

**The Report of the
Shelton Deer Committee**



Shelton, CT

Prepared for the Board of Aldermen

Adopted by the Shelton Deer Committee on February 10, 2015.



“The ‘deer line’ in overbrowsed forests and swamps plainly marks the standup height at which hungry or starving deer feed.”

-Leonard Le Rue, “The World of the White-tailed deer,” 1962

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Executive Summary

The Shelton Deer Committee was established by the Board of Aldermen in 2013 to study the impacts of deer in Shelton and to make management recommendations. This report summarizes those findings and recommendations. The Deer Committee made every effort to encourage public participation throughout the process, including press releases, a blog, Facebook posts, and a display at the Community Center. Very few public comments were received, primarily from hunters opposed to professional culling.

The overabundance of suburban deer is a growing problem that has posed challenges throughout the range of the White-tailed Deer. Suburbs provide ideal “edge” habitat for deer, which are highly adaptable and have learned to live in close proximity to humans. Deer have a high birth rate to compensate for heavy predation from wolves, mountain lion, and humans. When suburban communities become “built out”, hunting opportunities and predation are largely eliminated, and the deer population rises until it exceeds the food supply. The primary control for the deer herd is then malnutrition, deer-vehicle strikes, and fawn mortality at a high population density.

The consequences of overabundant deer include ecological damage as the forest understory is eliminated, with a loss of habitat for some species of songbirds and amphibians. Trees are unable to regenerate and water quality is degraded. After natural food sources have been eliminated, deer are forced to forage along roadways and in yards, leading to increased deer/vehicle strikes, landscaping damage, and a higher abundance of deer ticks in lawns.

The bacteria responsible for Lyme Disease is carried by the Deer Tick (*Ixodes scapularis*). This tick has a complex life cycle that includes a final meal on a large mammal, usually a deer, in order to successfully reproduce. In all studies where deer populations have been reduced to a threshold of 8-12 deer per square mile, the tick population and associated illnesses have been substantially reduced or eliminated.

Deer population estimates of Shelton/Monroe by the CT DEEP have ranged from 29 to 73 deer per square mile, equal to 800 - 2000 animals within city limits. An ecologically sustainable population ranges from roughly 10 to 30 deer per square mile depending on the type of habitat.

Deer browse assessments conducted by the Conservation Agent during 2014 revealed moderate to severe damage to the forest understory in Shelton open space. In some areas, nearly all vegetation has been eliminated below the browse line. Most other areas showed signs of unsustainable rates of browsing, with very few tree seedling surviving and stunted vegetation throughout.

There were an average of 49 deer/vehicle strikes per year reported to the Shelton Police between 2011 and 2013. This does not include Route 8, or deer strikes that were not reported to the Police. The State of Connecticut has found that less than one out of every six deer strikes are reported to the Police, so the true number of deer strikes in Shelton may be much higher.

There were 29 “confirmed and probable” case of Lyme Disease in Shelton reported to the State for 2013. The CDC estimates that only ten percent of cases are reported, so the true number of annual cases may be closer to 290.

Shelton residents are thought to spend millions of dollars each year due to the high deer population. Costs include landscaping damage, deer fencing, deer repellents, tick control yard treatments, vehicle damage, crop damage, and health costs due to tick-borne illnesses in both people and pets.

The Deer Committee recommends that the City of Shelton implement deer control immediately, because any delay will make the problem more difficult to address in the future. The initial goal should be an ecologically sustainable deer population for which our natural areas can provide sufficient forage and deer would no longer be forced to browse along roadsides and in backyards.

A new Deer Management Committee should be created to implement a program of controlled recreational hunts on select open space properties, beginning with bowhunting on a few suitable properties. Hunters would need to apply for a special city permit and may be subject to background screening, interviews, and reference checks.

Controlled recreational hunting is highly cost effective and is the most commonly used form of deer control in Fairfield County by municipalities and by organizations such as the Nature Conservancy and the Audubon Society.

The new Deer Management Committee would establish rules for hunting in the open space, such as minimum distances from trails or property lines. A small number of open space properties initially open to hunting would be expanded as the program matures. All actions concerning hunting on city properties would be subject to review by the Conservation Commission and approval by the Board of Aldermen.

Municipalities and other landowners are protected from recreational liability under state statute for activities that occur in natural open space areas when no fee is charged for the activity. There have been no recorded bowhunting fatalities involving nonhunters in Connecticut. Bowhunters shoot from tree stands. The range is limited and arrows that miss the mark are directed into the ground. The majority of bowhunting injuries are sustained when hunters falls from tree stands.

To achieve the primary goal of an ecologically sustainable deer population, some properties may need to have the canopy strategically thinned so more sunlight reaches the forest floor and the growth rate is increased. This can be done by girdling and dropping trees, or by a program of selective logging or harvesting for firewood.

Other recommended measures include facilitating the creation of a volunteer-lead program to match hunters with private property owners (most property in Shelton is privately owned), collecting data, and conducting public outreach.

Key Definitions

Browse – Feeding on woody plants. Technically, deer *browse* on the twigs of shrubs and saplings during the winter, and *graze* on soft forbes (e.g. wildflowers and ferns) during the summer. However, the term *overbrowsing* is generally used for the combination of excessive browsing and grazing by deer.

Built out – When most of the buildable land in a community has been either developed or reserved for parkland and open space, the town is said to be “built out.”

Carrying capacity - The number of animals that can inhabit an area without environmental degradation, as determined by assessing the health of the forest understory. “*Cultural Carrying Capacity*” is the number of animals a community deems appropriate for reasons of safety or property damage.

Controlled hunt – Hunts with a limited number of special permits and specific rules defined by the landowner that may be more stringent than general hunting regulations.

Deer tick - A common name for the black-legged tick (*Ixodes scapularis*), which transmits Lyme Disease and other tick-borne illnesses.

Keystone species - A species whose presence and role within an ecosystem has a disproportionate effect on other organisms within the system.

SECTION 1: THE SHELTON DEER COMMITTEE

Creation of the Deer Committee

The Shelton Deer Committee was established by the Board of Aldermen on September 12, 2013, to "*study the impacts of the deer population in Shelton with respect to tick-borne illness in humans and pets, deer/vehicle strikes, degradation of conservation and watershed lands, and damage to landscaping, and to make management recommendations in the form of a report to the Board of Aldermen.*"

The committee was created in response to a communication from the Shelton Conservation Commission dated June 3, 2013 (Appendix A), as well as comments from Shelton residents who were experiencing an increase in landscaping damage from deer, car accidents, and Lyme Disease. In their letter, the Conservation Commission cited environmental damage to Shelton Public Open Space due to excessive deer browse. The creation of a deer committee was recommended by the Fairfield County Municipal Deer Management Alliance, of which Shelton is a member, as the best way to begin the process of deer management. A number of other municipalities in the region have also created deer management committees, including Redding, Ridgefield, Wilton, Newtown and others.

Members of the Deer Committee were selected for their experience in relevant fields and include farmers; environmental scientists; active members of the Shelton Land Trust, Conservation Commission, and Trails Committee; hunters; a Master Gardener; and a medical professional. The members are:

Joe Palmucci (Chair)
William Dyer (Vice Chair)
Dan Beardsley
Jeff Forte
Teresa Gallagher
Allison Menendez
Darren Toth
Paul Uhrynowski
Brad Wells
Clerk: Kim Anglace

The Deer Committee met once a month on Tuesday evenings at 7:00 pm in City Hall. Every effort was taken to make the process as transparent as possible, including the creation of a Deer Committee blog which included meeting minutes, contact information, and notices of upcoming speakers. The formation of the committee was featured in articles in the Shelton Herald on September 23, 2013 and April 24, 2014 and in the November 2013 issue of Shelton Life. Information about the committee was posted on Conservation's Facebook Page on multiple occasions (the page has over 1000 followers), on the Conservation Commission's webpage (sheltonconservation.org), and on the Conservation Commission's bulletin board at the Community Center.

