

Town of Harvard

The Deer Management Subcommittee's Report to the Conservation Commission on the Management of White-tailed Deer

October 7, 2019

Introduction

At the request of the Harvard Conservation Commission, the Deer Management Subcommittee (DMS) has conducted an inquiry into Harvard's deer population. The purpose of this inquiry was to determine whether Harvard's deer population is overabundant, the impact of any overabundance, and whether to recommend a program of deer population management on conservation land.

The Conservation Commission's main priority for such a program would be to mitigate the effects of overconsumption by deer of local flora and to encourage the natural regeneration and diversity of native plant species in town forests. The Commission also noted that deer overpopulation increases deer-vehicle collisions and plays a role in the ecology of tick-borne diseases (Appendix A).

Approach

To investigate these issues, the DMS researched the literature regarding deer impacts on forest ecology, deer-vehicle collisions and human health. We interviewed or worked with a variety of professionals and others with experience in pertinent fields, including the State Deer Biologist and the State Botanist from the Massachusetts Department of Fisheries & Wildlife (DFW), a Botanist from the US Forest Service and prominent researchers in deer contraception and epidemiology from Tufts University. We spoke with representatives of the Massachusetts Department of Conservation and Recreation who manage the Quabbin Reservoir and the conservation administrators or deer management coordinators of five Massachusetts towns. We also interviewed the owners of two Harvard orchards, members of the Harvard Garden Club and several local hunters, who educated us on the practices and ethics of hunting.

We conducted public outreach, including publishing letters in the Harvard Press and hosting four public forums, which offered us the opportunity to learn and to have

extensive discussions with town residents, where we could hear their priorities, thoughts and concerns. Recordings of these forums are available to the public on the Harvard TV website (Appendix B). Below is a list of the invited speakers and panelists from our forums:

Speakers:

- Michele Grzenda, Conservation Administrator, Town of Weston
- Allen Rutberg, PhD, Professor, Department of Biomedical Sciences, Tufts University
- David Stainbrook, MS, State Deer & Moose Wildlife Biologist, Massachusetts Division of Fisheries & Wildlife
- Samuel Telford, ScD, Professor, Department of Infectious Disease and Global Health, Tufts University
- Robert Wernerehl, PhD, State Botanist, Massachusetts Division of Fisheries & Wildlife

Panelists:

- Lt. Robert Dalton, Manager, Andover Deer Management Program
- Troy Gipps, Manager, Grafton Land Trust Deer Management Program
- James Palmer, Manager, Dover Deer Management Program
- Frank Perry, Manager, Medfield Deer Management Program

The above research and outreach gave us perspective on the history of white-tailed deer populations in Massachusetts and the impacts that these populations have on forest ecology and human health today.

Background

White-tailed deer in the Northeast evolved over thousands of years under primary predation by wolves and cougars and by Native American hunters. Deer population density during those pre-colonial times rose and fell naturally, within a range of 5-15 deer per square mile.^{1,2,3} After the arrival of Europeans, deer, cougars and wolves were all heavily hunted. The cougar and wolf were extirpated from the region and have not been seen in Massachusetts since the mid-1800s, and Native American hunting is no longer widespread. By the late 1800s, white-tailed deer had been hunted to the brink of extinction.

Deer became protected by law in 1900, and hunting became highly regulated and often subject to local restrictions, as it declined in popularity. Meanwhile, farming collapsed, forests re-grew, and deer numbers increased in this more hospitable environment. More recently, people began to migrate into leafy suburbs and exurbs on recovered farmland, like Harvard, which provide deer with a patchwork of “fragmented forest” near houses and people, where they were often protected from their few remaining predators. White-tailed deer numbers have continued to rise, and today there are approximately

100,000 deer in Massachusetts and 30 million nationwide.¹ They are considered overabundant and problematic in many parts of the Northeast and other regions of the country. This overabundance is a product of human action and inaction.

