). Archery hunting within the City of Burnsville is allowed under current city ordinance "by any person shooting a bow and pointed-tip arrows who is the private landowner or with the written private landowner approval on their person; provided, however, that no arrow passes beyond the boundaries of the that property; and provided further that the shooting occurs at least five hundred feet (500') from any land or building not owned by that landowner and that no one is endangered. (Ord.319, 6-20-88)". The number of participants that partake in this hunting option is essentially limited to residents, with most opportunity likely in the Northwest and Southwest Management Units.

A special archery hunting option is available through the use of a "management group" such as the Metro Bowhunters Resource Base (MBRB) and Capable Partners (CP). MBRB is open to membership from the city and the general public. The purpose of the MBRB group is to train and test potential participants for special archery hunts to ensure their competency and ethics prior to granting membership and eligibility. For urban hunting programs, the MBRB or similar group is essential in providing and managing a safe, efficient and successful removal program. The CP group also has similar safety assurances, while also providing hunting opportunities to the physically handicapped where they otherwise may not have access to such opportunities; pairing able-bodied partners with each participant provides these opportunities. See Attachments E and F for further information on these two organizations. All special hunts, using MBRB and/or CP, would occur on public lands within the city unless residents adjacent to the parks volunteer access from their property as well.

Archery hunting in limited areas over limited timeframes can take a number of years to reduce a large deer population as compared to sharpshooting. Based on the number of deer to be removed to meet the density goals and the timeframe in which the city wanted to meet those goals, archery hunting was not identified to be implemented initially, however, it was recommended to be used as a long-term management strategy. Therefore, archery hunting was recommended to begin in the fall of 2003, after two years of sharpshooting, as the strategy to maintain deer densities at goal levels.

Details of the locations (specific parks), special provisions and potential timing of each special hunt would be defined annually. Attachment G describes in more detail suggested special provisions and guidelines for archery hunting on public and private lands within the city.

2. Do Nothing to address population size

By not taking any action to control the deer population size, the city runs the risk of having a larger deer population problem in the future. The current deer population within the city is at relatively high densities which is currently resulting in impacts to the native woodland vegetation, complaints by residents and collisions with cars. By limiting the city's actions to only using education, monitoring and feeding bans to educate the public and collect information, there would be no effect on the number of deer within the city (deer density)

and some of the impacts would not be addressed.

If deer are left to control themselves, then unnatural alterations of associated plant and animal communities would likely occur (Warren 1991). If the city's goal is to ensure the natural functioning of both plant and animal communities, the city needs to set a density threshold consistent with that goal. This in turn would then require the inclusion of a method for controlling the deer population size as part of the Deer Management Plan.

Without a deer management program that addresses the population size and growth, the only factors left to affect the mortality rate other than natural death will be through poaching, car collisions or emigration to other communities. If the population size gets large enough, the natural death rate will increase due to starvation and increased disease. This was not considered a feasible plan of action, as it does not address current concerns, or the goals or objectives of the overall program.

3. Trap and Transfer

Current DNR policy does not allow this method of population reduction for several reasons. First, there are heightened concerns among state health and wildlife agencies regarding the transfer of animal diseases across state lines. The Minnesota DNR is not aware of any state agency accepting or transporting deer. Additionally, the trap and transfer method has been demonstrated to be impractical, stressful to the deer handled, and can have high post-release mortality rates with near 80 percent mortality of translocated deer in the first year. The costs for this method have been recorded in the range from \$400 to nearly \$3,000 per deer (DeNicola et al. 2000). The cost is dependent on a number of factors such as the number of deer to be moved and the distance to the release site. This method also requires release sites that are appropriate and willing to accept the deer to be released. Such sites are scarce due to the abundance of deer statewide and across the country. Without the DNR's support, the lack of potential release sites, the high mortality rates and the potential high costs, this option was not recommended.

4. Birth control

The treatment of deer with contraceptive drugs is only being implemented by universities, wildlife agencies and the Humane Society of the United States as part of approved research projects (DeNicola et al, 2000). After 40 years of research on fertility control, there have been no practical and effective fertility control methods identified for free ranging deer populations. Free ranging populations, such as is the case in Burnsville, pose distinct challenges to the use of contraceptive drugs since treated deer should be marked for identification purposes and the use of anti-fertility drugs must be approved by the U.S. Food and Drug Administration (FDA). Another critical need to effectively use contraceptives for population management is detailed fertility data on the population and individual females within the herd. Without details on individual fertility rates within the population, the number of individuals that require treatment annually to manage population growth cannot effectively be determined. There is also significant risk involved with using fertility control to manage a population due to the unknown long-term effects of current anti-fertility drugs and the potential loss of genetic viability of the population with only a very small portion of the population reproducing in a given year. While fertility control may not affect the survival of the individual it can potentially be

lethal to the population (Hobbs et al. 2000).

A study in New York, one of the few conducted on a free ranging deer population, estimated the minimal annual time commitment per deer for fertility control was approximately 20 hours (Rudolph et al. 2000). This can compute to a cost range of \$1,000 to \$2,000 per deer assuming a contractor rate of \$50 to \$100 per hour. The overall cost of implementing an anti-fertility method to control population growth is dependent on the number of deer that need to be treated, with larger numbers requiring significantly more effort and cost (Rudolph et al. 2000; Nielson et al. 1997).

It should also be noted that current data on anti-fertility control methods show that it does not have immediate population reduction results (DeNicola et al. 2000). The greatest efficiency in population reduction and long-term management may be with the use of culling to reduce the population to target size and then a contraception method to maintain the herd size (Hobbs et al. 2000, Nielson et al. 1997). However, it may be several years before adequate contraceptive drugs are developed and available for use in free-ranging herds that can be applied in a manner as cost-effective as culling methods.

The DNR currently does not, and cannot, promote the use of contraceptives for population control at this time because approved anti-fertility drugs are not available for use and effective applications are only experimental. Therefore, this option is not recommended at this time, however, as technology advances this option may be considered in the future.

5. Trap and dispatch

This method is generally used in areas where hunting or sharpshooting would not be viable options for removing deer due to proximity to buildings. Clover traps would typically be used with bait to lure deer to the trap. These traps would only be set during the nighttime hours and monitored in late evening and early morning, generally following the procedures used in North Oaks (Jordan et al 1995). The traps would be located away from disturbances from dogs or humans to minimize stress to the captured deer. Traps would only be used on private residential lots, per landowner request, providing they are not adjacent to anyone opposed to the trapping of deer, the trap can be screened from potential disturbances, there are documented deer problems in the area, and the removal numbers were compatible with the overall Plan removal goals. The deer removed by this method would be processed and requested to be donated to food shelves for human consumption.

This option is not being recommended at this time because it tends to be more time intensive than other options when used on a broad scale.

6. Sharpshooting

This is the selected method to initially reduce the deer population to the recommended density goals. This method would only use qualified contractors to select sites, bait and remove deer. All sites selected for baiting and removal operations would be reviewed and approved by the police department and city staff prior to implementation. This method would primarily be used on public property. Sharpshooting could be used on private property, however, it would only be used if approved by the landowner provided that the adjacent landowners are not opposed, the site provides for safe removal, there are

documented deer problems in the area, and the removal numbers were compatible with the overall Plan removal goals.

Deer harvested outside of the regular hunting season via sharpshooting become the property of the state, as these methods require a "special management permit" from the state. The bulk of these deer are accepted by local food shelves or other charitable organizations and processed for human consumption. The City would recommend that the hides be donated to the Minnesota Deer Hunter Association for their Hides for Habitat program.

7. Reintroduction of natural predators

Wolves, cougars, black bears and to some extent coyotes are the common predators of white-tailed deer in Minnesota. Restoring these predators into an urban environment is not generally regarded as a viable option for urban deer population control because of the lack of suitable habitat and the high human densities (Coffey and Johnston 1997). It may sound like an attractive ecological method that would restore the balance of the ecosystem, however it is not an option that would be accepted by many and it would not be biologically feasible to establish the habitat needed for these predators. Both ecological and social constraints would prohibit any meaningful, long-term population reductions from this method.

8. Create more deer habitat within the city to support growing population

The city of Burnsville is approximately 97 percent built-out according to city planning staff. The amount of identified preferred deer habitat is about 6 square miles or nearly 4,000 acres. This comprises about twenty percent of the city's total area. Deer in the city are already using areas outside of their preferred habitat, meaning they are sharing space with their human neighbors. In this urban setting, creating additional habitat for deer could theoretically reduce the number of human-deer conflicts by providing deer more space. However, to reduce conflicts by this method, you would need to reduce human use in areas that would be labeled deer habitat (convert development into woodland cover). Based on the current level of development, this option would be very expensive and would have little impact on the number of conflicts unless the size of new deer habitat was very large. "Very large" would be on the order of 6 to 7 square miles, which is the amount needed in order to create enough habitat to reduce the average deer density to 20 deer per square mile. This option is not realistic given the amount of habitat that would need to be created to be effective in reducing deer density. Additionally, this option would not manage future population growth.

9. Conduct citywide deer feeding program

Providing urban deer with a supplemental food supply to alleviate conflicts with humans has been tried with little success (Schlick and Gillette 2000). The intent of supplemental feeding in urban areas is to draw deer away from specific problem areas (roads or residential yards). However, if alternate food sources are widely available within the problem areas, the draw of supplemental food sources can have little effect on deer foraging movements (Schlick and Gillette 2000). If the supplemental source does draw deer, it needs to be located far enough away from the problem area to remove the conflict. However, it also needs to be located such that the feeding location does not create a new concentration of deer that will create conflicts in a new

location (DeNicola et. al. 2000). Shifting deer conflicts from one neighborhood to another would not address the problem; it would only relocate it. Shifting higher densities to public lands is also opposite to the goal of the city to protect the integrity of its natural areas.

This option does not address the issues of population size and growth and is contradictory to the feeding ban ordinance proposed, therefore it has not been recommended to be included in the program.

10. Install deer-proof fencing around city natural areas

In some city parks it has been identified that high deer density has changed the forest structure. Deer could be fenced out of these areas to allow for natural regeneration of the forest community. Deer-proof fencing is expensive, especially in large-scale applications, and requires regular monitoring and maintenance to keep deer on their intended side. For example, an estimate for installing a 10 foot woven wire fence around Terrace Oaks Park (about 4,400 lineal feet) would be roughly \$9,000 for materials and an additional \$ 35,000 for installation. Yearly maintenance costs would vary depending on the amount of vandalism, damage from falling trees or branches, erosion and other factors that could allow deer access.