Summary of Guest Speakers:

January 2014: Teresa Gallagher, Shelton Representative to the Fairfield County Municipal Deer Management Alliance: The “Deer Alliance” consists of of nineteen member towns, including Shelton. Each town has their own approach to deer control, but there are common elements and findings that are shared between communities. For example, several member towns have researched their options and determined that deer contraception and deer relocation were not viable options. The Deer Alliance also lobbies the State of Connecticut for additional resources and more liberal hunting restrictions. Several towns have implemented controlled hunting on town property, including Ridgefield, Redding, and Newtown. Greenwich has employed professional sharpshooters. Towns that have implemented deer control are seeing a drop in deer-vehicle strikes and reduced landscaping damage.

March 2014: Pat Sesto, Wilton Director of Environmental Affairs, former Ridgefield Deer Committee Co-Chair, and former Chair of the Fairfield County Municipal Deer Management Alliance: Ms. Sesto focused on Wilton’s deer control program, which includes *controlled hunts* in which hunters must apply for a special permit to hunt on town property. The applicants are interviewed and given background checks. The town is very selective in deciding who may hunt in the open space. In addition, the town controls where and when hunting may occur. Neighbors are notified. Several Wilton handouts were shared, including the “Wilton New Hunter Registration Form” and the “2013 Participant Rules.”

April 2014: Howard Kilpatrick, Connecticut DEEP Wildlife Biologist: Mr. Kilpatrick gave an overview of urban deer control in Connecticut, including the ecological impacts caused by excessive deer (deforestation); hunting regulations; the life cycle of the black-legged (deer) tick; the relationship between ticks, deer, hunting, Lyme Disease, and deer-vehicle strikes. In summary, when there are more deer, there are more vehicle strikes, more ticks, and more Lyme Disease. Management options including contraception, poster devices, relocation, recreational hunting, and sharpshooting. The first three options are expensive and ineffective in a suburban setting. Sharpshooting is the most effective, but is expensive and controversial. Recreational hunting is moderately effective in controlling deer population, is cost effective, and is therefore the most commonly used option. Bow hunting is commonly used in densely populated areas. Much of the subject matter is discussed in the DEEP booklet “Managing Urban Deer in Connecticut” prepared by Howard Kilpatrick and Andrew LeBonte.

May 2014: Kirby Stafford, Connecticut Agricultural Experiment Station. "Dr. Stafford is a medical-veterinary entomologist whose research focuses on the ecology and control of the blacklegged tick, *Ixodes scapularis*, that transmits the agents of Lyme disease, human babesiosis, and human ehrlichiosis." Deer Ticks have a complex life cycle that includes early feedings on small mammals, usually mice, and a final feeding on a large mammal, normally a deer. Tick-borne illness are most often acquired from mice, but can also be acquired from chipmunks and some species of birds. Before a tick can

breed, it must have a final meal on a large mammal. All data collected so far show that when the population of deer is brought down below a *threshold* of 8-12 deer per square mile, the tick population collapses. Above that threshold deer density, sometimes there is a direct relationship between the deer population and ticks, and sometimes there is not, due to other variables in the environment. Dr. Stafford noted that suburban recreational deer hunting is capable of only bringing the population down to 30 deer per square mile, which may have modest impacts on Lyme Disease rates. But in order to have significant impact on tick-borne illnesses, the population needs to be brought down to 8-12 deer per square mile. Dr. Stafford provided copies of the "Tick Management Handbook."

June 2014: Joel Hurliman, Shelton Police Chief: Chief Hurliman presented statistics for deer-vehicle strikes reported to the Shelton Police Department from 2011 – 2013, a total of 147 deer strikes were reported, an average of 49 deer per year. This does not include Route 8. Of those deer, 79 were euthanized by the responding officer. The Chief was asked if he had any concerns over possible hunting in Shelton Open Space, whether by bow or firearm, and he did not providing all hunters abide by existing laws and regulations.

Public Comments

Several emails and comments at meetings were received from hunters opposed to professional culling. No other comments were received.

SECTION 2: OVERVIEW OF SUBURBAN DEER

Historical Perspective

Prior to colonization, Connecticut's deer population is believed to have been much lower than today, kept in check by heavy predation from wolves, mountain lions, and Native Americans. Colonists reduced the population further with intense hunting, including market hunting (which allows for the sale of the hide and meat). Most of the state was also clear-cut for farming, and deer numbers remained very low for about 200 years. By the early 1900's the deer population was estimated to be less than twenty deer in the entire state.

The deer population began to rise again in the 1900s after a series of laws were passed to protect wildlife from market hunting, and much of Connecticut's farmland was abandoned. In 1974, Connecticut passed the Deer Management Act, which recognized deer as a valuable "game" animal. Hunting laws were formulated to keep deer numbers high, for example, by allowing only bucks to be harvested.

By the end of the 20th Century, some suburban communities along the shoreline and in Fairfield County were experiencing unprecedented deer densities as hunting was eliminated. In 2005, the New York Times editorialized: "Forgive us if you are among the millions of gardeners, farmers, bird-watchers, drivers, fence builders, claims adjusters, body-shop operators, roadkill scrapers, 911 dispatchers, physical therapists and chiropractors who know this already. White-tailed deer are a plague."

Until recently, Shelton was considered more of a rural than suburban community, and deer hunting kept the population low. But in other parts of the country, it has been a widespread and growing problem for many decades. A book about white-tailed deer published in 1962 describes increasing numbers of deer starving during the winter (due to overpopulation), including large herds in New Jersey, with an estimated 2,000,000 deer starving each winter at that time across the country: "Starvation is not only a senseless waste, it is also brought about by man's use of the land, and his failure to keep the deer population within the food-capacity of the land to support just so many deer, and no more."¹

Causes of Overabundance

High deer densities are a direct result of suburban sprawl. The ideal "edge" habitat of backyards and roadways, in combination with a lack of predation (including hunting), inevitably leads to greater numbers of deer.



Figure 1: Healthy forest in Easton where there is deer control and forest management. The understory is dense and it is difficult to see through all the vegetation.

The lack of predation is the primary factor for deer abundance, due in part to the historic elimination of wolves and mountain lion, although Eastern Coyote has recently emerged as a predator of fawns. Before a suburb is *built-out*, there are still many areas where hunting occurs, and this keeps deer populations in check. Once most of the land has been either developed into housing tracts or preserved as parkland, hunting ceases to be an important factor, and the deer population levels increase dramatically.

The “edge habitat” of housing developments and roadsides typically generates more food for deer to eat than a mature forest. Extra light reaches the ground and allows for lush plant growth along the edges of yards and roadways. Gardens and shrubbery are also an abundant source of food for deer, as are bird feeders. In comparison, native plants in a forest grow more slowly and provide less food due to a lack of sunlight. Deer are very adaptable, and learn to thrive in the presence of humans, dogs, and cars in order to take advantage of the abundant food source.

A deer herd can theoretically double its population each year under ideal conditions because a healthy, well-fed doe normally has two fawns in the spring. Heavy predation has historically been the limiting factor on the population density. In suburban areas, however, the population is limited only by car-vehicle strikes, predation of fawns by coyote, and ultimately malnutrition, as the number of deer exceed the winter food supply. A starving doe is less likely to give birth to twin fawns.

Impacts of High Deer Populations

Deer are a *keystone species* that has the potential to profoundly and dramatically impact the landscape and the animals that live there. These impacts begin once the deer population has exceeded the *carrying capacity* of the land, most often because predation and hunting have been eliminated. The carrying capacity, which is the number of deer the land can support without environmental degradation, varies depending on the type of terrain, but is typically in the range of 10 to 30 deer per square mile.



Figure 2: A Pennsylvania deer exclosure demonstrates the profound impact deer have on the environment. Vegetation outside the fenced area is limited to ferns and grasses that deer do not eat.

