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Public Perception of Whitetail Deer in Hamilton, NY: Survey Results and Recommendations

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Public Perception of Whitetail Deer in Hamilton, NY: Survey Results and Recommendations

Abstract:

The overpopulation of white-tailed deer in the United States poses a serious ecological, biological and economic problem in both urban and rural areas. The stakeholders in this issue, such as animal hunters, homeowners, environmentalists, right's activists, and farmers, all have different opinions on how deer herds should be managed. Our class previously established that the deer population of Hamilton, NY is significantly overabundant according to ecological standards. In order to understand the public's perception of the current white-tailed deer population we investigated the ways in which residents' past experiences shaped their opinions on management strategies. To learn about these past experiences we used a phone survey because this method has a number of benefits that include time efficiency and ability to reach a variety of Hamilton residents. We found that the Hamilton, NY community perceives the current deer population to be problematic based on their perceptions of deer population size. Based on our research and results, we believe that a lethal form of management would be the most effective and the most widely supported way to reduce the local deer population.

Introduction:

The Deer Issue in the U.S.

The overpopulation of white-tailed deer in the United States poses a serious ecological, biological, and economic problem in both urban and rural settings (Cambronne, 2013). There are 30 million deer in the United States, meaning that there is approximately 1 deer for every 10 humans (Cambronne, 2013). In some suburban areas and parks, deer densities can reach up to 100-400 per square mile (Cambronne, 2013). These numbers are staggering when considering that most biologists agree that to maintain ecosystem stability, there should be 10 or fewer per square mile (Baez et al., 2013). Across the United States, people are realizing the considerable magnitude and scale of the issue of deer overabundance. Evidence of the rising salience of this issue can be found in recent press ranging from local newspapers to, most notably, TIME Magazine's December 9th cover displaying a photograph of a deer, entitled "America's Pest Problem; Why the Rules of Hunting are About to Change" (Von Drehle, 2013).

Determining Overabundance

An article by Gortazar et al. (2006) introduces and defines the term overabundance as when a species is affecting human well-being, affecting the fitness of the species itself, reducing the presence of other economically viable or aesthetically pleasing species, and causing dysfunctions in the ecosystem. The article points out that a multidisciplinary approach is necessary to accurately define overabundance and that management of these species is challenging (Gortazar et al., 2006; Green et. al. 1997). Once biological overabundance has been confirmed, the next step is to determine if the deer population has exceeded the Cultural Carrying Capacity of the area (West and Pankhurst, 2002). The Cultural Carrying Capacity is defined as "the maximum number of deer that can coexist compatibly with the local human population based on human perceptions, values, beliefs, attitudes and preferences" (West and

Pankhurst, 2002). We wanted to determine if the Cultural Carrying Capacity had been exceeded in Hamilton. Determining the Cultural Carrying Capacity can be challenging due to varying opinions and perceptions about addressing the issue of deer overabundance (West and Pankhurst, 2002).

Negative Ecological Impact

The ecological impacts of deer overabundance are evident through the damage done to the understory of forests, the lack of regrowth of saplings, and the diminishing diversity of local invertebrates and birds (Rooney and Waller, 2003). Tilghman (1989) investigated the impacts of deer densities on tree seedlings, woody shrubs, and herbaceous plants, and results prove high densities of white-tailed deer have severe impacts on species composition and overall forest regeneration. Specifically, tree seedlings success in the study area was correlated to how rapid they are capable of growing while deer browsing takes place. Essentially, if the seedlings are not allowed adequate time to grow due to excessive deer browsing, forest could be incapable of stable regrowth. Van Clef et al. (2004) found the survival rate of planted forest herbs outside of deer enclosures was 23% whereas plants protected from browsing had a 46% survival rate. From these data, it is clear that survival rate of forest understory can be increased if deer browsing decreases, perhaps from implementation of management. In another study in Wisconsin by Rooney et al. (2004) the authors observed species composition in 62 forests over 50 years where sites with high deer densities lost more than 60% of their plant species, and sites with lower deer densities lost only 16%. These data reflect the concerning impact deer overabundance is having on ecosystem diversity.