Deer Overabundance and its Impacts

Overabundant deer populations can have the following effects:

Damage to forest ecosystems

According to State Deer Biologist David Stainbrook, above approximately 20 deer per square mile, white-tailed deer populations reduce the natural abundance of the native plants that they prefer to eat.¹ This preferential feeding benefits non-preferred species of herbaceous plants and shrubs, including some invasive species. Deer also feed on smaller tree saplings, and over-browsing tends to decrease the relative abundance of preferred tree species, including oak and maple, skewing the age distribution of the forest and disrupting normal forest succession. These effects cause an imbalance in the forest's diversity, the otherwise balanced numbers of preferred and non-preferred plant species at both mature and immature life stages.^{1,4}

According to State Botanist Dr. Robert Wernerehl, overbrowsing threatens rare plants in Massachusetts, including orchids, which have declined in abundance by as much as one-third over the past 30 years, due at least in part to overconsumption by deer.⁴

The forest understory of saplings, shrubs and herbaceous plants provides valuable food and nesting habitat for birds, such as ovenbirds, sparrows and warblers, and their numbers have also been shown to decline due to deer impacts.^{1,4}

Vehicle collisions

Each year across the country, over 1 million deer are struck by cars. Many of these deer are killed, and about 150 people per year die and 29,000 are injured in these accidents, which bring a financial cost of over \$1 billion annually.⁵ The rates of these collisions are higher in areas with higher deer population densities, and they increase during the rut, or mating season, when males are on-the-move. In Harvard, there have been between 10 and 18 deer-vehicle collisions per year since 2014 (Appendix C).

Black legged ticks and mosquitoes

While not the focus of the DMS efforts, the relationship between deer and ticks was a portion of the DMS mission background. Deer play an important role as the primary reproductive host of the black legged tick.^{1,4,6,7} Although immature ticks usually feed on and acquire disease from small mammals like mice and chipmunks, adult female ticks require a blood meal from a large mammal in order to produce eggs, and DNA evidence shows that over 90% of them take this final blood meal from white-tailed deer.^{6,7} According our forum speaker Dr. Samuel Telford, a single deer can potentially enable the birth of millions of larval ticks per year.⁶

In 2013, the state's Special Commission on Lyme Disease, recognizing the important role that deer play in tick reproduction, recommended deer population reduction as a tool to reduce the threat of this disease.⁸

While there is scientific debate about how far the deer population must decline in order to reduce tick populations, tick abundance is strongly linked to the abundance of white-tailed deer, and several studies have indicated a strong relationship between deer population density, tick abundance and Lyme disease rates.^{1,4,6,9,10,11} An example is shown in Figure 1, below, from a 13-year field experiment conducted by the state of Connecticut, in which deer numbers were reduced from approximately 140 per square mile to approximately 13 per square mile over an eight-year period using a firearms hunting program.^{9,17}

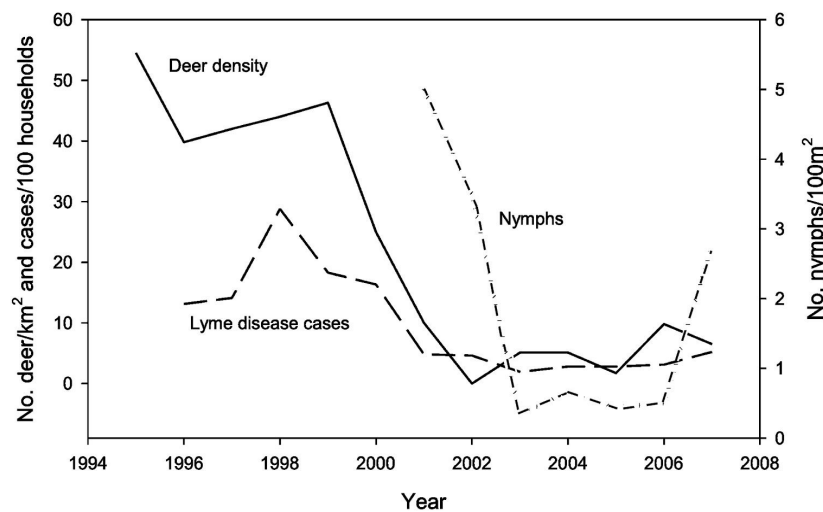


Figure 1. Reduction in deer density, numbers of Lyme disease cases and nymphs (nymphal blacklegged ticks) in Mumford Cove, Connecticut, 1995-2007. (Connecticut Agricultural Experiment Station (State of CT))^{9,17}