The food supply in natural areas tends to decrease as the deer population increases and deer eradicate their own food sources. Deer then begin to frequent roadsides and backyards, leading to many of the more visible impacts that residents are concerned with.

There is a predictable cascade of impacts that begins when a suburban community becomes *built-out* and hunting is mostly eliminated. “Buildout” occurs when most of the land has either been developed or set-aside for parkland (where hunting is typically prohibited). Impacts do not begin all at once. Rather, one impact leads to another, resulting in a cascade of impacts over time. Some impacts may not be felt for decades, such as the loss of trees.

Early impacts: As deer numbers begin to rise, the composition of the forest (and home garden) gradually changes as the plant species favored by deer are eaten faster than they can grow and reproduce. In the backyard, favorites like hostas, tulips, and arborvitae are repeatedly damaged year after year until the homeowner gives up and replaces them with “deer resistant” plants. Damage is uneven. Some locations may be repeatedly hard

hit, while other areas are rarely touched, depending on the specific daily routes traveled by deer each day. Black-legged ticks carried by deer become abundant, and people begin to contract tick-borne illnesses. Deer-vehicle strikes increase. In the forest, favored tree saplings such as maple and oak disappear, and are replaced with birch or beech. This can have long-term consequences to the future composition of the forest canopy, with the eventual loss of acorns that sustain many animal species through the winter. Another impact occurs when deer eat the flowers of a plant. Although they may not kill the plant, they prevent it from reproducing. This has an impact on flowering shrubs and wildflowers such as Pink Ladyslipper, which often have their blooms nipped off. *All of Shelton has likely reached this stage.*



Figure 3: Arborvitae are favored by deer and are often stripped below the browse line each winter unless protected.

Continuing Impacts: If the deer population continues to remain high, the plants that deer prefer to eat will be eradicated, and deer will begin to eat plants that are less nutritious. Gardeners will notice browse damage on plants that deer previously ignored. Forests will begin to look noticeably thinner. In a healthy forest, there should be many areas where a person cannot see very far due to the proliferation of shrubs and saplings. In the overbrowsed forest, the forest begins to take on a park-like appearance due to a lack of undergrowth. This can be deceptively attractive as hayscented fern and some grass species begin to proliferate in the absence of competition from other plants. Other forest species, such as songbirds that nest in shrubs, are impacted and may not be able to breed and raise young. At this point, the carrying capacity of the forest is reduced because there is now less food for deer to eat. Deer will then spend a greater proportion of their time along roadways and in back yards, resulting in more deer-vehicle strikes and landscaping damage. *Some areas of Shelton have reached this stage.*



Figure 4: Forest in Easton without deer control showing a browse line below which there is no vegetation.

Final Impacts: Over a period of several decades, deer will have eliminated much of their food supply and are highly vulnerable to malnutrition and starvation during the winter. They will eat nearly everything within reach. The forest floor is completely devoid of vegetation except for patches of a few plants deer cannot eat, such as invasive Japanese Barberry and grasses. These areas are subject to increased rates of erosion and a lack of cover for other animals, including amphibians and songbirds that nest on the ground or in the shrubs. The deer are so thorough in their efforts to find food that a *browse line* may be seen at a level of four feet above the ground. *Starvation indicator foods* such as beech saplings and red cedar will show browse damage. These foods fill the stomach but provide little nutrition. Due to malnutrition, the birth rate will decrease, and deer may decrease in size as well. At this stage, homeowners often experience severe damage to landscaping and may resort to deer fencing. Deer repellents may not work as well as they once did. If this final stage is continued over a period of time, *bottom-up deforestation* occurs as the mature trees eventually succumb to diseases or are knocked over in storms. No young trees will take their place. The seeds of plants that once existed in the area are no longer viable, so even if the deer population is reduced substantially, it will take many years for these plants to recover. Finally, the carrying capacity of deer on the land is much lower than it once was because most plants have been eradicated. Land that could once support 25 or 30 deer per square mile may now only support 5 or 10 deer per square mile. *Parts of Shelton have reached this stage.*

Deer are highly adaptable to living in close proximity to humans and readily learn to forage in back yards and vegetable gardens. The impacts to residential properties gradually increase as deer exceed the carrying capacity of nearby woods and deplete wild sources of food. Deer are then forced to forage near humans and become acclimated to living amongst housing developments. This gradual process of acclimation explains why deer often become far more noticeable and bolder near homes over the course of several years even if the overall deer population has not substantially increased during the same time period. Acclimation to people is hastened when residents feed deer.

Deer and Lyme Disease

Lyme Disease is an infection caused by the bacteria known as *Borrelia burgdorferi*, which is transmitted by the Black-Legged Tick (*Ixodes scapularis*), more commonly known as the Deer Tick. This tick has a complex life cycle which includes progressive stages as a larvae, nymph, and then adult, with each stage requiring a separate feeding on a mammal or bird. Tiny larvae and nymph-stage ticks feed primarily on small mammals, especially mice and chipmunks, from which some of the ticks will become infected with the *Borrelia* bacteria, as well as other tick-borne illnesses such as Anaplasmosis² and Babesiosis³. Adult-stage ticks must acquire a meal from a larger mammal, usually a deer, in order to successfully breed and lay eggs.

Deer are not carriers of the bacteria that causes Lyme Disease. Rather, high deer populations are responsible for large populations of ticks. Abundant ticks cause the *Borrelia* bacteria to become frequently transmitted and therefore very common in a variety of animal species such as mice and chipmunks, from which future ticks may become infected and spread the disease to humans and pets.



Figure 5: Adult deer ticks require a meal on a large mammal, usually a deer, before they can drop off and lay eggs. This deer is infested.

There is evidence that Lyme Disease has existed for many years. Genetic material from Lyme Disease bacterium was found in a 5300-year-old European ice mummy.⁴ During

colonial times, when New England was largely cleared for farmland and deer were nearly exterminated, Deer Ticks and Lyme Disease were virtually unknown except in isolated areas. “Montauk Knee,” now believed to be Lyme Disease, was a malady found at the tip of Long Island where deer were maintained for hunting purposes.⁵ As the deer population began to rise in tandem with suburban sprawl, deer ticks and Lyme Disease began to proliferate.

In studies conducted on islands and peninsulas in which deer densities were reduced to 8-12 deer per square mile or less, a strong relationship was found between deer, ticks, and Lyme Disease. Lyme Disease was substantially reduced. These studies include Mumford Cove in Groton, Connecticut; Monhegan Island, Maine; and a 248-acre site in Bridgeport.⁶

*“The incremental removal, reduction or elimination of deer has clearly been shown to substantially reduce tick abundance in many studies. Observational studies and computer models suggest that a reduction of deer densities to less than twenty deer per square mile may significantly reduce tick bite risk, while lower levels (~8 deer/mi²) would interrupt the enzootic cycle of Lyme disease and transmission of *B.burgdorferi* to wildlife and humans.” – Dr. Kirby Stafford, Tick Management Handbook⁷*

Studies in which a very high deer population is somewhat reduced, but not to the low level of 8-12 deer per square mile, are less conclusive. In some studies, a modest relationship was found between deer numbers and tick populations, while in others no relationship was found. This has led to a working hypothesis often used by the Fairfield County Deer Alliance of a “threshold” deer population required for tick propagation. The exact threshold number is unknown and may vary depending on the terrain, but is believed to be somewhat above 8-12 deer per square mile based on studies and computer simulations. Above that threshold deer density, other environmental factors, such as the rodent population and ground cover type, may become more significant in determining tick abundance. When deer are highly abundant and a small number of them are removed, ticks are still able to find a deer host on which to feed. As a result, the remaining deer simply carry more ticks. If enough deer are removed, however, some of the ticks will perish before they can find a deer host and breed, and the life cycle of the tick will be interrupted.