Forests are important for countless reasons. For example, they sequester carbon from the atmosphere and they provide natural resources, which are responsible for a number of economic benefits. Deer overabundance poses a serious threat not only to forest regeneration, but also to the entire timber business, which relies on growing new trees to make paper, furniture, and houses (Rooney et al. 2004). If new trees cannot grow, there will be economic and resource issues, in addition to the looming carbon-sink problem (Cambronne, 2013). Green et al. (1997) stressed the importance of public education to encourage informed decision-making and the growing need to have an educated public in order to manage deer populations effectively. We wanted to find out how knowledgeable the Hamilton population is about the ecological impacts of deer overabundance in order to understand the level of importance they placed on the deer population.

Human Health Concerns

In addition to ecosystem health, human health is also being negatively affected by deer overabundance. In one study (Gortazar et al., 2006), the authors review cases of disease in overabundant game species. They discuss how both species density and aggregation can contribute to disease transmission and that this can negatively impact humans and other animal species (Gortazar et al., 2006). The most prevalent disease humans can contract associated with deer overabundance is Lyme disease. A survey conducted in Groton, Connecticut included a question asking if residents or any member of the house had been diagnosed with Lyme disease and during which years (Kilpatrick and Labonte, 2003). We wanted to investigate if the increasing deer population has caused increased cases of Lyme disease in Hamilton.

Economic Losses

Another way in which deer overabundance is causing issues is through economic losses due to negative interactions between deer and humans. In 2012, there were 1.1 million deer-vehicle collisions in the United States. These collisions resulted in a total monetary cost of about \$3.8 billion. These collisions also resulted in over 10,000 injuries and 150 deaths (Cambronne, 2013). Because these data show high numbers of deer-vehicle collisions and high costs incurred by the damage, we wanted to see if Hamilton was experiencing these issues to the same extent.

Stakeholders

The range of opinions and perceptions regarding the issue of deer overabundance varies immensely as a result of the wide range of stakeholders involved in the issue. Therefore, identifying stakeholders is a necessary first step in addressing deer overabundance (Green et al. 1997). Once these groups are identified, the viewpoints within each group can be better understood. Understanding the various stakeholders and the views within the groups allows the issue of deer overabundance to be addressed effectively by incorporating aspects from multiple standpoints and compromising. A study by Triezenberg et al. (2012) found that a lack collaborative relationships with the community and important stakeholders about deer management strategies could inhibit action for years. By attempting to identify some key stakeholders here in Hamilton, we hoped to encourage communication to avoid stalemates among stakeholders that would halt implementation.

A study by Kilpatrick and Labonte (2003) suggests that surveys are an effective method for highlighting main stakeholder groups, and also to understand public perception, knowledge, and beliefs surrounding deer overabundance. Sterba (2012) has found that in almost any community, the same stakeholders can be found making the same claims. This finding affirmed that using similar methods as the studies from our research could attain the information we were seeking about Hamilton. Additionally, it helped us narrow down what information we specifically wanted to know, since it is likely that studies in locations similar to Hamilton could yield similar trends in their results.

Some main stakeholders in this issue include but are not limited to homeowners, hunters, farmers, and animal right's activists. Because different stakeholders have different interactions and perceptions of deer, all have different opinions on if and how deer herds should be managed (Green et al., 1997). Farmers have the frequent and direct interactions with deer and are thus one of the largest and most important stakeholder groups (Green et al., 1997). According to a study conducted in New Jersey, farmers tend to support any form of management to reduce the economic losses due to agricultural damage from deer (Cambronne, 2013).

Hunters often experience economic gain from deer and can be directly and positively affected by their overabundance. They also often hold the biggest stake in deer management despite being a stakeholder minority with respect to size (Green et al., 1997). In New York State, less than 3% of the population hunts (Batcheller and Riexinger, 2011). Even though hunters are not likely to be the majority, they can have a large impact on the decision-making process (Fulton et. al., 2004). Hunters are unlikely to think deer are overabundant while farmers experiencing crop damage may think the population requires significant reduction (Cambronne, 2013). The hunting industry makes a significant contribution to the United States economy. Though only 6% of adults in the United States hunt, in 2012 these hunters spent a total of about \$34 billion on equipment, licenses and other expenditures related to hunting (Cambronne, 2013). Due to the large potential benefits and economic effects of hunting in the United States, we

wanted to find out how much of the population hunts, and if hunters have different opinions towards management strategies than non-hunters.