This option does not address the issues of population size and growth (deer density) outside of the natural areas.

Plan for Monitoring

Your plan for monitoring reflects activities that occur in Phase 4 of the CBDM cycle, Evaluation and Adaptation. Evaluation is a critical component of any deer management program, as it is in this phase that you will track progress towards your goals and objectives, making necessary adjustments to your plan as you learn about what works and what doesn't. For a more thorough discussion of Phase 4, please visit the [Community Deer Advisor](#).

Despite the importance of monitoring, a plan for doing so often tends to be left out of community-based deer management plans. This does not necessarily mean that communities do not undertake monitoring and evaluation efforts, but perhaps indicates that communities may not see the continual evaluation of the program as part their CBDM plan. You should not consider monitoring as an afterthought, but view it as *just as important* as selecting objectives and actions for your program. When developing a monitoring plan, you may want to reach out to experts for guidance depending on the objectives you've identified for your plan. While some types of monitoring may be straightforward (e.g., if you're tracking deer-vehicle collisions) other kinds of monitoring may be more challenging (e.g., if you want to design a forest monitoring project).

It is critical for any monitoring plan to identify *indicators* you will be examining to assess progress towards achieving your objectives. What do we mean by "indicator"? We are referring to whatever you are going measure and observe to understand current conditions and track progress towards achieving your objectives. In fact, it's best to measure your indicators prior to implementing actions so you know what your current conditions are (your baseline), because monitoring involves tracking those indicators over time—so, you need to know your starting condition to evaluate whether your actions are having their intended effect.

It is important to identify for each indicator what specific data you are going to collect, who is going to collect those data, and how they will do so. For instance, will your community be conducting aerial counts of deer each year to monitor changes in population? Will you be monitoring regeneration of certain forest plants? Tracking deer-vehicle collisions?

Whatever your community will be doing to evaluate your deer management program's progress towards addressing important impacts, it is critical that the indicators you have selected are clearly identified and are tied to measurable objectives. Make sure it is clear in your timeline when you are going to be assessing indicators, who is going to be a part of that assessment (a university or NGO partner? volunteers? city officials?), and identify in your plan how you might account for changing needs within your community. Do you have a process in place in the event that you are not seeing anticipated changes in your indicators? It is also important to account for what you will do if when you achieve your objectives. In other words, how do you intend to *maintain* deer population and impact levels?

After completing this module, you should....

- ✓ Be able to describe the importance of monitoring
- ✓ Know what an "indicator" is
- ✓ Know how to comprehensively describe indicators for your plan

Plan for Monitoring, continued...

For more on selecting indicators, we draw your attention to this excerpt from the [Community Deer Advisor](#).

Selecting a set of meaningful indicators is a challenge for many communities. Think about how best to evaluate progress toward desired outcomes. What sorts of indicators will you use, and what will they tell you about your community's progress? For example, tracking the number of deer harvested is straightforward and can feel satisfying, but does not give much insight into whether deer-related impacts are lessening. At the other extreme, many communities assume it is important to quantify the local deer population with precision. However, accurate population counts are costly, can be difficult to obtain, and do not necessarily help determine whether desired outcomes are being achieved. It may be more important instead to track the number and nature of deer-related complaints to city hall (e-mails, phone-calls, etc.), a low-cost way to assess how well the program is perceived to be working. Keep it simple. It is better to have a small set of metrics you can collect consistently than an elaborate monitoring plan that cannot be sustained.

Hopewell Valley's full plan can be found at: <http://hopewelltp.org/DocumentCenter/Home/View/501>

In selecting indicators, it is important to consider:

- Whether or not you can link your selected indicators to your objectives
- What resources your community has at its disposal for monitoring. Do you have the capacity to understand what the data your community collects means, or do you have access to those who do?

Let's look at a few example monitoring plans and selected indicators.

(Example #1). This first example comes from Hopewell Valley, New Jersey. In reading this excerpt you'll note that the plan includes timelines for monitoring as well as identifies responsible parties for carrying out monitoring activities. The plan also identifies to whom the data should be relayed.

For all goals and strategies, the Task Force strongly recommends a tracking system that sets an agenda with timelines for completion, quantifies progress and allows effective communication with all stakeholders. Lyme disease and deer vehicle collisions are tracked continuously through existing mechanisms by the Hopewell Township Health and Police Departments, respectively. It is recommended that public questionnaires, as performed in 2010, be repeated every three years to track landscape and agricultural impact reduction goals and overall public opinion. Ecological health is tracked annually on various private and public parcels by the Friends of Hopewell Valley Open Space – summaries of these activities should be provided to the Task Force annually and a report should be provided every three years. The tracking of the deer population should also be repeated every three years using the same seasonal timing and methodology utilized in 2010. Brief but effective tracking / reporting should also be included within each listed strategy to assure effective communication and evaluation of their effectiveness toward meeting stated goals. Specific strategy measures should be developed by Task Force members that are assigned to implementing them.

Plan for Monitoring, continued...

(Example #2). This second excerpt comes from Oxford, Mississippi's Deer Management Plan. You'll see that this plan includes three approaches for monitoring progress. While the subheading for this plan is "Population Determination," you can see that they are measuring a number indicators. One is deer population and density, measured by a survey implemented twice a year to get a sense of the deer population. To identify hot spots in the community, they will be tracking two different indicators: deer sighting reports and property damage reports. Finally, to monitor deer-vehicle collisions, they are implementing a tracking program to report these incidents.

Oxford's full plan can be found at:
<http://www.oxfordms.net/documents/departments/deer/deer-plan.pdf>

Montgomery County's full plan can be found at:
http://www.montgomeryparks.org/uploads/docs/deerplan_update_aug2004.pdf

III. Metrics and Measurements

Population Determination

The deer population within the city limits will be surveyed twice a year, one fall survey, and one spring survey. Each survey will be conducted over a ten day period of time to help determine deer population and density. The survey will be conducted by driving three established routes, twice a day. The data gathered from the survey will be compiled and submitted to DWFP and the USDA for analysis and recommendations.

The City of Oxford will also solicit deer sighting and property damage reports from the general public and residents of Oxford. The data from these reports will be compiled and utilized to identify problem areas within the city.

The City of Oxford will implement a tracking program for reported deer versus vehicle incidents. This data will be utilized with the above gathered data to evaluate the effectiveness of the deer management program.

(Example #3). This excerpt is from Montgomery County, Maryland. For this excerpt, you'll see they start with identifying the objective with which these indicators are linked (reducing deer-vehicle collisions), and then identifies three indicators for tracking progress for this objective, what data they will collect, and who will be responsible for collecting that data. (Excerpt on following page).

Plan for Monitoring, continued...

a) Deer-vehicle Collisions

Deer-vehicle collisions (DVCs) represent important safety concerns including the potential for personal injury and death. For this reason reducing deer-vehicle collisions is a primary objective of the County's Deer Management Plan. Data on DVCs are collected from the following sources.

1. The Montgomery County Police Department (MCPD) keeps records on deer collisions on county roads that require police response as well as dead deer seen on roads by police officers and reported to the Division of Animal Control (Animal Control) for pick-up. The MCPD data, because it includes data on collisions in which the deer are not necessarily recovered, includes the most complete numbers for county roads but does not include all deer collisions on state roads or the many DVCs that go unreported. The data is analyzed by the MCPD and an annual report is issued. A copy of this report is sent to the DMWG and included in the appendix of this report.
2. Animal Control is responsible for picking up dead deer on county roads. Detailed location information on each pick-up is provided to the DMWG in an annual summary report. This data is mapped to determine the distribution of deer-vehicle collisions on county roads.
3. Road-killed deer on state roads within the county are picked up by the State Highway Administration (SHA). This data was not available for 2002 due to changes in collection protocol but will be provided to the DMWG and mapped in the future.

The data provided by the above agencies in some cases is complementary and in other cases overlaps considerably. Due to the detailed location information provided, the flexibility of the database, and in order to eliminate overlap, only Animal Control and SHA data is used for mapping. The distribution of deer-vehicle collision locations is used to help delineate hotspots of high deer density and activity in the county.

In addition, this data is shared with the Department of Public Works and Transportation (DPWT). Where appropriate, recommendations are made to implement measures to attempt to reduce the numbers of DVCs along identified stretches of road.

(Example #4). This last example comes from Metroparks Toledo, Ohio's Deer Management Plan. This excerpt begins by reiterating an objective for deer density, and notes that that will be assessed by aerial surveys conducted by Metroparks staff. You'll also see an explanation of how they will monitor deer browse impacts, and specific indicators are described, such as lupine and trillium population levels.

G. PROGRAM EVALUATION

Following 2017 culling operations, aerial deer surveys will continue to be used by Metroparks staff to monitor population levels at OOPM, SCPM, and other parks throughout the district. The target for both OOPM and SCPM is a reduction in the population index to less than 25 deer per mile². The Metroparks deer browse monitoring program (see Section I.C.1) will be the primary evaluation tool to determine whether the 2017 culling program successfully reduces deer numbers to acceptable levels. Metroparks staff and volunteers will continue to evaluate deer browse damage to at-risk populations of endangered and threatened plant species at OOPM. Lupine browse monitoring will also continue to be conducted at OOPM. Trillium research plots will be used at SCPM to evaluate recovery of spring ephemeral wildflower populations after culling. If noticeable reductions in deer browse are not detected after initial population targets have been reached, deer population targets may need to be reevaluated.

Metroparks Toledo's full plan can be found at:
<https://metroparkstoledo.com/media/2567/2016-17-deer-mgmt-plan-final.pdf>

Plan for Monitoring, continued...

In sum, your monitoring plan should include:

- Indicators identified for tracking progress towards your objectives
- Specific data you are going to collect for each indicator, who is going to collect those data, and how they will do so

Public Outreach & Engagement

It is important that your plan includes a discussion of your approach for public outreach regarding the deer management program. For a more in-depth discussion of public engagement, see the [Community Deer Advisor](#) website. You likely already have some experience engaging the public in the early phases of your deer management planning—perhaps to understand the impacts that are occurring your community via a survey or public meeting, for instance. Or, you may have engaged residents on your deer committee as part of the decision-making process. Describing the ways you already have engaged in public outreach, education, or engagement—probably in the background section of your plan—is important. You may have also included outreach strategies as part of your selected management actions to meet education-related objectives (holding neighborhood workshops on landscaping with deer-resistant plantings, for example). But if there are additional steps that will be taken towards engaging community members, here is the place to describe those steps.