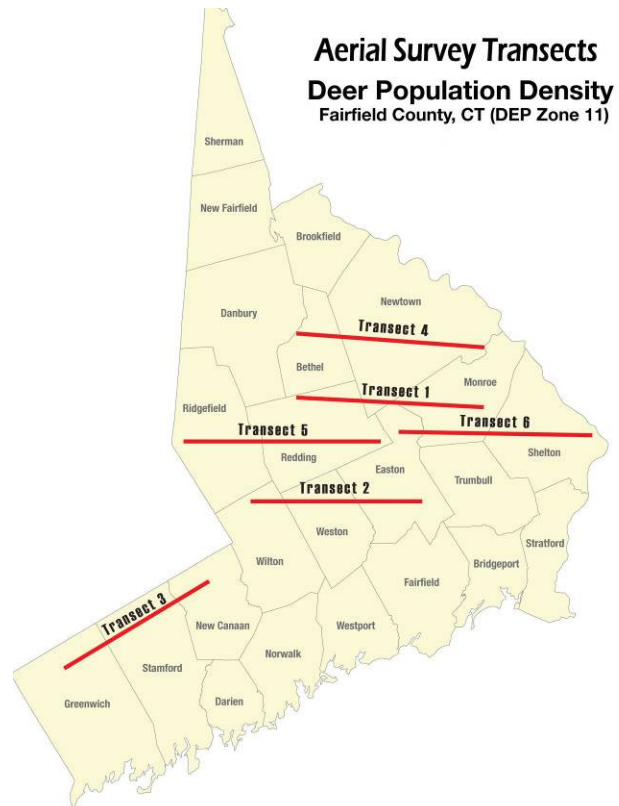
SECTION 3: DEER IN SHELTON

To what extent is deer overabundance is an issue in Shelton? Although costs are difficult to calculate, it seems clear that Shelton residents are spending millions of dollars each year as a result of the high deer population. Expenses include professional yard treatments for ticks, landscaping and crop damage, deer repellents and fencing, car repairs from deer-vehicle strikes, health care costs and missed work due to tick-borne illnesses, and veterinary care for pets.

Deer Density Estimates

Deer numbers are notoriously difficult to assess and subject to controversy. The Connecticut DEEP conducts periodic deer counts along specified aerial survey transects during the winter when there is snow cover, which allows for better viewing. The number of deer observed along the transect is multiplied by a correction factor to obtain the estimated number of deer per square mile.

Transect #6 of Zone 11 begins near Grove Street in Shelton (southeast of downtown), and heads due west, passing over Route 8 near Exit 13, Hope Lake, and the Nike Site, before crossing the southern portion of Monroe and ending in Easton. The CT DEEP has provided the following estimates of the deer population along this transect:



Deer per square mile

2009: 48 (mean for Fairfield County = 62)

2011: 73 (mean for Fairfield County = 75)

2013: 29 (mean for Fairfield County = 43)

AVERAGE: 50 deer per square mile

RECOMMENDED: 8-12 deer per square mile (for best disease control)

20 deer per square mile (for reduced ecological impacts)

Emphasis should not be placed any particular number, since these are imperfect estimates, not actual counts. The depth of snow, for example, can alter deer patterns. Deer bedded down under conifers may be impossible to see from aircraft.

Based on these reported deer densities and using an adjusted area of 28 square miles (Shelton is 30.6 square miles, with part of that area consisting of water and downtown areas), the total number of deer in Shelton range from 800 to 2000 animals. The average of the official deer estimates, 50 deer per square mile, is equivalent to 1400 total deer in Shelton.

As a comparison, the “ideal” deer densities of 8-20 deer per square mile translate to between 224 and 560 total deer in Shelton, with the lower number most effective in reducing the risk of Lyme Disease. If we assume the total deer population is 1400 deer in Shelton (based on the average of the estimated densities), then Shelton’s deer population is between 250% and 625% of the recommended deer population. Even if the very lowest estimate of Shelton’s deer population turned out to be the most accurate, Shelton’s deer population would still be between 145% and 360% of the recommended density.

Ecological Impacts of Deer in Shelton

The best way to determine whether a deer population is exceeding the ecological carrying capacity of the land is by an on-the-ground assessments of plant growth. Evidence of unsustainable browsing may include stunted vegetation, the absence of certain plant species favored by deer, and signs of winter deer feeding on “starvation food.”

The City of Shelton Conservation Agent, Teresa Gallagher, conducted a series of baseline deer browse assessments during the summer of 2014 on open space in the Long Hill and Nells Rock areas. A series of study plots was inventoried along regular intervals across each open space property. Six plots were sampled in each location. Two additional plots were inventoried at Eklund Garden, one on each side of a deer fence. All plots were 30’x 30’ and were identified so that the same plots can be resampled in the future if needed.

Moderate to severe deer browse damage was observed throughout the plots inventoried, with the exception of a study plot protected by deer fencing at Eklund Garden.

Eklund Garden Assessment: In 2009, a deer fence was installed around the perimeter of Eklund Garden, located at #10 Oak Valley Road in the Nells Rock area. Two plots were inventoried where the deer fence crosses the top of a dry, rocky ridge, one on each side of this fence. This area is woodland and was not planted as part of the garden. Inside the deer fence, there were twenty-seven healthy oak saplings, along with ten white pine. Outside the deer fence, there was one oak sapling and five white pine, all heavily stunted from deer browse. Based on the extensive browse damage observed, the saplings located outside the deer fence are not expected to survive and reach maturity.



Long Hill Assessment: The “Klapik property” (designated as Open Space #105.03) located south of Long Hill School showed signs of severe browse damage throughout, with the forest essentially stripped. Most of the study plots were nearly devoid of vegetation below a height of four feet, and in some locations a browse line was visible. Beech tree saplings showed signs of winter browsing. Beech tree is a “starvation food” that will fill a deer’s stomach in the

winter but provides little nourishment. This is evidence that deer have eliminated their winter source of food due to unsustainable rates of browsing and are now suffering from malnutrition during the winter. Because the forest has already been stripped of vegetation, moderate deer control alone may be insufficient to rejuvenate forest growth. A forest management plan that includes thinning of the canopy to let in more light and increase plant growth rates may be needed to restore the growth of tree saplings.



Figure 6: The Long Hill Open Space was nearly devoid of vegetation below the browse line in wooded areas.

Nell's Rock Assessment: The Abby Wright property off of Nells Rock Road (OS#27.04) showed signs of unsustainable browse damage, but the area was not yet stripped to the degree as observed in the Long Hill area. Young saplings of most key tree species were rare or absent. On some of the sample plots, maple-leaf viburnum, a shrub that is normally three to four feet tall, persisted at a height of less than one foot. Taller specimens often showed signs of having been nipped off recently by deer, but a few plants were still able to flower and set seeds. Woodland asters were heavily cropped to within a few inches of the ground. Plots at lower elevations still had plenty of plant growth (growing conditions are better), but this consisted mostly of plant species not favored by deer, such as hayscented fern and sweet pepperbush. However, these unpalatable plants did sometimes conceal deer favorites such as Jack-in-the-Pulpit, and one plot that initially appeared to be full of mostly hayscented fern turned out to be quite diverse in the number of plant species growing there, partly hidden by the fern.



Figure 7: Open Space off of Nells Rock Road showing a thinning understory. In the foreground is a carpet of stunted Maple-Leaf Viburnum, a shrub that is normally four feet tall.

Impacts to Shelton’s Trees: Changes to the composition of tree species occurs when trees are unable to regenerate due to heavy deer browsing. Over time, mature trees die from disease or blow over during a storm. If there are no young saplings ready to take their place, deforestation may result. This process will normally take many decades or even hundreds of years, depending on how long the existing trees live (oak trees may survive for hundreds of years). However, events such as hurricanes, as well as introduced pests and diseases, can cause widespread damage very rapidly. Examples include the 1938 hurricane, which toppled an estimated 2 billion trees, the Chestnut Blight, which rapidly destroyed the formerly dominant chestnut tree, and the Emerald Ash Borer, a recently introduced pest that is killing the ash trees of Connecticut.