The white-tailed deer is also a major host for mosquitoes in the Northeast, and it provides approximately 90% of the blood meals consumed by two of the primary human-biting species, *Aedes canadensis* (recently renamed *Ochlerotatus canadensis*) and *Coquillettidia perturbans*, both of which can transmit the Eastern Equine Encephalitis (EEE) and West Nile viruses.¹⁸ These species serve as “bridge vectors” that transmit avian diseases from birds to mammals. The mosquito in which EEE was detected in Harvard in August of this year was of the species *Coquillettidia perturbans*.¹⁹

Damage to yards and crops

Many homeowners in New England report localized damage to their gardens, and farms and orchards have incurred great expense to fence crops against deer.

Effects on Deer Health

At very high population densities, deer can deplete their food supply, resulting in malnutrition and starvation, especially during long, cold winters. Overcrowding also introduces the likelihood of passing communicable diseases such as bovine tuberculosis and chronic wasting disease.

Deer Abundance and Impacts in Harvard

DFW conducted three days of browse surveys of 11 Harvard conservation properties between 2017 and 2019, and these surveys were presented to us in ten written reports (Appendix D). The reports assess the extent of deer impact on native plants, and they provide a basis for estimating deer population density. DFW estimates deer population densities on Harvard conservation lands to be in the range of 20-35 deer per square mile, significantly above their ecological goal of 12-18 deer per square mile for the region and well above the natural pre-colonial abundance of 5-15 deer per square mile. DFW has advised us that our deer population is currently increasing at about 4-10% per year and that it will continue to rise if left unchecked.¹ At this rate, our deer population is likely to double over the next decade.

According to DFW, their browse surveys indicate that the diversity and health of native trees, shrubs and herbaceous plants in Harvard forests are beginning to be adversely impacted by overconsumption by deer - the natural understory of native plants, shrubs and immature trees is beginning to be diminished. These impacts will continue to worsen if deer numbers increase, with lasting consequences for the ecological balance of our forests.^{1,4,12}

Although DFW has given us what we believe to be well-reasoned conclusions regarding the state of our forests, the assessments that we received were not unanimous. US Forest Service Botanist Thomas Rawinski visited Harvard in September 2018, and he conducted a walk-through of four conservation properties. We did not receive a report from him, but he told us via recent email that “current impacts weren’t as bad as one might expect” and that “overall it seemed a good balance.” He speculated that “the deer population in Harvard will grow larger” and that “deer impact in Harvard’s forests would likely increase in the future.” We wrote to him asking his opinion on a deer management program for Harvard, and we have not received a reply as of this date.

Evaluating these somewhat divergent opinions on the condition of Harvard’s forests required us to make judgments based on the nature of the surveys that were done and the content of the reporting that we received. We made these judgments based on the experiences of some of our members who attended the surveys and on insights that we have gained during the investigative process. DFW conducted intensive, full-day surveys of 11 conservation properties over three days. Copious notes were taken, and evidence of deer browse and forest condition were documented throughout the process. We were provided with 88 pages of reports for these surveys, and these reports reflected a codified

system of evaluating forest condition based on a known classification of plant species according to deer preference.

Mr. Rawinski's walk-through, which lasted approximately three to four hours, was brief by comparison and less extensive in terms of lands covered. We are not aware of the extent of any documentation from his survey; we did not receive reporting from him, and we were provided with the opinions above via email, months later.

Judging by these differences, we believed that our best course was to use the DFW surveys and overall assessment of Harvard's forests as our guide in formulating this recommendation.

An important similarity between the assessments of Mr. Rawinski and DFW was the prediction that Harvard's deer population would grow and that deer impacts would increase in the future. This was a strong factor in our thinking, because, even if our deer population were perfectly balanced with the environment today, future population growth would create a future imbalance.

Regarding the impact of deer on gardens and crops in Harvard, we interviewed the owners of Westward Orchards and Carlson Orchards, who incurred out-of-pocket costs of approximately \$200,000 and \$185,000, respectively, in order to fence their orchards against deer. Portions of their orchards remain unfenced, and they may incur future costs to fence them.

We also spoke with members of the Harvard Garden Club. They co-sponsored one of our public forums, and they expressed concern over the impact that deer have on gardens in town.