For instance, do you plan on holding annual or semi-annual public meetings to update the community on progress towards your plan? Will you be maintaining a page on your community's municipal website regarding the deer management program? Keeping the public apprised of changes to your deer management program or progress towards goals and objectives—and even actively involved in the program (for example, are you using resident volunteers to help with monitoring?)—is an important aspect of effective CBDM efforts, and having a place in your plan where you can explicitly identify how you will do so is one way to stay accountable.

Many communities include a strategy for public engagement within the body of the CBDM plan. Next you will find a couple examples of what that looks like and how it is described in two communities.

After completing this module, you should....

- ✓ Recognize the diversity of activities that can be considered outreach and engagement

Public Outreach & Engagement, continued...

Excerpts from these two examples begin on the next page.

(Example #1). This first example is from Montgomery County, Maryland. Starting at the bottom of the first page of the excerpt, you'll see the header "Public Information/Education." The section begins by identifying which entities are responsible for carrying out actions related to public information and education, as well as why it is important that these actions are implemented. A total of eight actions are listed, and they reflect a diversity of approaches to public engagement, such as developing educational materials, developing educational programs, developing a media plan, making sure the library has resources on deer, and creating a newsletter about deer management issues within the county. If you haven't yet decided how you might engage the public within your community, this example might give you some ideas.

(Example #2). This second example is from Howard County, Maryland. Similar to the Montgomery County example, this list of actions related to public information and education is quite diverse.

In sum, public engagement is an important aspect of community-based deer management, to inform the planning process itself, keep the community apprised of progress, and even to involve community members in helping to achieve some of your goals and objectives. Thus, providing an outline of the intended approach for public engagement within your plan is advisable. There may be a variety of activities related to public engagement, so be sure to consider all of the ways you might be reaching out to the public, from public meetings to simply making your plan available on a website.

Example #1: Pages 107 through 108

Example #2: Pages 109 through 110

Montgomery County's full plan can be found at:
http://www.montgomeryparks.org/uploads/docs/deerplan_update_aug2004.pdf

Howard County's full plan can be found at:
<https://www.howardcountymd.gov/wildlife>

Action 6. Establish a monitoring program to qualify and quantify the impacts of deer on native plants, plant communities, wildlife, rare, threatened and endangered species and natural areas in the county park system (see Appendix III).

Urban/Suburban Deer Ecology and Population Dynamics

Lead agency M-NCPPC; participating agencies - NBS-CUE, DNR

Little information currently exists on the population dynamics of deer in urban and suburban settings in Maryland. Yearly harvest data is collected by DNR on a county level but represents only deer populations in areas open to hunting. Information on deer ecology and population dynamics specific to Montgomery County is vital to a responsible deer management program.

Action 7. Develop and establish a program to monitor relative changes in deer population density and habitat usage within targeted parks (Appendix III).

Use of Geographic Information System (GIS)

Lead agency M-NCPPC; participating agencies - NBS-CUE, DNR

The use of GIS can greatly facilitate the manipulation and graphical representation of data used in the natural resources management process. Geographic and thematic data bases developed within GIS can be used to address both ecological and environmental factors related to deer presence, abundance, and mobility throughout the county, as well as for mapping and analyzing important data on deer-human conflicts.

Action 8. Utilize a Geographic Information System (GIS) in the collection and interpretation of data for The Deer Management Plan. This will include mapping of land use types, habitat types, deer-auto accident locations, sites of deer depredation on agricultural and private lands, conservation and environmentally sensitive areas, rare, threatened and endangered species site locations, telemetry data, deer exclosures and other vegetation monitoring points.

Part II

Public Information/Education

Lead Agency M-NCPPC; participating agencies - DNR, Montgomery County Library System, Montgomery County Extension Service

All too often the problems caused by deer are augmented by a lack of understanding on the part of the humans affected. Public information and education is therefore a critical part of this plan. The following actions are designed to better inform and educate the public and to address commonly expressed concerns related to deer.

Action 9. Develop an informational brochure on white-tailed deer in Montgomery County, including information on deer biology, ecology, deer related problems and their prevention. This brochure will be developed in cooperation with M-NCPPC interpretive staff and Montgomery County Cooperative Extension Service and distributed throughout the county.

Action 10. Encourage the use of the Nuisance Animal Information Line as a source of public information on deer problems and ways to prevent them. This State wide program, available through an 800 number is operated by the USDA Animal and Plant Safety Service (APHIS) and DNR. The Hotline provides information to homeowners and farmers on preventing deer damage to yards and crops.

Action 11. Offer educational programs, through the Montgomery County Cooperative Extension Service and M-NCPPC Montgomery County Nature Centers, on deer in Montgomery County. These programs will include information on deer biology, ecology, deer related problems and their prevention as well as information on Montgomery County's Deer Management Plan. Nature Centers will also use bulletin boards and other displays/exhibits to further educate the public on deer related topics.

Action 12. Develop and maintain a current media plan in order to provide timely and relevant information on deer, including seasonal bulletins advising of increased risk of deer/auto accidents (i.e. during breeding season, hunting season, seasonal dispersal), as well as background and other relevant information (i.e. spring fawning season and info on deer ticks). These public notices will include multimedia public service announcements (PSA's) utilizing local newspapers, radio and TV stations as well as special productions on cable TV.

Action 13. Pursue appropriate action to insure that the County Library System purchases and has available throughout the county, books on white-tailed deer biology and management, as recommended by the Task Force Report.

Action 14. Develop a traveling bulletin board exhibit including information on deer biology, ecology, deer-related problems and their prevention as well as information on Montgomery County's Deer Management Plan. This exhibit will rotate between County Public Libraries, County office buildings and other public locations and will act as dispersal sites for the Deer Brochure.

Action 15. Develop a multimedia presentation including information on deer biology, ecology, deer-related problems and their prevention as well as information on Montgomery County's Deer Management Plan. This program will be presented by MNCPPC staff to local civic groups, environmental groups, County Park Commission, Department of Parks, Montgomery County in-service training etc.

Action 16. Develop an annual newsletter on deer management issues in Montgomery County that will be distributed to interested citizens groups. The purpose of this publication will be to keep citizens informed on the implementation of the Deer Management plan as well as provide additional and updated general information on deer in Montgomery County.

- Action 6.** Establish protocols and procedures for monitoring deer populations and their impact on the environment. Stay abreast of new technologies and procedures for estimating deer populations. Keep up to date records of populations of plants and wildlife most susceptible to negative impacts from over-abundant deer. Monitor levels of browse damage as it impacts biodiversity and forest structure. Perform periodic surveys of deer health - as indicative of herd health and carrying capacity - by studying internal and external parasites, fat levels and reproductive system health.

PUBLIC INFORMATION AND EDUCATION

The Task Force Report makes clear that public information is an important part of the management of deer-human conflicts in the County. A lack of understanding of deer biology and ecology appears to be compounded by ignorance, misinformation and misconception regarding the available management options. The following actions are intended to better inform and educate the public and to address commonly expressed concerns related to deer.

- Action 7.** Develop an informational brochure on white-tailed deer in Howard County including information on deer biology, ecology, deer-human conflicts and the management options that may reduce or end those conflicts. This brochure should provide a list of agencies and organizations involved in the issue, and how they may be contacted. It should be distributed throughout the County, in libraries, schools, and government office buildings, and to the Columbia Association and other homeowner's associations. Make it a page of the County's website.
- Action 8.** Publicize the Nuisance Animal Information Line, a toll-free number (1-877-463-6497) operated by APHIS and DNR, which provides information to homeowners, businesses and farmers on preventing animal damage on their properties.
- Action 9.** Offer educational programs through Cooperative Extension, the Department of Recreation and Parks, Columbia Association, homeowner's associations and interested organizations such as garden clubs. These programs would include information similar to the brochure, and would also serve as a forum for exchange of new ideas and opinions.
- Action 10.** Develop and maintain, through the Public Information Office, a media plan to provide timely and relevant information on deer, suited to the needs of the season. These press releases and broadcast segments would be distributed to local newspapers, television and radio outlets, and through the government access cable channel (Cable 15).

- Action 11.** Develop and produce an exhibit display on deer issues and the management plan. This display could be rotated around the library system, public schools and other public buildings, and other locations if requested.
- Action 12.** Hold informational meetings for Government officials so that they will know the scope of the management plan and the proper directions in which to steer public inquiries they may receive.
- Action 13.** Produce and distribute an annual update on deer management activities and information for all interested parties. Note all significant accomplishments and milestones reached during the preceding year.
- Action 14.** Develop a deer management website, with appropriate links, to disseminate information through the increasingly popular medium of the Internet.
- Action 15.** Implement a Deer Management Info-line Number that people can call to learn the latest management activities and policies, and to learn about other resources and information regarding deer and deer-related issues. The recorded message on such a phone line could be updated as necessary, and comments and inquiries from callers could also be recorded.

MANAGEMENT OPTIONS FOR DEER-PEOPLE IMPACTS

Just as there is a variety of ways in which deer impact their surroundings, there is a variety of ways in which these impacts may be addressed. Some alternatives may be more effective in some situations, while other ones may be impossible in certain circumstances. Often, a combination of several management techniques may be necessary. Ten management alternatives were presented in the Task Force Report. This part of the plan will present an overview of these alternatives with their drawbacks and assets. An additional technique - habitat management - will also be presented.

Management options fall into two broad categories. First, population control options are those that actually impact the number of deer in a given area. These methods may be lethal or non-lethal, and have varying degrees of effectiveness and differing time frames within which desired results may be expected. Various ecological, legal and societal factors determine which options may be feasible in any given situation. All population control methods require some amount of long-term maintenance, since deer will continue to reproduce.

Secondly, there are management options do not involve population control. Some of these are means of managing deer behavior or preventing access to certain places by deer. These options are intended to reduce the level of conflict between deer and people without reducing herd size or productivity. The rest of these management practices do more to modify human behavior and perception of the impact of deer.

Budget

The budget is an important piece of any deer management plan, and surprisingly, we've found that it is often missing from plans. Commonly, a cost estimate is provided for just a few actions throughout the body of the plan. Sometimes plans have budget elements nested within actions selected (e.g., if a plan notes that they will be hiring sharpshooters, it may place an estimate of cost in the text). While this approach is okay, it can be more helpful as a reference for readers to include a separate, traditional budget as a component of your plan.