Oak trees are in decline throughout Connecticut for multiple reasons, excessive deer densities being a primary factor. The study plot protected by deer fencing at Eklund Garden provides a stark illustration of that impact: Twenty-seven oak saplings were growing inside this sheltered plot, while only one stunted sapling was able to grow in the adjacent study plot outside of the fence. Another factor in the decline of oak is a lack of logging or other forest disturbances which would provide more sunlight to oak saplings, which are only moderately shade-tolerant. The acorns from oak trees are critical to the winter survival of several wildlife species, including deer and turkey. Oak trees, and acorns as a winter food, will eventually be lost in Shelton unless special efforts are taken to foster the growth of oak saplings.

Oaks			
Saplings 1-7 ft high (average number per plot)			
Long Hill	Nells Rock	Eklund – Outside the deer fence	Eklund – Inside the deer fence
0.0	0.3	1.0* (heavily browsed)	27.0

Sugar and red maple saplings, both favored by deer, were conspicuously absent from all study plots in Shelton with the exception of one red maple growing inside the deer fence at Eklund Garden. Because sugar maples saplings are highly shade tolerant, this tree would normally be expected to become the dominant tree throughout much of Southern New England, along with beech. Sugar maple does not grow well on dry hilltops and therefore was not expected or found at the Eklund Garden plots. Red maples are the most common tree in Connecticut, able to grow in both swamps and dry areas, and although red maple saplings are less shade tolerant than sugar maple, its complete absence is indicative of excessive browsing.

Maples				
Saplings 1-7 ft high (average number per plot)				
	Long Hill	Nells Rock	Eklund (outside deer fence)	Eklund (inside deer fence)
Sugar Maple	0.0	0.0	NA	NA
Red Maple	0.0	0.0	0.0	1



Figure 8: Browse line along a line of maples at Long Hill. Maple and oak seedlings are unable to survive in this location due to the browsing pressure.

Other tree species were also severely impacted throughout the study plots. At Eklund Garden, there were ten healthy white pine saplings in the sheltered study plot compared with five in the adjacent plot outside the deer fence. Those five pines were heavily damaged by deer browsing. Very few saplings of birch, black cherry, ash, and hickory were observed throughout the study areas. The only tree species that appeared to be

reproducing successfully was American beech in the Long Hill area. However, many of the mature beech trees throughout the study areas showed signs of beech bark disease, which ultimately kills the main stem of the tree and causes the tree roots to form clonal shoots that masquerade as saplings. These clones grow for some time until they too are killed by beech bark disease. Therefore, it is not clear to what extent the beech trees are actually reproducing successfully, or simply showing symptoms of beech bark disease. Moreover, even beech trees show signs of heavy winter browsing, although they provide little nourishment and are considered a starvation food.

Watershed Impacts: In 2013, the Aquarion Water Company began controlled hunts on their Shelton properties, stating, *“Overbrowsing by deer continues to impact tree regeneration resulting in significant loss of vegetation and increased potential for erosion and nutrient releases on the watersheds. These conditions adversely impact the quality of the water supplies.”*⁸ Adverse impacts to water bodies such as the Far Mill River and Hope Lake may be occurring as well.

Landscaping Impacts in Shelton

Tick Control Treatments: Many Shelton homeowners routinely hire professionals to spray tick-control chemicals over their lawns. Pesticides are referred to as “acaricides” when applied to kill ticks. In a 2010 study commissioned by the Fairfield County Municipal Deer Management Alliance, it was estimated that Shelton residents spend a total of \$1,336,384 each year on these treatments⁹ (9875 single-family households x \$135.33 average expenditures per household in Fairfield County).

Although commonly marketed as “safe” due to low mammalian and bird toxicity, existing acaricides are broad-spectrum insecticides that are toxic to a wide range of insects, including beneficial insects such as bees. This includes commonly used “green” organic products such as pyrethrin-based sprays¹⁰. These acaricides are also highly toxic to aquatic life. The cumulative ecological impacts of the widespread use of acaricides does not appear to have been studied.

Landscaping Damage: The Shelton Deer Committee did not have the resources to survey Shelton residents regarding landscaping damage, but based on conversations it appears anecdotally that many residents are experiencing increased landscaping damage, bolder deer (including deer that do not leave when they see people), and are increasingly taking measures in response. These measures range from abandoning certain plantings that deer favor (e.g. hostas), using deer repellent sprays, and installing deer fencing, especially around vegetable gardens or sections of a yard. The practice of encircling an entire property with deer fencing, common in some communities to the west such as Redding or Wilton, is still rare in Shelton.

Shelton maintains two community gardens where residents can lease plots to grow vegetables. Both gardens are protected by deer fencing, and plot holders often note they cannot grow vegetables in their own yards because of the deer.

The degree of landscaping damage reported by residents varies widely, from residents who say they “are lucky” and have never had a problem, to people who routinely see multiple deer in their yards (at times these deer refuse to leave) and are experiencing severe damage to plantings. Most people seem to be experiencing moderate but increasing damage. Disparities in the level of landscaping damage across Shelton is likely due in part to the habit of deer following the same route every day. Properties along that route will experience more damage than other properties. Properties located near severely overbrowsed woodlands may also experience increased landscaping damage because the food sources in the forest have been depleted.



Figure 9: Deer fencing like this one in Redding has become common in parts of Fairfield County. The protected private property on the left is regenerating.

Residential tolerance of deer in the backyard in Shelton varies widely. Some residents do not mind damage to plantings, even if it is severe, because they enjoy seeing deer. Most residents do not appear to mind a minor level of landscaping damage and, as long as damage is limited, these residents enjoy seeing deer on their property. However, once deer begin to inflict significant sustained damage on residential properties, opinions about deer and deer control often shift quite rapidly, with calls for someone to “do something.” This has occurred to many Shelton residents over the past five years.

Costs can be substantial. The Fairfield County Municipal Deer Management Alliance commissioned a study in 2010 to study the economic impacts of deer, in which the average Shelton homeowner was estimated to have suffered \$402 per year in losses due to deer browse on landscaping, for a total of nearly \$4,000,000 per year to Shelton residents.¹¹ This was based on the average costs to single family homeowners throughout

Fairfield County (\$804) multiplied by a factor of 0.5 to adjust for median household income. The study may overstate current costs because deer impacts have only recently become widespread in Shelton, and many residents have not yet resorted to the costly use of deer repellents or installed deer fencing. Such measures are likely to become increasingly common in the absence of deer control.

Crop Damage in Shelton

Deer can inflict serious damage to crops planted by Shelton farmers, so farmers typically invite recreational hunters onto their properties to cull the herd. Farmers may also apply for a Crop Damage Permit to cull deer outside of the regular hunting season. However, this permit can be difficult to obtain.

The Deer Committee was unable to obtain information from all of Shelton's farmers, but a sampling of impacts include:

- Beardsley Orchards: The farm estimates their losses at \$10,000 per year.
- Fairview Tree Farm: An entire crop of newly planted tree seedlings were pulled out of the ground by deer. The farm applied for a Crop Damage Permit from the CT DEEP and was denied because there was no evidence that the seedlings had ever been planted.
- Guy's Ecogarden: Corn is no longer grown due to deer damage.

Vehicle/Deer Strikes in Shelton

The Shelton Police Department provided the following statistics that cover a period of three years (2011 - 2013):

- A total of 147 deer strikes were reported to the Shelton Police (an average of 49 per year).
- 79 of the deer were euthanized by the responding officer.
- These statistics include CT Routes 108 and 110, but not Route 8.
- The number was fairly consistent from year to year (indicating no sharp changes in the deer population)
- Not all deer strikes are reported to the Police. The CT DEEP estimates that 18,000 deer are found dead along roadways each year, an average of 106 per town, and notes that additional deer are injured and wander away from roadways before dying.¹²

According to the State Farm Insurance company, deer collisions cost an average of \$3888 per collision in 2013.¹³ Therefore, the cost of *known* vehicle/deer strikes to Shelton residents is estimated at a minimum of \$190,512 per year. True costs may be far higher if a substantial percentage of collisions are not reported to the Police. These costs are largely externalized to insurance companies.