The interactions that residents have with the deer in their town heavily influence their perception and what management options they consider acceptable (Sterba, 2012). Homeowners are another main group of stakeholders and they can be negatively impacted both directly and indirectly. Homeowners can simultaneously experience vehicle collisions or significant garden damage while also enjoying the aesthetic value of deer and not wanting to harm them in order to solve the problems they cause (Kilpatrick et al., 2007). Homeowners voting on local management probably have the most significant influence over the situation.

Animal rights activists generally oppose any lethal methods of control, despite the significant drawbacks of non-lethal management, such as high cost and ineffectiveness (Perry and Perry, 2008). Environmentalists are concerned with the ecology of the forest and the impact of deer on other species in the area (Perry and Perry, 2008). All of these groups can have significant influence over the implementation of management, and each groups' concerns should be taken seriously.

In a study by Fulton et al. (2004) conducted in the Cuyahoga Valley National Park in Ohio, a survey was used to assess acceptance of lethal methods of control. The study found that most respondents believed lethal control was acceptable, and that taking no action would be unacceptable (Fulton et al., 2004). For the purposes of proposing management strategies to the Town of Hamilton, we considered it important to investigate if Hamilton residents shared similar beliefs with the participants in this study.

Management strategies are more effective when the stakeholders support the strategy. Therefore, identifying and understanding the stakeholders is a crucial component of working towards deer population management strategy implementation (Fulton et al., 2004).

Importance of Public Perception

Many studies have found that public support is necessary for the successful implementation of deer management (Fulton et al., 2004; Green et al., 1997; Sterba, 2012). Fulton et al. (2004) found a significant correlation between negative perceptions of deer and support for management implementation of deer herds. These authors also found that management strategies are likely to deteriorate without the support of the stakeholders. Another study by Sterba (2012) confirmed this finding, and additionally noted that these past interactions with deer heavily influence their perception and what management options they consider acceptable. Another article (Green et al., 1997) concluded that public involvement is crucial to the success of natural resource management.

An important component in shaping public opinion of the different stakeholders is previous interactions with deer. Separate studies conducted by West and Parkhurst (2002) and Sterba (2012) concluded that prior experience with deer is a key factor in determining an individual's perception of the species as a whole. Sterba's (2012) research also found that it is important to define the goals of herd reduction to implement management strategies. Having a strong understanding of the past experiences and perceptions of homeowners in Hamilton could aid the derivation clear goals, and put forward a detailed plan that will target the concerns of all stakeholders.

Frequency of deer sightings impacts perceptions of deer; those who see deer more often tend to have stronger opinions about them (Green, 1997). In Hamilton, location of residence within the town could affect the frequency of deer interactions and therefore perceptions of deer.

One way in which frequency of deer sightings can be effectively quantified is through surveys. In a study by Fulton et al. (2004), a survey was conducted to assess if a difference in opinions about deer exists between respondents residing in suburban areas and respondents residing in rural areas. Much of this survey was devoted to analyzing the correlation between perceptions and support for specific management strategies (Fulton et al., 2004). Although there was minimal difference between the suburban and rural responses in most categories, the survey did find one significant response that varied with correlation to residence location (Fulton et al., 2004). Residents in the suburban area were more supportive of lethal control than those in the rural area (Fulton et al., 2004). This correlation suggests that high deer densities are more disruptive or noticeable in suburban areas than rural areas. In the context of Hamilton, this study cautions that opinions could potentially vary based on location within the Town of Hamilton. Specifically, we aimed to investigate if opinions of residents within the Village of Hamilton might be systematically different than residents outside the village. These study results suggests that village residents might be more supportive of lethal management and perhaps have had more negative encounters. From this study by Fulton et al. (2004), we concluded that it is very important to determine if differences in opinions exist based on location within the Town of Hamilton.

The majority of participants in the survey conducted by Fulton et al. (2004) found lethal control applicable, and agreed that it should be implemented within the park. On the other hand, 1 in 3 participants implied they would not visit the park if lethal control was introduced, suggesting that safety concerns might be a leading limitation for certain management strategies (Fulton et al., 2004). These data suggest that categories within surveys and personal experiences are not mutually exclusive. Some suburban areas have limited firearm hunting due to perceived safety concerns and strict firearm discharge laws (Kilpatrick et al., 2007). Specifically, as in the study by Kilpatrick (2007), a respondent can agree with a management strategy in theory, but not fully support it in practice. Communities may support a management strategy in theory, but if costs are high or if a long time is needed for the strategy to effectively reduce the deer herd, then support may decrease (Kilpatrick et al., 2007).