Your budget should include estimated costs for each element of your community's plan for each year that the effort is funded (given the duration of the plan). For the budget for your CBDM plan, identify both one-time costs as well as ongoing costs. Accounting for recurring costs is important, as community-based deer management is not a one-time effort—it often takes a long time horizon to work towards the changes in impacts your community desires. Ideally, communities should consider a 10+ year time horizon for their process, if possible. Experts have noticed that the most successful communities often have an annual line item for deer management in their community's municipal budget. Doing something for a few years then stopping is usually not a great use of your community's resources, and is a common flaw in most community-based deer management plans.

Be as comprehensive as possible. Costs such as hiring a firm to conduct sharpshooting for deer population control, for instance, may be easy to identify. However, do not forget about other potential costs such as those associated with outreach and education. In addition, monitoring and evaluation should be an ongoing part of any deer management plan, so estimating a budget for that aspect of your plan shouldn't be overlooked.

Why is the budget so important? Well, one reason is that if your deer management plan is serving as a proposal to your community's board of trustees or mayor, considering the costs of the elements you've laid out will be an important factor in determining the feasibility of the plan. In fact, you may even consider describing some of the potential savings that may accrue (e.g., from reduced deer-vehicle collisions), especially if your plan is serving as a proposal. Including a budget can also be helpful for other communities to get a sense of what might be feasible in their situations, given their own municipal budgets.

It's understandable that you might be reluctant to include a budget—cost for some aspects of your plan may be difficult to estimate. Start by identifying which elements you can find a cost estimate for most easily. For other estimating other costs, reaching out to deer management experts or other communities that have selected similar actions (see the [Community Deer Advisor](#) for case examples) might be helpful.

After completing this module, you should....

- ✓ Understand why including a budget is important
- ✓ Recognize the elements of a complete budget, including one-time and recurring costs
- ✓ Understand the variability in program costs

Budget, continued...

Keep in mind that there may be dramatic differences in the cost of programs from one community to another. For instance, the [Village of Trumansburg](#) in New York estimated that their only costs were associated with an aerial deer flyover survey, on which they spent \$4,000. Their program relied on volunteers to carry out most of their activities, which made for a program that was doable with their small community's resources. Compare that cost with the nearby [Village of Cayuga Heights](#), which spent significantly more money implementing their plan. While some of the cost was attributed to hiring a private firm to carry out deer population control activities, some of that cost was attributed to an expensive lawsuit brought by citizens opposed to the plan. This unexpected legal cost is something to keep in mind when determining your budget. You may not be able to anticipate all components of your budget, so be sure to go back and adjust when you know more about what your community will need to spend to be effective.

Make sure you are realistic when developing your plan: you'll likely need to strike a balance between actions needed to achieve your objectives coupled with an honest evaluation of what costs are affordable for your community. If your plan is a proposal presenting a few options instead of advocating for one particular option, it may be helpful to include example budgets for each option.

There are many kinds of line items that communities might include in their budgets, such as:

- Data collection costs
- As many communities tend to take specific population-control actions, population control costs are a common element of budget
- Monitoring costs (an example of recurring cost)
- Costs for other actions such as putting up fencing, or materials for education and outreach efforts
- Does a new position need to be created in order for your community to carry out your proposed actions? If so, you may find it helpful to include those personnel costs in your budget.

To get a sense of how some communities are doing accounting for their plans, let's look at two example budgets.

(Example #1). This first example is from Ann Arbor, Michigan. This is a straightforward budget, identifying initial costs and ongoing costs. It reports both estimated dollar amounts as well as staff time needed to implement the plan. (Example #1 excerpt on next page).

Ann Arbor's full plan can be found at:

<https://www.a2gov.org/departments/community-services/Pages/Deer-Management-Project.aspx>

Budget, continued...

Estimated Cost of Recommendations

Estimated costs for recommendations include:

1. Culling in Wards 1 and 2 (including culling contractor, permitting and staff time costs)
 - 1st year cost = \$25,000 to \$35,000
 - 2nd year onwards cost is \$25,000 - \$30,000
2. Annual flyover = \$3,000
3. Measure impact of deer on City's natural area:
 - 1st year cost = \$30,000-\$40,000
 - 2nd year onwards = \$15,000-\$25,000
4. Development of deer management materials and resources for website = 80 staff hours

Recommendations for Deer Management in Ann Arbor
May 7, 2015

(Example #2). This next example is a very thorough budget from Burnsville, Minnesota (excerpt from this example begins on the next page). This is one of the best examples of an informative budget we have seen. It provides estimated costs for both the first and second year of the program, noting that the budget will need to be adjusted annually, with a revised cost projection occurring after the initial program is evaluated. The budget clearly breaks down the costs of activities related to education, monitoring, ordinance establishment, and population control. It's also clear what the cost estimates for each of these activities entails; e.g., education costs are related to enclosure monitoring as well as newspaper articles, cable programs, and an annual workshop. What do you think of this budget? Are there any other kinds of costs you plan on outlining in your own community's budget?

In sum, a budget is a critical piece of any community-based deer management plan, especially if your plan is outlining a suite of potential approaches for a board or a mayor to select from. Be sure to include:

- Recurring costs
- One-time costs
- Example budgets for multiple options, if you are not recommending one particular action

Example #2: Pages 114 through 116

Burnsville's full plan can be found at:

<http://www.burnsville.org/DocumentCenter/Home/View/1338>

9.0 ESTIMATED COSTS

The following table provides an estimate of costs for the implementation of the various options recommended in the previous section. The citywide recommendations are identified first and a subtotal provided. Specific unit recommendation costs follow in subsequent sections.

Two costs are provided for each item, one based on the implementation cost for the remainder of 2001 to get the program organized and initiated, and the second is for the first full year of implementation (2002). Each year the annual budget should be adjusted based on the estimated deer density and removal needs, and the goals of the overall program.

Table 15: Estimated Cost to Implement Recommendations

Recommendation	Unit Cost	2001 Costs June - December	2002 Costs January - December
<i>Education</i>			
Exclosure Monitoring	\$ 50 / hour	\$ 0	\$ 2000
Newsletter articles, Cable Programs, Annual Workshop	\$ 500 / year \$ 25 / hour	\$ 0	\$ 500 \$2000
Subtotal		\$ 0	\$ 4,500
Monitoring			
Aerial Counts	\$ 200 / hour	\$ 0 *	\$ 1,250
Monitoring Coordination	\$ 25 / hour \$115 / hour	\$ 0 \$ 3000	\$ 4,000 \$0

Statistics and Figures update	\$ 4,000 / year	\$ 0	\$ 4,000
Subtotal		\$3,000	\$ 9,250
Ordinance			
Feeding Ban	\$ 115 / hour	\$ 1,500	\$ 0
Subtotal		\$1,500	\$ 0
Population Control			
Sharpshooting	\$ 200 / hour	\$ 5,000	\$ 30,000
Coordination, Permits and Orientation	\$ 115 / hour	\$ 1,000	\$ 1,200
	\$ 25 / hour	\$ 0	\$ 6,000
Subtotal		\$6,000	\$ 37,200
TOTAL		\$ 10,500	\$ 50,950

a Aerial counts completed in January 2001

Assumptions

For the purposes of this estimate, it was assumed that a portion of the work would be completed by outside consultants rather than city staff to give the maximum cost range. Other assumptions used to prepare these preliminary costs are described below.

- Population Control cost estimate for 2001 is based on removal to the 25 deer per square mile goal for the East Central Unit, whereas for 2002 it is based on removal of up to 150 deer from all six units to meet the 25 deer per square mile density goal.
- An annual evening workshop would be organized for residents of the city to provide information on fencing, repellents, plants, and potential vendors of these items. Expert speakers on these topics would be invited to present information, as well as local vendors.
- Consultant would work with city staff and attorney to draft proposed feeding ban ordinance.
- The statistics and figures for data collected in subsequent years of monitoring would be updated annually to illustrate current data on car/deer crashes, complaints, and aerial counts. A consultant would work with the city to compile the crash data from various sources, and create updated graphics for the crash and complaint sites and aerial counts, as well as update the projection and removal tables.
- Archery coordination will consist of consultant working on behalf of the City to develop guidelines and

restrictions for hunting times and locations by the Metro Bowhunters Resource Base and Capable Partners groups.

- Monitoring of the enclosure fence, the enclosed area, and an adjacent unrestricted area would be completed a minimum of three times per year. Any repairs would be made as necessary. Enclosures were installed September 2001 in Terrace Oaks Park in partnership with STOP group.

On-going Costs

It is expected that after the first 2 years of implementation that the annual cost of the Deer Management Program will decrease as the total number of deer to be removed annually should decrease. A revised annual cost projection will be made after March of 2003, once the effect of sharpshooting is evaluated.

Timeline

It is important to develop an anticipated timeline for the various components of your deer management plan. When are different management actions scheduled to be completed? When do you intend to collect data for monitoring and evaluation, and over what time horizon? Do you have any annual public meetings scheduled where progress on your deer management program might be shared with the community?

You may include a variety of aspects of your plan on your timeline, such as when specific recommended actions may be implemented, when outreach or education efforts might take place, any monitoring actions, when you might be updating your plan, or when your deer committee may be convening again, for instance. As with the budget, timing may be noted in the text of your plan with respect to particular objectives or actions. However, it can be helpful as a reference for readers to include a separate timeline as a component of your plan—and we recommend doing so.

Including a timeline is important for a variety of reasons. One, it can help your community with budgeting, so you have a sense of what particular activities or services are going to be required in the future. A clear timeline is also important for noting progress towards goals. The more detailed the timeline, the better, especially if you can include who is responsible for achieving certain tasks on the timeline.

You should think about including both long-term deadlines and short-term milestones. Your short-term milestones might include steps such as hiring a private firm to control deer, or convening a public meeting to discuss your selected actions. An example of a long-term objective might be to carry out a resident survey in five years to track experiences with deer impacts, for instance. Many of your longer-term deadlines may likely be related to monitoring and evaluation. It should not be surprising if you're able to more easily identify specific deadlines for your short-term milestones as opposed to long-term ones.