Tick-borne Illnesses in Shelton

According to the Connecticut Department of Public Health, Shelton had 29 "confirmed and probable" cases of Lyme Disease in 2013. The CDC now estimates that only 10% of

cases are reported nationwide.¹⁴ If this is true in Shelton, then the real number of cases is closer to 290 per year. The costs of treating Lyme Disease vary widely depending on whether the disease is caught early, properly diagnosed, and is successfully treated with antibiotics. When a proper diagnosis is missed, Lyme Disease can progress into more serious cases of arthritis, palsy, or other conditions, for which extensive tests and treatments may ensue for years at considerable costs.

In the economic report commissioned by the Fairfield County Municipal Deer Management Alliance in 2010, a figure of \$10,652 was used as the average cost to treat a case of Lyme Disease. This number is based on a 2006 study that found the average Lyme Disease case cost \$2,970 in direct medical costs and \$5,202 in indirect medical costs, nonmedical costs, and productivity losses. Using the 2006 cost estimates with the 2013 estimate for Lyme Disease cases in Shelton (290) gives a total cost of \$3,089,080 per year. However, the authors of the study did note that costs had gone down during the study period as patients and the medical community became more aware of Lyme Disease.¹⁵

Emergent tick-borne illnesses include anaplasmosis, babesiosis, and the more rare Powassan virus, which is similar to equine encephalitis and may be fatal. We have no data regarding the potential impacts of these diseases on Shelton residents.

Tick-borne Illness in Pets

Tick-borne illnesses are also a significant cost to pet owners, who pay for annual screenings, Lyme Disease vaccines (and subsequent boosters), testing, and treatments when a pet becomes ill. Veterinarians often recommend treatments such as FrontLine as a means of reducing a dog's exposure to ticks, especially for dogs that spend time outdoors. Recent local charges from one veterinarian practice¹⁶ for these services and product were:

Annual Lyme vaccine \$31

Annual screening for "HWT/Lyme/Ehrlich/Anapl" \$73 (heartworm + three tick-borne illnesses)

Frontline Plus \$206 (one year)

These costs may be adjusted as follows to account for the proportion spent on tick control and tick-borne illnesses: 0.75% of the annual screening (\$55) and 50% of the Flea/Tick medication (\$103). Using these figures, a dog owner may spend \$189 per year on each dog to prevent and screen for tick-borne illnesses. In 2013, there were 1750 registered dogs in Shelton, for total potential annual costs of up to \$330,750 for preventative measures in registered dogs alone. This does not include preventative costs for cats and unregistered dogs, or treatment costs for pets that become ill.

SECTION 4: MANAGEMENT OPTIONS

1. **No Action.** If no actions are taken at this time, the negative impacts described previously are expected to worsen, as they did in other Fairfield County towns prior to the implementation of deer control.

The carrying capacity of woodland areas in Shelton is expected to decline further as forests are stripped and there is less for deer to eat in natural areas. The lack of food in natural areas will force deer to spend more time foraging along roadsides and in back yards, resulting in bolder deer and more severe landscaping damage and other impacts. **Moderate deer control is much more effective when it is implemented before forests are completely stripped**, because a diverse assemblage of existing woodland plants can more quickly regenerate and be used as a food source for the remaining deer. If, on the other hand, deer control is delayed until woodland areas have been depleted of both plants and viable seeds, biodiversity will have been lost and the ability of the land to heal itself compromised. Some areas in Shelton have already reached a stage where forests are completely stripped, so time is of the essence.

One uncertainty is the emergence of the Eastern Coyote as a predator of deer. At this time, Eastern Coyote are commonly believed to prey only on fawns or adult deer that have been injured or trapped in deep snow. However, the Eastern Coyote, also called the Coy-Wolf by some wildlife biologists, is essentially a new and evolving species (or subspecies), containing a mixture of DNA from the Eastern wolf.¹⁷ Coyote are not native to the Northeast, but expanded into this area from the Plains states, interbreeding with wolves at one point. The Eastern Coyote is larger than Western coyote and has more powerful jaws capable of bringing down larger prey due to wolf genes, but, like coyote, is highly adaptable to living amongst people. The presence of abundant deer as a potential food source might favor the rapid evolution of this mixed-gene coy-wolf to a larger, more wolf-like species able to prey upon adult deer. Whether this will eventually happen, or how fast, is a matter of conjecture. Also unknown is to what extent suburban residents would tolerate a larger predator such as a wolf.

2. **Birth Control.** At this time, average costs for chemical birth control are \$1000 per deer, and it has not been shown to be effective in suburban communities.¹⁸ Each doe must be targeted individually and shot with a dart gun. The process must be repeated periodically. Moreover, birth control does nothing to address the existing deer population and a deer can live up to 18 years. New techniques may be invented that are lower in cost and more effective in the future.
3. **Relocation.** This is not a viable option. It is very expensive, there is no location in which deer can be relocated to, and the process is so traumatic that as many as half of the deer may not survive.¹⁹
4. **Four-Poster Devices.** These devices can be set up at feeding stations to automatically apply insecticide to deer around their ears, where ticks are most commonly found.

The devices can be somewhat effective in reducing tick populations, but are expensive, and do nothing to address other problems associated with over-abundant deer such as damage to watersheds and landscaping.

5. **Fencing and deterrents.** Deer fencing can be very effective at excluding deer from yards and gardens. It can also be used in small woodland areas to protect sensitive plants or seedlings. It is not effective in protecting against ticks or Lyme Disease unless the fenced area is several acres because ticks are easily transported by birds and mice into the fenced area. Although fencing is costly and can be time-consuming to install and maintain, residents in western Fairfield County often protect their properties with it. Another method commonly used in Fairfield County is the application of deterrent horticultural sprays, such as Bobbex. These sprays may be very effective if applied frequently, but are costly. Deterrents may lose effectiveness if deer are starving, an issue most likely to occur with winter shrubbery.
6. **Programs to match hunters with property owners.** Because most property is privately owned in Connecticut, several local communities have created programs to match willing property owners with hunters. Some of these programs were implemented by private citizens rather than government agencies, such as the BeSafeRedding and BeSafeNewtown programs, but municipalities can also maintain matching lists or assist with private efforts. Outreach efforts consist of contacting property owners and offering educational information including state hunting regulations and safety, special crop damage permits for farmers, the ability for property owners to set their own rules, and limits on liability to the landowner. If the owner is interested in allow hunters to access the property, they are connected with hunters. These hunters can be previously screened.



Figure 10: Screenshot of the "BeSafeRedding" website.

7. Open recreational hunts

An open hunt is one in which anyone from the general public may hunt so long as they have a valid hunting license and follow state laws, similar to the way many waterways are open to public fishing. Open hunts are rarely considered appropriate in congested Fairfield County. The state does hold “no-lottery” deer seasons at Paugussett State Forest in Newtown and Pootatuck Forest in New Fairfield. These are the only known examples of open hunts in the county.

8. Controlled recreational hunts

A “controlled hunt” is one in which the property owner allows recreational hunting but imposes an additional layer of restrictions on the hunter. At a minimum, this will include a requirement for the hunter to obtain prior permission from the property owner to hunt the land. This may be in the form of a special permit. Public and private property owners are also at liberty to set rules regarding exactly when, where, and how they may hunt on that property. Hunters still need to comply with all state regulations pertaining to both hunting and the use of firearms.

Controlled hunts are highly cost effective compared with other options. Recreational hunters cull the deer herd at no charge, with the only costs to the landowner being administrative. In Fairfield County, municipalities that have implemented controlled hunts on their open space properties include Bethel, Brookfield, Redding, Ridgefield, Wilton, Darien, Newtown, Greenwich, and New Canaan. Organizations that have employed controlled hunts for ecological reasons include the Nature Conservancy (at Devil’s Den), the Audubon Society (Greenwich), and the Aspetuck Land Trust (at Trout Brook Valley).