It is clear to us that Harvard is beginning to experience problems from an overabundant deer population. While we cannot know exactly how high the population is or how it will change in coming years, we have reason to believe that, if left unchecked, the population will grow and the impacts discussed above are likely to become more severe. Deer population levels are overwhelmingly determined by our own actions, and their current overabundance has become a reality that we must address.

Options

We considered four possible methods of controlling and reducing the deer population, including the capture and relocation of deer, contraception, professional sharpshooting, and recreational hunting using a variety of means.

Capturing and relocating deer is a difficult and expensive process which is currently not permitted by DFW. Even if it were permitted, due to widespread overabundance, it is unlikely that we could find relocation sites; and studies have shown that this practice is

highly stressful to the animals, with a low but significant capture-related mortality rate. This is not an option that is open to us.^{1,12}

Contraception uses a vaccine that blocks fertilization of eggs in female deer. It has been tried experimentally on small, isolated herds of deer, mostly on islands or in urban parks, and has been proven effective at reducing populations in those settings. All of the work done so far has been funded by grants, and conducting a similar program in Harvard would require funding. The cost of capturing deer and administering the drug would be at least \$500 per deer every two years, according to cost estimates from our forum guest, Dr. Allen Rutberg, who developed the vaccine and has conducted programs in several locations in the Northeast. For example, Dr. Rutberg informed us during his presentation that his program at Hastings-on-Hudson, NY costs tens of thousand of dollars per year for an area of approximately four square miles.¹³

According to Dr. Rutberg, it would be impractical to administer a contraception program in a town like Harvard, because our deer population density is relatively low compared with the areas where he has conducted his projects, and, as a result, the effort required to capture deer here would be cost prohibitive.¹³

In addition, according to DFW, contraception is not currently permitted in Massachusetts; and baiting deer, which has been a key component of the capture and vaccination process, is also not permitted.^{1,12} Although contraception has been suggested by some residents, we do not consider it to be a viable option for Harvard. We recognize that deer management is a rapidly changing landscape, and should a permitted, practical and effective method of contraception emerge, we would certainly consider recommending it as a possible alternative.

Culling by professional sharpshooters using rifles is the most effective way to reduce deer populations quickly and substantially, and populations reduced in this way can be maintained at reduced levels with archery programs. Sharpshooting can be done safely from elevated tree stands, using bait in controlled areas. However, it is expensive, sure to be highly controversial, and would require a special permit from the state.^{1,12} Sharpshooting has been used in areas of the state with very high deer densities as an extreme measure. We believe that our deer population can be reduced by less extreme methods before it grows to an unmanageable level.

Recreational hunting with shotguns and primitive firearms is currently done on private Harvard land, within the Delaney Wildlife Management Area and in the Oxbow National Wildlife Refuge according to state law and DFW regulations. However, given the other recreational uses of town land and the potential for public safety concerns surrounding these weapons, we believe that hunting with them would not be acceptable to residents.

Recreational archery from elevated tree stands is well-suited to suburban areas and an effective long-term method of culling deer. It is extremely safe, because the effective range of a bow is short (generally not more than 75 feet), and because tree stands offer a

clear view of the surroundings and a safe downward shot. Should an arrow miss, it would be grounded in the earth. According to DFW, "we have never had a non-hunter injured by an archery hunter in Massachusetts."¹

Bow hunting has taken place on lands in Harvard for centuries and has been lawful on the Delaney property and the Oxbow Reservation for decades without mishap. Many private lands in Harvard are also currently bow hunted with landowner permission. Controlled archery deer management programs have begun in recent years on MassAudubon and Trustees of Reservations properties and in the towns of Andover, Medfield, Weston, Grafton, Carlisle, Sudbury, Framingham and Dover. These programs use limited groups of vetted archers, and, according to the five deer program managers we interviewed, they have succeeded without mishap or conflict with other recreational users.¹⁴

Because other options are either costly, impractical, controversial, potentially dangerous or not permitted, we believe that a controlled archery hunting program is the only currently practical option for safely and effectively addressing our overabundant deer population.

Can Overabundant Deer Populations be Controlled with Archery?