You should plan to include a timeline even if it can't be as detailed or precise as you'd like. If you have delays or unanticipated obstacles, be sure to go back to your plan (especially if it's available online for residents to review) and update your timetable accordingly. It's okay (and normal!) to have to adapt a timetable. For instance, if you have to change an ordinance to take the actions recommended in your plan, it may be difficult to anticipate exactly when that might happen. It's understandable to be concerned about failing to achieve deadlines you've set for yourself—but you don't want to be stuck in a situation where residents are expecting a certain action to take place when it needs to be delayed. So remember the remedy: if changes are made to your program, revise, update, and upload your plan again.

After completing this module, you should be able to...

- ✓ Recognize the elements of a complete timeline, including short-term and long-term deadlines
- ✓ Understand the importance of updating your timeline

Timeline, continued...

In developing your timeline, you may find it helpful to note that certain deadlines in your timeline may be tentative, if necessary. Including rationale for why dates have shifted in your revised timeline may also be advisable, so residents know not only that a change has been made but also why that change was made—and that it wasn't for arbitrary reasons.

So, what do some timelines look like? Let's review a couple.

(Example #1). This first example is from Solon, Ohio's Deer Management Plan. This timeline (which they call a "Schedule of Events") includes a nice introduction that states the length of time the plan is expected to cover—10 years. It also clearly states that the plan may vary as necessary. A "Schedule of Events" may include data collection actions, as well as report when specific components of the plan might be updated and when citizen input would be collected.

Solon's full plan can be found at:

<http://oh-solon.civicplus.com/DocumentCenter/Home/View/790>

D. SCHEDULE OF EVENTS

As stated previously in this work, this Management Plan is meant to have a life span of approximately ten years. It is expected that normal deer reduction activities will continue for that period. However, the Plan does allow for some variation to this schedule, based on input from all sources. In addition, the City will be reviewing other methods and strategies (including non-lethal) with a goal of reducing the level of human/deer conflict with the City.

It is the City's intent to proceed with the Program based upon the schedule in the following list of goals:

- 1) Inventory and analyze the locations of existing deer crossing signs within the City. Are these signs appropriately located? Are they effective? Are fewer signs warranted? Are additional signs warranted? Are other types of warning signs appropriate? (Winter of 2015)
- 2) Review the location of DVA within the City. Specific analysis must be placed on those locations where excessive DVA are occurring. (Winter of 2015)
- 3) Examine fencing along the US Route 422 corridor to determine if it is adequately preventing DVA. As part of this examination, look at other areas of the City to determine if fencing would help control issues in site specific areas. (Spring and Summer of 2015)
- 4) Annually document the number of DVA in the City. The goal is 35 DVA a year.
- 5) On an annual basis, update the information in Table 1-A to reflect the latest year's information on deer counts, DVA, and number of deer removed as part of the Program.
- 6) Based on survey information provided by residents and businesses, establish a baseline for the WAC of deer in each section of the City. It is intended that citizens input will be requested at all times during the life of this Management Plan. This information will be monitored and analyzed at least every two years starting in the fall of 2014. It is generally accepted that the immediate goal will be to attain responses of light or no impact to questions 3 and 4 of the survey from at least 80% of the respondents.
- 7) Establish at least ten locations in wooded areas (at least two per section of the city) where deer browse damage can be monitored. Annually monitor these same sections, take photographs, and provide appropriate narrative on the amount of damage (if any) is observed. Begin this effort in the summer of 2015.
- 8) Update Deer Management information on the City's website every two years starting in the winter/spring of 2015. The City will provide updated information on all aspects of the program including non-lethal control options.

Timeline, continued...

(Example #2). This second example is an excerpt from the City of Oxford, Mississippi's Deer Management Plan. This excerpt very clearly states how frequently the plan will be reviewed and updated—annually. This timeline item is also helpful because it assigns responsibility for who will carry out this task: city officials, the state wildlife agency, and the US Department of Agriculture.

Plan Updates and Changes

The City of Oxford Deer Management will be reviewed and updated on an annual basis by officials from the City of Oxford, the MS DWFP, and the USDA. This review will include a determination on the effectiveness of the above listed population management techniques and tools, and data gathered from population surveys. The review and update process will allow the city to more effectively manage the deer population and to identify any deficiencies in the plan.

(Example #3). This last example is from Burnsville, Minnesota. This example covers three years of the program, and includes planning activities (e.g., finding a contractor for sharpshooting), implementation activities, and monitoring activities.

The sequence in which the program will be implemented is expected to generally proceed as follows:

Sept. – November 2001	Identify contractor and specific locations for sharpshooting.
Nov. – December 2001	Conduct sharpshooting
January 2002	Conduct aerial deer counts and adjust removal numbers as needed
Jan. – August 2002	Monitor complaints, crashes and review sharpshooting results.
Sept. – November 2002	Identify specific locations for sharpshooting
Nov. – December 2002	Conduct sharpshooting
January 2003	Conduct aerial deer counts and adjust removal numbers as needed.
Jan. – August 2003	Monitor complaints, crashes and review sharpshooting results. Review and update archery hunting provisions and locations, if necessary.
Sept. – December 2003	Initiate archery hunting as outlined by special provisions to maintain deer density. Identify contractor and specific locations for sharpshooting, if necessary.

Timeline, continued...

In sum, a good timeline:

- Includes long-term and short-term deadlines
- Identifies who is responsible with achieving tasks on the timeline
- Is updated when delays or obstacles arise, with reasons for changes explained

Oxford's full plan can be found at:

<http://www.oxfordms.net/documents/departments/deer/deer-plan.pdf>

Burnsville's full plan can be found at:

<http://www.burnsville.org/DocumentCenter/Home/View/1338>

Responsibilities

For each activity included in your deer management plan, someone or some entity should be identified as the responsible party for carrying out that activity. Of course, they should be aware of and have agreed to that responsibility (e.g., who is responsible for collecting monitoring data?). Parties need to acknowledge that they *are* responsible for an aspect(s) of the plan, especially if they weren't involved in the development of the plan.

There might be roles in your plan for local government employees, staff of state and federal wildlife agencies, landowners, hunters, private consultants, residents, staff of a local parks department, municipal police, local or university Cooperative Extension specialists, or members of a deer task force or committee, to name a few. Identify who in your decision-making group needs to reach out to specific individuals, organizations, or departments to ensure that someone is responsible for carrying out all components of your plan.

You may identify the responsible party or entity in the corresponding section for activities of the plan (actions, monitoring, outreach, etc.), or you may simply outline those responsibilities in your plan and then work on identifying specific individuals to work on them. You may also list responsibilities as part of a timeline, which may be the most convenient place to do so, because an important part of identifying responsible parties for your plan is identifying the timeline for which those activities need to be carried out. Be sure to include the affiliations of the responsible parties. This does not necessarily involve listing a specific individual, as municipal leaders may change, for instance, but rather their role: e.g., a particular action is the responsibility of a deer committee, a mayor, a "Friends of" group, etc. However, the more specific you can be, the better. If, at the initial development of the plan it is unclear who the responsible party might be beyond "the municipality," for instance, it is advisable to go back and update the plan when responsibilities have been assigned.

After completing this module, you should...

- ✓ Be able to recognize the diversity of roles and responsibilities for carrying out activities in your plan
- ✓ Know where in your plan you might identify responsible parties or entities

Responsibilities, continued...

Here are a few ways different communities have identified responsible parties for their plan.

(Example #1). This first example is from Rochester Hills, Michigan. As you can see from the following three excerpts, responsible parties were identified within the plan's section on recommended actions. We see a variety of entities identified: Oakland County Sheriff Department, the Mayor, City Council, County Road Commission, the Department of Public Service, the Engineering Division, Oakland University, as well as local landowners. Are the roles clear to you? Are there any actions where it is not clear who is responsible?

2012 Action Plan Recommendations

Engineering Division should cooperate with the Oakland County Road Commission to bring in portable signs and determine the best locations for placement based on the most recent deer/vehicle crash data. These movable signs will warn motorists during the fall rut to be on the lookout for increased deer activity and to remind them to be cautious and to drive with care. The city should continue to work with Oakland University and other landowners to identify and modify areas of excessive brush along major roads to increase visibility and reduce deer/vehicle crashes.

2012 Action Plan Recommendations

An article should be placed in the Fall Edition of the Hills Herald, information on the ban should be shown on Cable Channels 10, 20 and 99 and placed on the city's website, and a note should continue to be put on water bills to remind residents of the city's deer feeding ban. Any reports of deer feeding within the city should be investigated and enforced by Ordinance Enforcement and Oakland County Sheriff Department.

2012 Action Plan Recommendations

The Mayor and City Council should designate October as "Deer Awareness Month." The Ranger/Naturalist has compiled a master list of volunteers that could assist him in talking with homeowners that call with deer complaints. After appropriate city training, these volunteers can provide information, suggestions, and samples of repellents to those residents who are having problems with deer in their yards. All resident calls on deer (nuisance deer and dead deer) should be documented on the City's Lucy System. Dead deer on county roadways should be forwarded to the Oakland County Road Commission for resolution. Dead deer on private property remain the responsibility of the property owner, while dead deer on city roadways should be forwarded to and handled by the Department of Public Service.

Responsibilities, continued...

(Example #2). This next example comes from Hopewell Valley, New Jersey. Their plan has outlined responsibilities in two main ways. First, at the beginning of the plan, the authors of the plan (the Task Force), request that two main entities are held accountable for carrying out aspects of the plan. They ask for a permanent Deer Management Task Force and outline some of the responsibilities they would retain; they also ask for the Township Committee to take on a number of responsibilities as well. Here they also suggest that public and private stakeholders will also be responsible for implementing some portions of the plan, which are made clearer later in the plan when specific actions are recommended.

Rochester Hills' full plan can be found at:

<http://rochesterhills.org/DocumentCenter/View/1752>

Hopewell Valley's full plan can be found at:

<http://hopewelltp.org/DocumentCenter/Home/View/501>

The Task Force requests approval from the Hopewell Township Committee for the following:

- 1)** The assignment of a permanent Deer Management Task Force to implement the plan. This body would meet periodically and have ongoing responsibility to implement strategies that achieve stated goals with assistance from Hopewell Valley municipalities and other stakeholders from public and private sectors.
- 2)** The ongoing commitment of the Township Committee and staff to implement the plan. Examples include initiation of a Township-led deer management program on municipal lands and utilization of the Township website for public outreach/communication. Most recommendations are 'budget neutral', but all require commitment from elected officials and municipal staff.
- 3)** Provide an annual contribution of \$5,000 as seed money to establish a venison donation program. This would allow the donation of 50 deer (equivalent to 5,000 pounds of venison or 20,000 meals). The Task Force would seek additional funding from public and private sources to grow the program.