In densely populated areas and on smaller open space properties with hiking trails, hunters may be restricted to bowhunting. This type of hunting is done from tree stands so that missed shots are directed into the ground. The range of arrows is much less than firearms, with most shots less than 25 yards. Because arrows can be deflected by branches and brush, bowhunters are less likely to release a bow unless they have a very close and clear sighting. This type of hunting is perceived to be the safest, with the most common cause of injury due to the hunter falling out of a tree stand. *There are no recorded bowhunting accidents in Connecticut involving non-hunters.* Connecticut hunting regulations allow bowhunting near dwellings and property lines.

The use of firearms may be more effective than bowhunting at culling deer, at least for the first year when deer are unfamiliar with hunting. Deer hunting is often restricted to shotguns, which have a shorter range than rifles, and muzzleloaders. Hunting in Ridgefield, for example, is allowed on about a dozen city properties, with half restricted to archery and the other half open to both archery and shotguns/muzzleloaders. Under state law, firearms cannot be used within 500 feet of an occupied dwelling without written permission from the owner.

Municipalities may temporarily close a park during a controlled hunt, especially if firearms are being used. Ridgefield, for example, closes their parks while there is hunting but does not allow hunting on “weekends, holidays, or when schools are not in session.” Other towns and organizations may keep hiking trails open but post warning signs at trailheads. There is a long history of hunting and hiking trails coexisting where major trails of the Connecticut Blue-Blazed Trail system crosses State forests and private lands. Trail users are urged to wear blaze orange during the hunting season.

Recreational hunting can be moderately effective at controlling deer populations on specific properties, potentially reducing deer densities to about 30 deer per square mile²⁰, a level that may be ecologically sustainable in some forests, especially if the canopy is opened to allow more light to reach the forest floor.

Controlled hunts reduce the number of deer/vehicle strikes in the immediate area, as well as landscaping damage to nearby homes. Once the undergrowth in wooded areas has been restored, there is less need for deer to forage in backyards and roadways. Any impacts on tick-borne illnesses, however, would likely be moderate.

Controlled hunts in suburban areas do not appear to be successful in bringing the deer population down to the very low density of 8-12 deer per square mile that may be required to break the tick breeding cycle. The number of ticks and incidents of Lyme Disease may be reduced, but that impact would be modest using recreational hunters compared with professional culling efforts.

Shelton is located in Hunting Zone 11 (Fairfield County), for which hunting regulations are designed to help reduce the deer population. The CT DEEP encourages bowhunters to use corn-filled baiting stations beneath tree stands to improve their odds of harvesting deer. The hunting season in Zone 11 is longer than in other parts of the state.

Controlled hunting on selected open space parcels, assuming there are sufficient hunters to participate, would help reduce the deer population in the selected open space properties as well as adjacent areas. Deer are creatures of habit and tend not to leave their home territories for new areas even if nearby land has been hunted and offers better foraging. Currently, controlled hunts in Shelton are held primarily on private agricultural lands in the White Hills. Controlled hunts on city open space would help to provide relief to other sections of the city.

9. Track data

Municipalities are encouraged to collect data such as deer/vehicle strikes, the number of Lyme Disease cases, deer densities, forest health, and the status of hunting on public and private properties. The relative number of deer/vehicle strikes from year to year can be valuable in confirming or contradicting population trends as reported by the CT DEEP.

10. GIS Mapping

The City's GIS map could be augmented with layers pertaining to deer control, such as:

- Properties with potential for hunting (vacant lands, farmland, open space, state properties)
- Properties currently open to deer hunting (and the type of hunting)
- Forest health of open space properties
- Location of deer/vehicle strikes

Mapping this data can provide insight as to which areas of Shelton the Deer Management Committee should focus its efforts. Mapping may identify areas that show a combination of severe forest damage, a high concentration of deer/vehicle strikes, and nearby properties with hunting potential.

11. Public Education and Outreach

Deer overabundance is a relatively new issue for Shelton residents. The City (through a Deer Management Committee) can provide information for landowners describing the use of deer-resistant plantings, deer fencings, and deer repellents, and caution drivers about the peak times for deer/vehicle strikes. The City can also encourage the use of least-toxic pesticides that have been proven effective for ticks, such as the use of bait boxes for mice. Many residents are not aware of the ecological impacts posed by excessive deer, and there are misconceptions pertaining to the relationship between deer and tick-borne illnesses.

12. Professional culling

The fastest and most effective method of deer control entails hiring professionals to cull the population. It is also very costly and may be controversial. This is typically done by a company that specializes in urban deer control, using sharpshooters at night. Feeding stations and lights may be used to attract and confuse deer, and rifles have silencers. A special permit must be acquired from the CT DEEP, and the meat from harvested deer is donated to local food banks. This method has been highly successful in significantly decreasing incidents of Lyme Disease on islands and peninsulas when the deer population was brought down to 10-12 deer per square mile.²¹ The primary criticism of these studies has been that the island and peninsular study areas may not be representative of typical inland areas.²² A CDC study is currently in progress in Redding to determine if professional culling is equally effective at eliminating Lyme Disease in more typical suburban areas. Although highly effective, this method is expensive, costing several hundred dollars per deer harvested. It is therefore most cost effective to first bring the deer population down to about 30 deer per square miles using recreational hunters, and only then, if necessary, reduce the population further with professionals. Recreational hunting can then be used to try and maintain the population, but in order to keep the population very low, professionals would need to be rehired periodically to cull the herd again.

Although the use of sharpshooters can be controversial, the Town of Redding found that most residents within a one-mile study area supported the presence of professional sharpshooters and even granted permission to set up baiting stations for the sharpshooters near residential buildings. The strongest protests continue to be

from hunters who prefer a higher deer population for their sport. Due to the high cost and fear of controversy, Greenwich and Redding are the only Fairfield County towns in which professionals have been employed to cull deer.



SECTION 5: RECOMMENDATIONS

The City of Shelton should begin to implement a deer control program immediately, starting with the creation of a Deer Management Committee. A delayed response will only worsen the problem and make it much more difficult to address in the future.

The primary objective at this time should be to reduce the deer population to a sustainable level at which the forest understory can provide sufficient natural forage and deer are not forced to inhabit roadsides and yards to find food. Deer management should lead to fewer problems with landscaping damage, deer-vehicle strikes, and possibly modest reductions in Lyme Disease. Ecological benefits would include improved water quality, habitat preservation for certain species of songbirds, and cover for amphibians. This objective will be much easier to achieve for those natural areas where understory plants persist because the existing plants can rebound quickly. In areas that have already been severely degraded, additional measures may be necessary to reestablish a healthy forest understory, such as opening up the canopy to let in more light.

Recreational hunting is a cost-effective management technique which has been used successfully by a number of municipalities in Fairfield County, with a resulting drop in deer/vehicle strikes and landscaping damage. Shelton should introduce a hunting program on city open space properties in an incremental fashion, starting with bowhunting on a small number of suitable properties.

Note that full control of Lyme Disease should not be expected unless the deer population is brought down to a very low level of 8-12 deer per square mile, which requires professional culling at a substantial cost. The Deer Committee does not recommend professional culling at this time. However, city leaders and residents should be aware that this option is currently the most effective method available for control of tick-borne diseases.

Full List of Recommendations:

1. Create a "Deer Management Committee" to implement a deer control program (the current Ad Hoc Deer Committee would be disbanded). The Deer Management Committee would work out the logistics and details of the remaining recommendations.
2. Open a small number of suitable City open space properties to bowhunting by special permit only ("controlled hunt") subject to review by the Conservation Commission and approval by the Board of Aldermen. Applicants for special hunting permits should be subject to background checks, references, and interviews, with preference given to Shelton residents.
3. Establish rules for controlled hunts regarding where and how the hunts will be carried out, such as the minimum distance from trails or property lines, approval of tree stand locations, and days when hunting is allowed.
4. Expand the areas open to hunting over time, subject to review by the Conservation Commission and approval by the Board of Aldermen.