In response to problems associated with deer overabundance, wildlife managers have, in recent years, turned their attention to controlling or reducing white-tailed deer populations. At least ten towns or land trusts in Massachusetts, as well as state and local governments across the Northeast, have adopted archery deer management programs in recent years, and these programs have been successful in reducing or mitigating the growth of local deer populations.¹⁵

According to DFW and other experts that we interviewed, one factor in deer overabundance and the key to effectively managing deer populations is *access to huntable land*.^{1,6,16} The majority of towns in western Massachusetts, although they are more forested, have lower deer densities and fewer deer-related impacts than suburban areas in the eastern part of the state, because town lands in western Massachusetts are largely open to hunting. As shown in Figure 2, there is a strong correlation between areas with high deer population densities and areas with high percentages of forested land within the legal 500-foot "setback" around houses, where hunting is restricted. These restricted areas create protected habitat for deer, which encourages their numbers to grow. According to a GIS analysis by DFW, approximately 70% of Harvard's forested land is currently within this setback. A program that reduces the amount of land under hunting restrictions by permitting hunting on portions of town land can be expected to mitigate deer overabundance.¹

Weston's deer management program, begun in 2012, serves as an example of the effectiveness of this kind of program. Prior to 2012, deer harvest within the town was in the range of 12-18 deer per year, exclusively on private land. Today, the total harvest is over 50 per year, and the portion attributable to their program has grown from 18-20 per

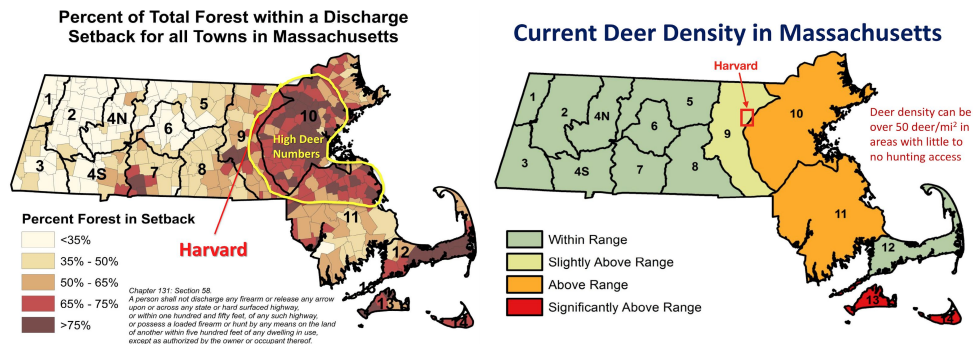


Figure 2. Percent of total forest within discharge setback for Massachusetts towns (left) and regional deer population densities for the 14 Massachusetts Wildlife Management Zones (right). Harvard sits at the eastern edge of Zone 9. (Department of Fish & Wildlife)

year to 29-35 per year, due in part to an increase in the number of properties within the program. Deer-vehicle collisions in Weston, a potential indicator of their deer population density, are lower today than they were when the program began (Appendix E).

The Quabbin Reservoir deer management program, run by the Massachusetts Department of Conservation and Recreation, began in 1991 in response to decreased forest regeneration, soil erosion and resulting water quality issues. The deer population there was reduced from approximately 100 per square mile in 1991 to under 20 per square mile in 2009, with an increase in stem counts (a measure of plant regeneration) of 1,140%. This resulted from an aggressive firearms management program, and, while we would not expect an archery program to match these results, they illustrate the long-term potential that management programs have for improving forest regeneration (Appendix F).

A natural advantage to deer management programs is site fidelity. According to our experts, deer exhibit a strong tendency to remain within their home ranges, even when surrounded by areas of lower deer density, and deer migration between neighboring areas is relatively low. This is particularly true of female deer, which are the more important gender for population control programs.^{1,13} This tendency works to the advantage of deer management programs because it preserves the progress made each year and allows for a compounding effect in population reduction.

The trend to start programs in more and more towns across the state is another advantage to deer management programs. At the start of this century, there were no town-organized deer management programs in Massachusetts. Today, there are at least eight, and the number is growing. The Sudbury Valley Trustees will begin an archery deer management program on conservation land in Littleton this fall. We have been in contact with representatives of the towns of Bolton and Stow, and they have expressed interest in our exploration of deer management for Harvard. Programs that manage deer populations in these neighboring towns will surely be a benefit to our town.