In this second excerpt from Hopewell, in strategy 2D, "Encourage and facilitate program for venison donation to local food banks," some specifics regarding those public and private stakeholders are identified. In reading the recommendation for this strategy, you will see the task force has identified roles for local municipalities in contributing money to a venison donation program as well as a role for a nonprofit organization, even noting two specific individuals who will serve as contacts to this nonprofit.

2D) Encourage and facilitate program for venison donation to local food banks

The Task Force should assist with a creation of a Hopewell Valley venison donation program. This would include transportation, processing and distribution with a network of hunters, butchers, and food banks. Hopewell Valley hunters that responded to the public questionnaire cited a lack of outlets for venison restricted their harvesting of deer (See Appendix A – Question 9b). The Task Force recommends that Hopewell Valley municipalities contribute \$5,000 annually to the program. This amount would accommodate the donation of approximately 50 deer, which translates to 5,000 pounds of venison or 20,000 meals. The Task Force should seek additional contributions from the public and private sector to enhance the program once the program is established with a recurring annual contribution from the municipalities.

A partnership could be formed with Hunters Helping the Hungry (HHH) - www.huntershelpingthehungry.org. HHH is a non-profit organization that facilitates venison donations. In 2009, HHH was able to process 15,000 pounds of venison (ca. 60,000 meals) utilizing \$15,000 of funding (ca. \$1 per pound of venison). Jack Chellew and John Person are HHH contacts.

Responsibilities, continued...

(Example #3). This last example is from Montgomery County, Maryland. The excerpt begins on the next page. At the bottom of the first page of the excerpt, you'll see the start of a section called "Principal Agency Roles." In reading through this example, you'll see that specific tasks aren't necessarily identified, but that the general responsibilities for each of the main actors necessary for implementing this plan are outlined.

In sum, parties responsible for carrying out all activities in your plan need to be identified, and those parties need to know that they are responsible. It should also be clear on what timeline these responsible parties need to carry out their designated activities.

Example #3: Pages 125 through 126

Montgomery County's full plan can be found at:

<http://www.montgomeryparks.org/caring-for-our-parks/wildlife/deer-management/>

What follows is a comprehensive White-tailed Deer Management Plan for Montgomery County, Maryland. Guided by the Task Force's recommendations, this plan establishes goals and objectives for managing deer in the County, develops a plan of action for each of the problem issues identified in the Task Force Report and sets a time table for the implementation of those actions.

This management plan is divided into four parts. Part I addresses the collection, centralization and use of accurate data on white-tailed deer and their impacts in Montgomery County, and forms the foundation on which sound management decisions must be based. Part II outlines the implementation of a comprehensive public awareness and education program to better inform citizens about deer-human conflicts and their prevention. Part III describes the various management alternatives that are available to reduce deer impacts and outlines the implementation of population management alternatives to reduce deer populations in areas where this is deemed necessary. Part IV outlines the current status of the plan's implementation and the work program for the current fiscal year. This section of the plan will be updated annually and will reflect any modifications or additions to the plan.

Goal and Objectives

Goal

To reduce deer-human conflicts to a level that is compatible with human priorities and land uses.

Objectives

1. Reduce on a county-wide basis the number of deer-vehicle collisions.
2. Reduce depredation on agricultural crops and ornamental shrubs and gardens to levels acceptable to the community.
3. Reduce the negative impacts of deer on natural communities in order to preserve the natural diversity of flora and fauna within the county.
4. Develop a county-wide education program to provide residents with information on deer, deer problems and how to minimize or prevent deer-human conflicts.

Principal Agency Roles

The deer related problems that exist in Montgomery County and the actions called for to address these problems cross responsibility boundaries of a number of different agencies. As part of a cooperative planning process, the Montgomery County Deer Management Group (DMG) was established through a memorandum of understanding (Appendix II). The group is made up of representatives from the Maryland Department of Natural Resources Wildlife Division (DNR); the Maryland-National Capital Park and Planning Commission, Department of Parks, Montgomery County Natural Resources Management Group (M-NCPPC); and The National Biological Service (NBS). This core group will work with other agencies as necessary to accomplish the actions described in this Plan. Below are brief descriptions of the roles and responsibilities for each of these agencies. Under each heading in part I and II of the plan we have listed a lead agency and participating agencies. The lead agency is one of the agencies listed above that will assume primary responsibility for the actions to be taken under that section. The participating agencies will work cooperatively with the lead agency to accomplish those actions.

The Maryland Department of Natural Resources Wildlife Division

The Maryland Department of Natural Resources Wildlife division has the legal mandate and legislated authority to manage deer populations throughout the state of Maryland (Maryland Annotated Code: 10-202 & 10-205). DNR will provide input into development of the comprehensive management plan for white-tailed deer in Montgomery County through recommendations and providing technical guidance toward the implementation of specific deer management alternatives. The Division's objective is to work with representatives of Montgomery County - M-NCPPC and the NBS-CUE in resolving deer-human conflicts in Montgomery County.

M-NCPPC Department of Parks, Montgomery County

"The mission of the Department of Parks, Montgomery County, Maryland, is to provide for the acquisition, conservation, development, maintenance, and management of a park system which, in harmony with the environment and in partnership with the community and other public agencies protects, conserves, enhances, and interprets our natural and cultural resources; identifies and offers a variety of leisure opportunities; and is safe, accessible, and enjoyable for all. Our commitment is to be receptive, progressive, equitable, and adaptive in observing and fulfilling this mission for current and future generations."

-Adopted July 1994

The M-NCPPC Department of Parks, Montgomery County currently maintains 27,763 acres of parkland (approximately 8 percent of the county) in 325 different park and open space areas. The Department, through the enabling legislation that established the Maryland-National Capital Park and Planning Commission (Article 28 of the Annotated Code of Maryland), is responsible for protecting, preserving, and managing natural resources including streams, wetlands, forests and wildlife in County parks and consequently must play a critical role in the management of deer on a county wide basis.

The Department of Parks is a designated agency of Montgomery County charged with identifying and initiating actions to resolve deer related problems pursuant to the published findings of the Task Force Report. Within the Department of Parks, the Natural Resources Management Group is responsible for addressing wildlife management issues on park property and works cooperatively with DNR in the development and implementation of wildlife management initiatives.

U.S. National Biological Service

The NBS maintains technical expertise and experience in addressing deer management concerns, particularly in urban environments. Their primary role is that of consultant and technical advisor.

Public Participation

DNR

The Maryland Wildlife Division offers public participation and citizen involvement in the decision making process through:

Supporting Documents

Many plans may include as appendices to their main document additional supporting documents. For instance, if some data were collected early on in your process (such as an aerial deer population count, a survey of community member attitudes, etc.), you might include that information and results as an attachment. Likely you will have referenced the findings from these supporting documents somewhere in the body of your plan if they contribute materially to the rationale for the actions your plan outlines.

When deciding what to include, consider whether or not having the documents available as an attachment will be useful to those reading your plan. If you've already included all of the information from those supporting documents within the body of your plan, try to determine if adding more content as an appendix is repetitious or not.

We commonly see communities including the following kinds of supporting documentation, to give you an idea of what you might be interested in including in your own plan:

- Ordinances and resolutions
- Deer population counts
- Public education materials
- Resident survey
- Deer incident reports
- Minutes from public meetings or hearings
- Data or reports from previous program implementations, particularly if you are updating an existing deer management plan

(Example #1). For an example, on page 129 of the [Joint City of Bloomington-Monroe County, Indiana's Deer Task Force recommendations](#) you'll find the start of the plan's Appendices. The Appendices are 70 pages long, so we have not included an excerpt here. But if you click the link to their plan, you'll see four appendices that include a resolution creating the task force, a data sheet from the Indiana Department of Natural Resources about deer, responses to questions from community outreach meetings, and results of a public opinion survey.

After completing this module, you should be able to...

- ✓ Recognize the different kinds of documents you might include in appendices

Bloomington-Monroe County's full plan can be found at:
https://issuu.com/bloomingtonparks/docs/common_ground

Supporting Documents, continued...

A number of communities have conducted a resident survey, which can be helpful for a number of reasons. A survey might help you during the problem definition phase of the CBDM cycle by providing a sense of: the impacts that residents are experiencing, the priority for management of impacts, and how residents in your community weigh the costs and benefits of living with deer. A resident survey might also be helpful during the decision-making phase, if you need to get a sense of the desirability of certain management approaches. A survey may be useful during the evaluation phase of the CBDM cycle, as you may wish to get a sense of whether or not residents are reporting lower levels of impacts, and whether or not they are satisfied with how the program is progressing.

The Community Deer Advisor points out that if you are interested in carrying out a resident survey, it's important to recognize that doing so often requires a significant time commitment coupled with funds for developing a survey instrument. It might be necessary to consult experts along the way, such as private companies that specialize in survey design or local universities. You can find some example surveys on the [resources](#) page of the Community Deer Advisor.

In sum, there are many different kinds of supporting documentation that you might include as appendices to your plan. You should have a sense of what this supporting documentation might be, based on the sources you've cited within the body of your plan. It's often a good idea to include results of studies that your community has conducted if you're citing them as a source, because there may be no other place where readers of your plan can find them (in contrast with academic references, for instance). But, don't just add appendices for the sake of adding them! Be mindful of what's helpful additional information, what's superfluous, and what's repetitious.

References

Throughout the development of the plan, you may have referenced a variety of sources, from state wildlife agency reports to academic journal articles. It may be especially helpful for other communities if you identify references that may be useful to them. In addition, including references for your plan helps provide the rationale for your plan. For instance, if one of your considered actions was use of immunocontraception and your deer committee decided it wasn't right for your community based on relevant scientific research effectiveness, you should cite that research. As we discussed earlier, controversy in deer management processes tends to bubble around the selection of particular actions. Explaining why the committee chose what it chose and providing support for the decisions is what makes your choices defensible. Whether you choose to list the documents you referenced in the development of your plan at the end or in the main text is up to you.