5. Facilitate the creation of a volunteer-lead program to match hunters with property owners, such as the [BeSafeRedding](#) and [BeSafeNewtown](#) programs. Most property in Shelton is privately-owned.
6. Collect and monitor data related to the abundance and impacts of deer (GIS mapping, deer/vehicle strikes, Lyme cases, deer density, forest health, deer exclosures, etc.)
7. Monitor the effectiveness of professional culling efforts in other towns to combat tick-borne illnesses, such as the ongoing CDC study in Redding, CT.
8. Conduct public education and outreach (e.g. discouraging deer via landscaping, fencing, deer repellents; conducting daily tick checks; impacts of deer on ecosystems; hunting regulations and safety; feeding of deer; etc.)

¹ Leonard Lee Rue, III, *The World of the White-tailed Deer*, 1962.

² CDC Fact Sheet, Anaplasmosis, www.cdc.gov/anaplasmosis

³ CDC Fact Sheet, Babesiosis, www.cdc.gov/parasites/babesiosis

⁴ Andreas Keller, et. al., “*New insights into the Tyrolean Iceman’s origin and phenotype as inferred by whole-genome sequencing.*” *Nature Communications*, February 2012.

⁵ Kantor FS. Disarming Lyme Disease, *Scientific Am.*, Sept. 1994

⁶ Howard Kilpatrick and Andrew LaBonte, *Managing Urban Deer in Connecticut*, Second Edition, 2007.

⁷ Kirby Stafford, *Tick Management Handbook*, Bulletin 1010, The Connecticut Agricultural Experiment Station.

⁸ Letter from Stephen Stamos, Aquarion Water Company, to Shelton Mayor Mark Lauretti, dated October 4, 2013.

⁹ Peter Arno and Deborah Viola, New York Medical College, “*Economic Impact of Deer in Shelton*,” May 2010, sponsored by the Fairfield County Municipal Deer Management Alliance.

¹⁰ Pyrethrin Fact Sheet, National Pesticide Information Center, November 2014.

¹¹ Peter Arno and Deborah Viola, New York Medical College, “*Economic Impact of Deer in Shelton*,” May 2010, sponsored by the Fairfield County Municipal Deer Management Alliance.

¹² *Managing Urban Deer in Connecticut*, Connecticut DEEP Wildlife Division, 2007

¹³ CTPost, “*Your chances of hitting a deer in Connecticut*,” September 14, 2014.

¹⁴ CDC Fact Sheet, “*Lyme Disease: How many people get Lyme Disease?*”

www.cdc.gov/lyme/stats/humanCases.html.

¹⁵ Xinzhi Zhang et. al, *Economic Impact of Lyme Disease*. *Emerg Infect Dis*. 2006 April.

¹⁶ Invoices from Shelton Veterinary Center, 560 Huntington Street

¹⁷ Kays, Roland, et. al., *Rapid adaptive evolution of northeastern coyotes via hybridization with wolves*, RSBL, January 2010.

¹⁸ *Managing Urban Deer in Connecticut*, Connecticut DEEP Wildlife Division, 2007

¹⁹ *Managing Urban Deer in Connecticut*, Connecticut DEEP Wildlife Division, 2007

²⁰ Presentation by Kirby Stafford to the Shelton Deer Committee, CT Agricultural Experiment Station, April 8, 2014.

²¹ *Tick Management Handbook*, Bulletin No. 1010, The Connecticut Agricultural Experiment Station 2007.

²² Richard Ostfeld, *Lyme Disease*, Oxford University Press, 2011

APPENDIX A

Letter from the Conservation Commission to the Board of Aldermen
recommending the establishment of a deer committee



City of Shelton
Shelton Conservation Commission



54 Hill Street, Shelton, Connecticut 06484

6/3/2013

John Anglace, President
Board of Aldermen
City of Shelton
54 Hill Street
Shelton, CT 06484

RE: Deer Management

Dear Mr. Anglace:

In recent years, the Conservation Commission has observed escalating damage to city open space lands due to deer browsing, and has fielded an increasing number of complaints from residents due to landscaping damage, motor vehicle accidents, and Lyme Disease caused by deer. The Fairfield County Municipal Deer Management Alliance ("Deer Alliance") commissioned a study that found that deer cost the average household in Fairfield County \$900 a year, including landscaping expenses, motor vehicle damage, and health care costs.

According to the DEEP, Shelton has an estimated 48 deer per square mile, and some neighboring towns to the west have 65 or more deer per square mile. The recommended deer density is 10-20 deer per square mile, with the lower end of the range recommended for disease control. Within Shelton's boundaries, the population levels have the following results (based on 30.6 sq. miles of land area):

Total Number of Deer In Shelton

<300 Tick-borne diseases are nearly eradicated at this level.

<600 Damage to landscaping and forests is minor

1500 Current number of deer in Shelton.

2000 Projected population for Shelton

In Connecticut, deer management is the responsibility of municipalities and all landowners, both public and private. The Conservation Commission therefore recommends that the Board of Aldermen establish an ad hoc Deer Committee which would study the impacts of the growing deer population in Shelton with respect to habitat destruction, tick-borne illnesses in humans and pets, vehicular deer-strikes, and landscaping damage. This committee would also explore management options and make recommendations in a report to the Board of Aldermen.

That is the action that members of the Deer Alliance, of which Shelton is a member, recommend. They also recommend that the committee be comprised of members from a broad cross section of the community, especially those with important experience or

expertise, such as a representative of the Police Department, a medical professional with experience treating Lyme Disease, a hunter, a representative of the Conservation Commission, an environmental professional, and a landscaper.



Shelton's 1500 deer are estimated to eat between 7,000 and 14,000 lbs of forage per day. The impact of overbrowsing can be seen in the photo above, taken in Redding, which shows a deer fence installed by a private landowner. The land to the left of the fence is what a healthy forest should look like. The land to the right of the fence is very typical of degraded conservation areas in Fairfield County. Shelton's open space has been thinning steadily and is expected to look like the above photo in the future.

The environmental impacts of overbrowsing are so significant that the Audubon Society and Nature Conservancy have implemented deer control on their preserves in order to save habitat for other species. The Aquarion Water Company has expanded lands open to hunting in an effort to preserve water quality. Many towns and land trusts in Connecticut now allow bowhunting on conservation lands even when there are hiking trails nearby. Generally speaking, this requires a special permit from the town or trust, and restrictions are placed on the bowhunters to ensure safety. The CT DEEP continues to loosen hunting restrictions in an effort to address the issue. A bill currently before the General Assembly would allow bowhunting on Sundays on private property, and would also allow landowners to apply for a special permit to kill "nuisance" deer outside of hunting season.

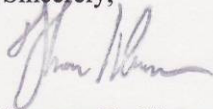
Although the Conservation Commission has a vested interest in deer control on the City's open space properties, we feel this issue goes beyond Conservation's purview, encompassing public health and safety as well as private property damage. Moreover,

deer control options are not limited to city-owned properties, since most deer live on private property and cross multiple property lines. Deer management typically includes education and public outreach. The BeSafeRedding program connects private property owners who desire deer control with hunters looking for land on which to hunt. Management often includes efforts to collect and track important data such as the deer population, the density of deer ticks, the percentage of ticks with infectious diseases, the number of vehicle strikes, and the number of reported tick-borne illnesses in Shelton.

In summary, the Conservation Commission advises the Board of Aldermen that the rising deer population is degrading city-owned conservation areas, that we are receiving complaints about deer from residents due to property damage and tick-borne illnesses, and that other municipalities in Fairfield County recommend the establishment of a Deer Committee to study the issue and compile a report for BOA with recommendations.

Thank you for your consideration of this important issue.

Sincerely,

A handwritten signature in blue ink, appearing to read "Thomas Harbinson", written over a faint, illegible printed name.

Thomas Harbinson
Chairman