In his lecture at our forum, the State Deer Biologist stated the importance of beginning a deer management program as early as possible in order to mitigate the compounding effects of population growth over time.¹ Figure 3 shows expected rates of population growth or decline in a hypothetical deer population based on hunting access.

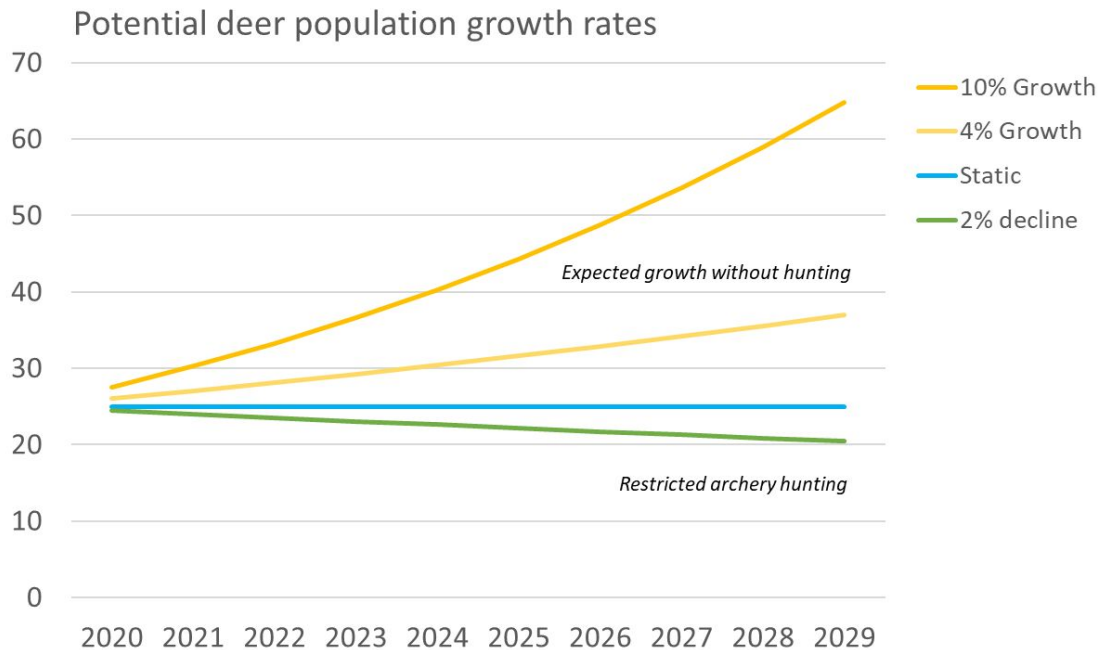


Figure 3. Hypothetical population growth and decline of a deer population

We believe that, with long-term commitment, archery programs have the potential to successfully manage deer populations and to mitigate the impacts of deer overabundance. Starting early, increasing the number of town lands included in programs and working in cooperation with private landholders is the most likely strategy to reach the goals that these programs hope to achieve.

Recommendation

We found that Harvard forests show impacts from an overabundant deer population, and, after studying the options, that the best practical method available at present to address this problem is to initiate a controlled archery hunting program.

We recommend that the Harvard Conservation Commission authorize a controlled archery hunting program on selected portions of town-owned lands (Appendix G) during the regular archery hunting season each year, according to state hunting regulations, and that the DMS and its volunteers be authorized to organize and carry out this program.

We recommend a controlled archery hunting program modeled after programs currently running in towns such as Andover, Medfield, Dover, Framingham, Grafton, Weston,

Carlisle and Sudbury, which have been generally accepted by their residents as safe and effective tools to limit or reduce deer populations. These programs use vetted groups of experienced, state-licensed hunters who use archery to hunt deer from elevated tree stands after a state mandated safety course. Tree stands keep hunters in a fixed position, offer a clear view of surroundings and require a safe downward shot, with a maximum effective range of approximately 75 feet. Under Massachusetts law, hunting is not allowed within 500 feet of homes or within 150 feet of roadways. Hunters are required to pass a proficiency test, hitting a 6-inch target 3 out of 5 times at 75 feet. Hunters work off-trail, and many residents of these towns report that they have never seen a hunter in the woods. Hunters are held to the highest standard of ethics for humane culling. Meat is never wasted, and the venison produced by these programs is locally-harvested, truly organic, sustainable and carbon-neutral. Hunting license fees contribute to state conservation efforts and the acquisition and maintenance of conservation land. There is no cost to the towns.