Some plans may include in-text citations of journal articles, Cooperative Extension resources, state agency resources and reports, as well as other deer management plans. Other plans may just include a reference list or suggested readings. Whatever sources you consult while developing the plan should be acknowledged. A good rule of thumb for listing out your references is to ask yourself, based on the information included in my reference list, would somebody else be able to easily find my source? So, while you may find it useful to rely on a formal style for your references (e.g., MLA, APA, Chicago Style) what is most important is that your source is clear to those who may want to reference similar material.

Here is a brief list of the kinds of references communities have used in the development of their plans:

- Academic journals, conference proceedings, university reports, and books may be particularly useful for citing data in support of your decisions
- Reports provided by your municipality, insurance reports highlighting deer collision data, state or federal wildlife agency reports (on deer management practices, the state of the deer herd)
- Extension documents and practitioner's guides may be particularly useful for planning your outreach and education approach
- Communication with experts
- Field guides, magazine articles, or newspaper articles, which may be especially useful if your plan is providing a background about deer generally or about deer in your community specifically
- Other deer management plans

In our review of existing deer management plans, we found that few plans include references in their supporting documentation (around 10%). This does *not* necessarily mean that few plans consulted references in the development of a plan, but more likely chose not to include those references in the text of the plan. If you consulted a source, we recommend that you note it.

After completing this module, you should be able to...

- ✓ Recognize the different kinds of sources you might cite in your plan
- ✓ Understand the importance of including references

References, continued...

Let's look at an example from a plan that *did* include references, both in-text and at the end of the plan.

(Example #1). For an example of in-text references, here are two excerpts from the recommendations of the Joint City of Bloomington-Monroe County Deer Task Force in Indiana. The first excerpt demonstrates the use of academic studies as they described the implications for using one potential action alternative, the use of contraception. In the second excerpt, when describing Lyme disease as an impact residents in Bloomington and Monroe County are concerned about, they draw not only on academic citations, but also on data from the Indiana State Department of Health.

Bloomington-Monroe County's full plan can be found at:

https://issuu.com/bloomingtonparks/docs/common_ground

CONTRACEPTION

(Not supported by IDNR in free-ranging contexts.)

Two primary forms of contraception have been utilized to stem the growth of deer herds: PZP and GnRH.

The first method of inducing infertility in deer is by immunocontraception using a vaccine extracted from the ovaries of pigs, called *porcine zona pellucida* (PZP), in which the deer is immunized against a protein or hormone needed for reproduction (Miller and Killian 2000). When this vaccine is injected into a doe, her immune system forms antibodies against the vaccine. After the doe ovulates, the vaccine antibodies attach to her ovum and block fertilization, which causes the female to experience multiple estrous cycles and extends the breeding season (Warren 2000). An extended breeding season will increase deer activity at a time of year when conservation of calories is important and may result in increased winter mortality. Lengthened breeding activity of bucks may also lead to an increase in the number of deer-vehicle collisions. At this time, the use of PZP for fertility control in deer is experimental.

Unlike PZP, GnRH prevents eggs from being released from the ovaries, thereby eliminating multiple estrus cycles. GonaCon™ is the only commercially-available approved GnRH vaccine. Long-term field efficacy data does not exist; however pen studies (wherein animals are confined and excluded from other deer) indicate that a single-shot GnRH vaccine can last for up to four years (Miller et al. 2004). The EPA has approved the use of GonaCon™ as a "pesticide." However, the Office of the Indiana State Chemist has not approved this pesticide for use in Indiana. At this point, there are no known dangers to humans or wildlife from eating deer vaccinated with GonaCon™. However, the long-term bioaccumulative effects of the pesticide are still being studied.

References, continued...

(in-text example re: Lyme disease)

The problem is that reducing the deer herd doesn't translate into reduced exposure to Lyme disease. First, adult black-legged deer ticks feed on raccoons, skunks, opossums, and other medium-sized mammals. When deer are scarce, ticks don't necessarily become scarce, because they have alternative hosts. Indeed, several studies on mainland sites in New York and New Jersey found no correlation between deer and ticks. Second, ticks and Lyme disease are rare or absent in parts of the United States (the Southeast, most of the Midwest) where deer are abundant. Third, ticks are only dangerous if they are infected, and deer are hosts to the ticks, but play no role in infecting ticks - that's the role of the white-footed mouse (as well as chipmunks and shrews) (Jordan et al. 2005; Jordan et al. 2007 and Ostfeld 1997).

Model simulations of the relationship between deer and ticks show that a reduction in deer density results in a small reduction of the black-legged deer tick population. In order to drastically reduce the host tick numbers, deer would need to be almost entirely removed from the landscape, since one deer serves as a host for many ticks. Experiments on island deer populations indicate that with a drastic reduction of deer numbers, the host tick numbers will also decline. In a free-ranging population, where deer are not constrained to one geographic area, it is unlikely that reduction of deer numbers would decrease the presence of black-legged deer ticks, thereby decreasing the risk of Lyme disease (Ostfeld 1997).

Another important point to consider is that the population-level risk of Lyme disease in Monroe County is relatively low. Based on data from the Indiana State Department of Health, the number of confirmed cases in Monroe County has held steady at "less than five" per year over the last several years.⁴ Indeed, from 1990 to 2003, only four cases of Lyme disease were reported in Monroe County. From 2003 to 2004 (the last year for which data is available), one Monroe County resident was confirmed to have Lyme disease. To be fair, various factors confuse the diagnosis and reporting of the disease, and there are strong arguments that the disease is either highly under-reported or over-reported (misdiagnosed).

The in-text citations provided in the body of the report are linked to a thorough reference list included at the end of the deer management plan, an excerpt of which is provided below. In looking at just the first page of the plan's reference list, you can see the diversity of sources cited, including journal articles, city reports, books, and conference proceedings. The reference list is clear, and if someone wanted, they could easily track down and review the sources for themselves. (The reference list excerpt begins on the next page).

LITERATURE CITED

ALLAN, B. F. Keesing and R.S. Ostfeld. 2002. "Effect of Forest Fragmentation on Lyme Disease Risk." *Conservation Biology* 17(1):267-272.

ANDREN, H. 1994. "Effects of Habitat Fragmentation on Birds and Mammals with Different Proportions of Suitable Habitat: A Review." *Oikos* 71: 355-366.

BAISER, B. J.L. LOCKWOOD, D. LAPUMAN AND M.F.J. ARONSON. 2008. "A Perfect Storm: Two Ecosystem Engineers Interact to Degrade Deciduous Forests of New Jersey." *Biological Invasions* 10:785-795.

BERINGER, J., L.P. Hansen, W. Wilding, J. Fischer, and S. L. Sheriff. 1996. "Factors Affecting Capture Myopathy in White-Tailed Deer," *Journal of Wildlife Management* 60: 373-380.

BOONE, J.L. and W.G. Wiegert. 1994. "Modeling Deer Herd Management: Sterilization is a Viable Option." *Ecological Modeling* 72: 175-186.

CASEY, D. and D. Hein. 1983. "Effects of Heavy Browsing on a Bird Community in Deciduous Forests." *Journal of Wildlife Management* 47:829-836.

CITY OF BLOOMINGTON COMMISSION ON SUSTAINABILITY. 2010. "Recommendation to the Joint City of Bloomington-Monroe County Deer Task Force," December 14, 2010.

CITY OF BLOOMINGTON ENVIRONMENTAL COMMISSION, "Greenspace Trends Report (1993-2007)," November 30, 2007.

CONOVER, M.R. 1997. "Wildlife Management by Metropolitan Residents in the United States: Practices, Perceptions, Costs and Values." *Wildlife Society Bulletin* 25: 306-311.

CONOVER, M. R. 2002. "Resolving Human-Wildlife Conflicts. The Science of Wildlife Damage Management." Boca Raton, Florida, USA: Lewis Publishers.

CORNICELLI, L., A. Woolf and J. Roseberry. 1996. "White-tailed deer Use of a Suburban Environment in Southern Illinois." *Transaction of the Illinois State Academy of Sciences* 89: 93-103.

If you visit the Community Deer Advisor, you will find a resource library with some references that your community may find useful, in categories such as [deer ecology](#), [deer impacts](#), [facilitation and communication](#), [management actions and alternatives](#), [setting goals](#), and [measuring progress](#), to name a few.

In sum, whether you do so in-text, at the end of your plan, or both, it's important that readers are able to find your sources. References are a critical legitimizing component of your plan, so be sure to include them.

Making Your Plan Available: Template and Checklist

Communication is important at all stages of your deer management process, as discussed [here](#) on the Community Deer Advisor. However, when you've developed your deer management plan, likely after the decision-making phase of your community's process, it's especially important for you to make clear to your community the details of your plan. Many communities make their plan available on a municipal website, so it is easily accessible to the public. However, some communities may find it beneficial to develop a specific, separate communication plan.

Here are some key elements of a communication plan:

- Objectives and desired outcomes (public awareness, increased knowledge, behaviors); i.e., the purpose of the communication plan and how it helps meet the goals of the deer management program
- Strategies to achieve objectives
- Tactics to communicate; e.g., using social media, public workshops, etc.
- Key audiences: who's important to reach?
- Messages: how do you want to talk about your plan?

If you are interested in creating a communication plan for your own community, on the [Community Deer Advisor](#) you will find some instructions on how to do so, a template for a communication plan, and an example plan.

Before you upload your plan to your website, be sure to include a table of contents, the date of the plan's publication, the author or authors of the plan, and an acknowledgement of any outside assistance with respect to the plan. Other communities, especially those in your state, may look to your plan to help guide the development of their own plan. For instance, if you received outside assistance from a wildlife biologist, that person may be a good resource for other nearby communities. If this plan reflects a revision to an earlier plan, it might be helpful to note, either on the website or at the beginning of the plan, why revisions were needed.

That's it! Thank you for completing this course on how to create a community-based deer management plan. A template for developing a plan of your own begins on the next page. After the template you'll also find a brief checklist for you to review when you've completed your plan.

Community-Based Deer Management Plan Template for

[City, State]

This is a template to help you recognize the important components of a deer management plan. As you browse the example deer management plans included on this website, you will find that they do not follow a standard format. Some plans are hundreds of pages long with many appendices, whereas others are simple 10-page documents. Some states may require that communities undergo an environmental impact assessment process prior to implementing a program, which may affect the length of a plan and the components of that plan. However, what we have included in this template are the core elements that a deer management plan should include no matter the length.