While safety concerns are entirely understandable, it is important for stakeholders to keep an open dialogue when considering management strategy options (Green et al., 1997). Management strategy implementation could vary in different locations within the Town of Hamilton, and any management is helpful to reduce population size. Deer rarely roam more than one square mile range, making management within 1 mile effective (Kilpatrick et al., 2005). This territory is called the home range. A study conducted in Greenwich, CT found that about one third of deer in the town had no part of their home range open to firearms hunting because of the proximity to homes and business (Kilpatrick et al., 2005). We aimed to see if these restrictions were similar in Hamilton, and consider alternate management techniques if this is the case such as ways in which more land could be opened to hunting.

The biggest challenge in addressing deer overabundance in the context of a town is understanding the social implications of any type of management strategy. The combination of positive and negative impacts of white tailed deer in the United States sets up an interesting dynamic when addressing the topic. To further complicate the issue, experiencing negative and positive effects are not mutually exclusive. For example, a person might experience lawn damage while also saving money by eating venison as a source of meat rather than buying from a supermarket. Because there are many stakeholders, each with a range and probably a combination of positive and negative interactions with deer, the discussion about if and how the

deer population should be controlled quickly escalates in complexity. Additionally, since deer overabundance is such a contentious issue even small minority opposition can lead to social conflict (Fulton et al., 2004). We hoped to collect data that would indicate if Cultural Carrying Capacity has been reached, allow better understanding of perceptions of key stakeholders, and ultimately determine what management strategies would be supported by the Hamilton community (West and Pankhurst, 2002).

Methods:

Phone Survey

We conducted our study using both a phone-survey and an online survey (IRB approval October 16, 2013). We chose both methods to maximize participation across the community. The phone survey was our primary survey method because it is the most efficient type of survey and it allowed us to reach a wide variety of Hamilton residents. It is important to ensure that public opinion is collected in a systematic and non-biased way in order to avoid disproportionate representation by minority stakeholders (Green et al., 1997), thus we took great care in crafting unbiased survey questions.

Perry and Perry (2008) conducted a 5-10 minute telephone interview in Chincoteague Island, Virginia with only a 14% refusal rate. Green et al. (1997) also conducted a phone-survey and had an 85% success rate. Kilpatrick and Labonte (2003) were successful in using a 7-year-long study on community opinions regarding the deer issue before and after an intense shotgun-archery deer hunt. Their study used a door-to-door survey method, but since we are under time constraints, this method was not realistic for us. We also considered a focus group, like the one Dandy et al. (2012) used to determine perceptions about wildlife management, but again because our time restrictions and the associated data limitations with this type of study we did not use focus groups for our project. Based on all of these prior surveys and studies, we concluded that the phone-survey method would allow us to gather the most data in the shortest period of time. Despite the fact that we did not use Kilpatrick and Labonte's (2003) survey method, we drew from their successful study to help us formulate appropriate questions for our own survey questions.

Telephone interviews are the most popular form of survey data gathering in developed nations because they "have the impersonal quality of self-administered questionnaires and the person quality of face-to-face interviews.... [they] are unintimidating... but allow interviewers to probe..." (Bernard, 2011, pg. 194). The negative aspect of phone-surveys is that we had only approximately 8-10 minutes in which to conduct each survey. This time constraint limited the amount of questions we could ask our participants. However, this also gave us the opportunity to tailor our survey in the most efficient way. This limitation forced us to have a clear idea of what we wanted to learn from our data in regards to the stakeholders in Hamilton.

We aimed to survey 15% of the households in Hamilton, NY. We called landline numbers in Hamilton which all begin with "315-824." Because we called only landlines, we used the number of households in Hamilton as our population size. Assuming that it is likely for each place of residence to have one landline activated, the number of households would be the most accurate number to use as our population size. Additionally, our respondents were required to be over 18 years of age, and some of our survey questions were phrased to address the participant and members of the participant's household.

Like Green et al. (1997), we used a random sample of phone numbers. Our original list of phone numbers, from Verizon online, had a high percentage of out of service numbers so we

decided to use numbers from the Hamilton phone book. We cut off the names to maintain anonymity. We distributed these numbers to the students conducting surveys randomly, and callers dialed the numbers in the order that the phone numbers were listed.