As an additional benefit to these towns, hunters in their programs routinely find and report illegal hunters, who are removed and sometimes prosecuted. We have found evidence of illegal hunting on Harvard conservation land, and we believe that a legal, controlled hunting program here would provide an effective means of reducing this problem.

We acknowledge that archery hunting will cause some deer to suffer. This can be mitigated, but not eliminated, by strict vetting and proficiency testing. Skilled and ethical hunters only take viable shots. While killing deer inherently involves some suffering, we believe that hunting is ethical when done according to the standards described above.

Deer also suffer from other causes, including car impacts, predation by coyotes and the effects of overpopulation. If we take no action and the deer population continues to grow, more will be struck by vehicles, and ultimately the population will rise to a level where diseases such as chronic wasting disease and bovine tuberculosis are transmitted and an increasing number of deer are malnourished or starve to death during hard winters. While the idea of killing a deer by means of hunting may be unsettling to some, we conclude that deer are bound to suffer in some way no matter what we do and that the suffering involved in hunting is outweighed by the benefits, for both us *and the deer*, of reducing the population by the safest and most practical means available.

We also acknowledge that a program of hunting on town land is bound to make recreational use of that land less enjoyable for some residents who are fearful of injury or who disapprove of hunting in principle or find it distasteful to encounter in practice. This can be mitigated by carefully controlling the areas where we allow hunting and how hunters gain access to their stands, by issuing public notifications and by posting notices on trails in the vicinity of hunting stands. According to the deer program managers we have interviewed, no conflicts with other recreational users have occurred in their towns, and their programs have received broad acceptance and support from their residents. We believe that public enjoyment of our town properties for hiking, bicycling, dog-walking,

bird watching and other activities can safely co-exist with hunting, just as it has in these other towns and in Delaney and Oxbow for many years.

We do not expect this program to achieve immediate results. It is likely that an archery program of this kind will take many years to reduce the deer population to the level of 12-18 deer per square mile as recommended by the state. Our hope is that an initial hunting program with limited scope, in keeping with the strategy laid out by the State Deer Biologist, will slow or stop the growth of our deer population, and that, as the program builds trust and acceptance within the community, it can be expanded to include an increased number of Harvard conservation lands, cooperation with land trusts and private landowners to allow greater access, and coordination with surrounding towns, allowing us to meet our goals with increasing efficacy.

The Conservation Commission has emphasized the importance of monitoring the deer population and forest health in order to assess the effectiveness of this deer management program. We agree and recommend increasing or decreasing the program based upon this monitoring. It would, for example, be inappropriate to conduct a hunt after a particularly harsh winter with significant deer mortality, if the deer population were to fall below ecological target levels.

To monitor forest health, we suggest using methods such as the “ten tallest” method, which tracks plant growth within a ten-foot radius of a variety of fixed sites over time. Mr. Rawinski has offered to train volunteers to conduct a monitoring program using this method. Other methods, including future browse surveys and pellet (scat) counts, could also provide value as we assess our progress in achieving our goals.

There is reason for optimism. Our deer population density is lower than in some areas of eastern Massachusetts, and we believe that our goals will be more easily achieved by comparison. We believe that, with a long-term commitment to the goals described above, we can bring our deer population into the range of state guidelines, restore ecological balance to our forests, reduce deer-vehicle collisions and perhaps eventually decrease the abundance of ticks and the incidence of tick-borne disease in our town.

We urge the Commission to approve the recommended program to start this fall, as delaying action will make this undertaking more difficult. We appreciate the opportunity to serve our town, and we look forward to working with you.

Harvard Deer Management Subcommittee

Robert Douglas, Chair

Paul Willard (Conservation Commission representative)

Tom Cotton (Harvard Conservation Trust representative)

Jason Cole

Ben Urquhart

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