Be sure to include a date of plan publication, identify the author of the plan, and if you received any outside assistance it may be helpful to note that as well. Other communities, especially those in your state, may look to your plan to help guide the development of their own plan. For instance, if you received outside assistance from a wildlife biologist, that person may be a good resource for other nearby communities.

PLAN SUMMARY AND BACKGROUND

Here is where you might provide a brief summary of the content of your deer management plan, e.g., actions selected and a general timeline for implementation. You may also provide some background regarding your community or a description of the area targeted for management, e.g., location, size, land ownership type, etc. If a deer committee was convened to help create the deer management plan, include some information about a) how committee were selected (process, by whom, criteria for selection, etc.); b) committee members names and affiliations; c) important dates or milestones; d) the decision-making process used to create the deer management plan. Some plans may also include a purpose: what is your community's overall purpose in creating this deer management plan? Some communities may describe their purpose as to mitigate some general deer impacts, or to provide planning guidance.

PROBLEM DEFINITION

Here is the place to describe the deer management problem that your community is facing. Include a discussion of the primary impacts that are driving the problem; these might include impacts to habitat, impacts to ornamental plantings around residences, or perhaps public health and safety impacts such as deer-vehicle collisions or increased Lyme disease cases. Describing the impacts that are driving the problem in your community will help readers of your plan understand the links between the management actions your committee selected, the objectives those actions help meet,

and the impacts those objectives help address. You may find it helpful to organize your impacts by type, e.g., human health impacts, ecological impacts, etc. In addition, it can be helpful to identify where or to whom the impacts are occurring, how severe they are, and if they have changed over time. It may also be helpful to include the sources you relied upon to identify the impacts, if possible. For instance, did you acquire numbers about rising deer vehicle collisions from your local police department? Did you implement a resident survey? Was there a deer population survey or forest monitoring project that helped to elucidate your community's impacts, or impact change over time?

GOALS

Include here some broad goals that you hope to achieve with your deer management program. These goals might be expressed as a list of general outcomes or reflect a desired future condition. Example goals might be maintaining a socially-acceptable level for the deer population; preserving healthy, local forestland; supporting a community that is well-educated on how to live with deer while reducing human-deer conflicts, etc. These goals should be realistic and achievable. Some communities may find it helpful to connect their community-level goals to any statewide goals for deer management, if applicable (i.e., does your state wildlife agency have a deer management plan you may look to in order to help refine your own community's goals?)

MEASUREABLE OBJECTIVES

Here is where you include your measurable objectives, the achievement of which collectively allow accomplishment of your goals for deer management in your community. It may be helpful to think about your objectives in terms of categories, such as: objectives directed towards the number/behavior of deer, objectives directed towards increasing community knowledge about deer/deer management (e.g., driving behavior, deer-resistant plantings, etc.). Example objectives might be to reduce the number of deer-vehicle collisions to a certain amount per year, to eliminate deer damage to ornamental plantings around homes, to increase or maintain stems of certain forest plant species to some density, etc. Whatever objectives you have identified, it is important that they be measureable and have a time component (target date for achievement), meaning that there is a way for you to track progress towards meeting these objectives. In the following sections, you will identify your selected management actions as well as selected indicators for monitoring progress on your plan, both of which need to reflect these objectives. As you identify your objectives, be aware of the kinds of actions you might need to take to make progress towards these objectives as well as the kinds of data that you might need to collect in order to evaluate that progress. Including measurable objectives that are tied to indicators and actions is arguable the most important component of your plan. It is critical to know what you are making progress towards in order to have some way to judge success of

your program. It is also important that you start with identify objectives, not with actions. Actions selected should be matched to goals and objectives, not the reverse.

MANAGEMENT ACTIONS RECOMMENDED

Here is where you outline the various management actions recommended or selected for your community-based deer management program. These actions may include strategies for population control, strategies directed at deer behavior, strategies directed at human behavior, public outreach, education or communication strategies, local ordinance changes or others. Likely your plan will include a suite of management actions, so you may choose to organize them according to type (e.g., deer population control, ordinances, etc.) For each action selected, it is important that you explain how this action will contribute towards meeting your objectives, identify who will carry out the action and on what timeline, and describe the site targeted for management, if applicable. For instance, if you will be installing deer-proof fencing around various natural areas in your community, which natural areas will be protected and if not all at once, then in what order? And who will be doing the installation? It is important that this section is complete and clear, as controversy around deer management in communities is often focused on management actions. It is also critical that you identify why particular actions were selected or recommended; this forms the rationale for your plan.

MANAGEMENT ACTIONS CONSIDERED

Were there actions that your community considered prior to selecting the management actions outlined above? If so, an explanation of which actions were considered and why they were ultimately not recommended provides an important part of the rationale for your implementation plan. Be as specific as possible. For example, if deer immunocontraception was a popular choice among residents but the deer committee found it not to be feasible in your community, make sure you clearly explain why. Was it cost? Effectiveness? Time expected for results? If a management action was considered and rejected, the reasons why should be communicated here. Including these kinds of considerations is an important part of communicating the rationale for your plan; as mentioned earlier, controversy around deer management is often focused on the actions selected. Presenting a clear rationale as to why particular actions were not suitable for you community is an important part of developing a sound, acceptable deer plan.

PLAN FOR MONITORING

Here is where you should include a list of the indicators you will be monitoring to assess progress towards achieving your objectives. It is important to identify for each indicator what specific data you are going to collect, who is going to collect those data, and how they will do so. For instance, will your community be conducting aerial counts

of deer each year to monitor changes in population? Will you be monitoring regeneration of certain forest plants? Tracking deer-vehicle collisions? Whatever your community will be doing to evaluate your deer management program's progress towards addressing important impacts, it is critical that the indicators you have selected are clearly identified and are tied to measureable objectives.

PLAN FOR PUBLIC ENGAGEMENT

Here is the place to include plans for public outreach regarding your deer management program. You may have included outreach strategies as part of your selected management actions to meet education-related objectives (e.g., holding neighborhood workshops on landscaping with deer-resistant plantings), but if there are additional steps that will be taken towards engaging community members, here is the place to describe those steps. For instance, do you plan on holding annual or semi-annual public meetings to update the community on progress towards your plan? Will you be maintaining a page on your community's municipal website regarding the deer management program? Keeping the public apprised of changes to your deer management program or progress towards goals and objectives is an important aspect of effective CBDM efforts, and having a place in your plan where you can explicitly identify how you will do so is one way to stay accountable.

BUDGET

Include here the estimated costs of each element of your community's plan for each year that the effort is funded. Identify both one-time costs as well as ongoing costs. Be sure to be as comprehensive as possible; costs such as hiring a firm to conduct sharpshooting for deer population control, for instance, may be easy to identify. However, do not forget about other potential costs such as those associated with outreach and education. Sometimes you will see plans that have budget elements nested within actions selected (e.g., if a plan notes that they will be hiring sharpshooters, it may place an estimate of cost in the text). While this is a fine approach, it can be helpful as a reference for readers to include a separate, traditional budget as a component of your plan.

TIMETABLE

Include here an anticipated timetable for the various components of your deer management plan. When are different management actions scheduled to be completed? When do you intend to collect data for monitoring and evaluation, and over what time horizon? Do you have any annual public meetings scheduled where progress on your deer management program might be shared with the community? Remember, it is important that if changes are made to your program, you revise your

timeline accordingly. As with the budget, timing may be noted in the text of your plan with respect to particular objectives or actions. However, it can be helpful as a reference for readers to include a separate timeline as a component of your plan.

RESPONSIBILITIES

For each activity included in your deer management plan, someone or some entity should be identified as the responsible party for carrying out that activity. Of course, they should be aware of and have agreed to that responsibility (e.g., who is responsible for collecting monitoring data?). You may identify that person or entity in the corresponding section of the plan, or you may use this space to outline those responsibilities. You may also list responsibilities as part of a timeline. Be sure to include the affiliations of the responsible party. This does not necessarily involve listing a specific individual, as municipal leaders may change, for instance, but rather their role: e.g., is this particular action the responsibility of a deer committee, a mayor, a “Friends of” group, etc.

ADDITIONAL SUPPORTING DOCUMENTS

Here is where you might attach any additional supporting documents for your plan. For instance, if some data were collected early on in your process (e.g., aerial deer population counts, a survey of community member attitudes, etc.), you might include that information and results as an attachment.

REFERENCES

Here is where you may list documents you referenced in the development of your plan. Some plans may include in-text citations of journal articles, Cooperative Extension resources, state agency resources and reports, other deer management plans, etc. Other plans may just include the reference list or suggested readings. Whatever sources you may have consulted to inform your development of the plan may be included.

Community-Based Deer Management Plan Checklist

- ☑ Have you included on your plan's cover page...?**
 - ✓ Date of plan publication
 - ✓ Plan authors and affiliations
 - ✓ Any outside assistance received
- ☑ Have you included a summary of your plan?**
- ☑ Have you included a description of the area targeted for management, including...?**
 - ✓ Size
 - ✓ Location
 - ✓ Land management type
- ☑ Was a committee convened to help create a plan? Have you included information about...?**
 - ✓ How committee members were selected
 - ✓ Members' names and affiliations
 - ✓ The decision-making process used to create the plan
- ☑ Have you included a purpose for your plan?**
- ☑ Have you described the impacts that are driving your deer management problem, including...?**
 - ✓ Where or to whom the impacts are occurring
 - ✓ How severe the impacts are
 - ✓ If the impacts have changed over time
 - ✓ Sources for impact data
- ☑ Have you included goals for your program?**

- ☑ Have you identified objectives for your program, and are they...?**
 - ✓ Specific
 - ✓ Measurable
 - ✓ Attainable
 - ✓ Relevant
 - ✓ Time-related
- ☑ Have you described the actions recommended for your program, including...?**
 - ✓ How the actions meet your objectives
 - ✓ Who will carry out the actions and on what timeline
- ☑ Have you described the actions you considered but did not select, including...?**
 - ✓ Rationale for why those actions were not chosen
- ☑ Do you have a plan for monitoring, including...?**
 - ✓ The data you will collect for each indicator
- ☑ Have you described all of the ways you will involve the public, including outreach and engagement strategies?**
- ☑ Do you have a budget that includes both one-time and ongoing costs?**
- ☑ Do you have a timeline for all the components of your plan?**
- ☑ Are the responsible parties for each activity identified?**
- ☑ Have you included additional supporting documents?**
- ☑ Have you cited your sources and included a reference list?**