The entire ENST 390 class (11 students) administered the survey on October 21-23, 2013. In our three nights of making phone calls for two hours each night, as a group we totaled about 54 calling hours. We called a total of 899 phone numbers, of those 206 people answered the phone. Out of the people who answered the phone, 83% of people agreed to participate in the survey (170 responses). The total response rate of our phone survey was 16.8% (number of participants/total number of phone calls x100). Out of the 899 numbers called, 316 were not in service. We used surveymonkey.com to record our responses, which allowed us to gather and analyze our data immediately.

Online Survey

We also chose to post our survey online to increase response rates. We posted the survey on nextdoorhamilton.com on the morning of October 24, 2013 and collected responses until October 27th. During these four days we collected 62 responses. We recognize that the people who answer the survey online are self-selecting, which is a form of bias, and therefore used these data with caution.

In order to determine the number of households in Hamilton, we called the Madison County Real Property Department in Wampsville, New York (315-366-2346). According to this office, the number of residences is 1,465, which we used as our population. This number is approximate because it includes residences for multiple families and camps, but it provides us with an indirect estimate of the number of landlines in Hamilton. We used the number of residences to determine what percent of households we were able to reach through our survey. We collected 170 responses from our phone survey and 62 from our online survey for a total of 232 responses. This is about 16% of Hamilton households, and thus we considered our sample to be a statistically significant portion of the town population.

Results:

The goal of our survey was to understand people's past interactions with deer in the Hamilton area and to determine how these interactions influenced their perception of the population. We asked a number of questions about people's general opinion of the local deer population (Table 1).

Table 1: Responses to General Perception Questions

Survey Question/Statement	N	“strongly agree” and “agree” (%)	“neutral” (%)	“strongly disagree” and “disagree” (%)
Deer cause problems in the Hamilton community.	206	162 (78.6%)	15 (7.3%)	29 (14.1%)
I enjoy seeing deer around.	205	133 (64.9%)	36 (17.6%)	36 (17.6%)

Hamilton residents see deer frequently, and many multiple times a day (Table 2). For both village and non-village residents, the respondents who saw deer 0-2 times in the past week represented the smallest portion of the sample. (Table 2)

Table 2:
Responses to “How Many Days in the Past Week Have You Seen Deer in the Hamilton Area?”

	N	0-2 days	3-6 days	Everyday
Total	192	29 (15.1%)	51 (26.6%)	112 (58.3%)
Village Residents	74	21 (28.4%)	24 (32.4%)	29 (39.2%)
Non-village Residents	118	8 (6.8%)	27 (22.9%)	83 (70.3%)

Many of our survey questions addressed a number of different types of deer damage, with 88.7% of respondents reporting at least one negative interaction with deer. Negative interactions include reports of Lyme disease, deer-vehicle collisions, garden and or lawn damage, and agricultural damage (Table 3). Notably, ~65% of respondents reported being personally involved in a deer-vehicle collision, and of these 64.1% of them occurred within the last five years.

Table 3: Responses to Questions Relating to Negative Interactions with Deer

Survey Question	N	“Yes” (%)	“No” (%)
Have you or anyone in your immediate family had Lyme disease?	201	27 (13.4%)	174 (86.6%)
Have you ever been involved in a deer-vehicle collision?	202	131 (64.9%)	71 (54.2%)
Has anyone in your household, besides you, ever been involved in a deer-vehicle collision?	51	28 (54.9%)	23 (45.1%)
Have you ever experienced garden and or lawn damage due to deer?	185	131 (70.8%)	54 (29.2%)

Have you ever experienced agricultural damage or crop losses due to deer?	188	24 (12.8%)	164 (87.2%)
Have you experienced any other damage caused by deer that I have not yet mentioned?	169	9 (5.3%)	160 (94.7%)
Combined total	203	180 (88.7%)	23 (11.3%)

The question “Has anyone in your household, besides you, ever been involved in a deer vehicle collision?” was only included in the online version of the survey and had 51 responses. Of those who answered the question, 54.9% answered affirmatively (Table 3). A follow up question asked, “How many total collisions has your household (including you) been involved in?” (Table 4). Of the respondents, 33.3% reported two collisions per household, and 18.2% of respondents reported four or more collisions.

Table 4: Collisions Per Household

Number of collisions	N (%)
8	1 (3.0%)
7	0 (0%)
6	1 (3.0%)
5	3 (9.1%)
4	1 (3.0%)
3	7 (21.2%)
2	11 (33.3%)
1	9 (27.3%)

Note: N=33

In an effort to understand the public’s thoughts with respect to the management of overabundant deer we asked a number of survey questions about how people perceived the size of the deer population (Table 5) as well as commonly used management options (Table 6).

Table 5: Responses to “The population of deer in Hamilton Should be Reduced.”

Survey Question - Respondent category	N	“strongly agree” and “agree” (%)	“neutral” (%)	“strongly disagree” and “disagree” (%)
The population of deer in Hamilton should be reduced.	206	153 (74.3%)	28 (13.6%)	25 (12.1%)
Village resident	74	58 (78.4%)	7 (9.5%)	9 (12.2%)
Non-Village resident	115	84 (73.0%)	17 (14.8%)	14 (12.2%)
Hunter	45	22 (48.9%)	3 (6.7%)	20 (44.4%)
Non-hunter	142	111 (78.2%)	17 (12.0%)	14 (9.9%)

Over 86% of respondents support hunting as a way to control the local deer populations (Table 6). However, only 28.4% of respondents were deer hunters themselves or had family members who hunted deer. Furthermore, only 30.5% of respondents own more than five acres of land, which would include land that is far enough away from a dwelling that it could be hunted on legally.

Table 6: Responses to Questions Relating to Deer Management

Survey Question/Statement	N	“strongly agree” and “agree” (%)	“neutral” (%)	“strongly disagree” and “disagree” (%)
Local government should be involved in managing deer populations.	197	122 (61.9%)	25 (12.7%)	50 (25.4%)
Local taxes should be used to fund management of deer populations.	196	(40.8%)	(19.4%)	(39.8%)
I support hunting as a way to control the local deer population.	201	174 (86.6%)	14 (7.0%)	13 (6.5%)

We also wanted to gauge the public’s level of understanding of the harmful environmental impacts of overabundant deer, as the increase in deer population is an important

concern to environmentalists and biologists (Rooney and Waller, 2003). Nearly one third of respondents were unsure of the answer to both of the questions about deer's impact on the environment (Table 7).

Table 7: Understanding of Deer Impact on Environment

Survey question	N	Positive (%)	Negative (%)	Both positive and negative (%)	No effect (%)	Unsure (%)
What effect do high populations of deer have on forest re-growth?	198	13 (6.6%)	69 (34.9%)	43 (21.7%)	11 (5.6%)	62 (31.3%)
What effect do high populations of deer have on other animals and plants?	200	6 (3.0%)	71 (35.5%)	49 (24.5%)	19 (9.5%)	55 (27.5%)

The final section of the survey asked the participants some important demographic data. This section included asking how far the participant lives from the village, how long the participant has lived in the area, and the participant's gender, age, and occupation. The first question we asked how far the respondent resides from the Village of Hamilton. The responses to this question were bimodal in both the phone and the online survey in that most respondents lived in or very close to the village or a few miles away. Most of our respondents lived less than one mile outside of the village or between four and five miles outside of the village (Table 8).

Table 8: Distance From The Village

Response	N (%)
I live in the village	8 (4.0%)
Less than 1 mile	74 (37.2%)
1-3 miles	23 (11.6%)
4-5 miles	74 (37.2%)
6-8 miles	13 (6.5%)
Greater than 8 miles	7 (3.5%)

Note: N = 199

We also asked how long respondents have lived in the Hamilton area, and the majority has lived in the area for well over 10 years. The bulk of our respondents were between the ages of 50 and 70 years old, and the average age of respondents was 65.1 (Table 9). The median age

for the respondents to the online survey (74) was higher than the median age for the phone survey respondents (64).

Table 9: Age of Respondents

Age	Combined	Phone Survey	Online Survey
	N (%)	N (%)	N (%)
18-19	1 (0.6%)	1 (0.7%)	0 (0.0%)
20-29	0 (0.0%)	0 (0.0%)	0 (0.0%)
30-39	4 (2.2%)	4 (3.0%)	0 (0.0%)
40-49	16 (8.9%)	13 (9.6%)	3 (6.7%)
50-59	37 (20.6%)	30 (22.2%)	7 (15.6%)
60-69	54 (30.0%)	48 (35.6%)	6 (13.3%)
70-79	36 (20.0%)	20 (14.8%)	16 (35.6%)
80-89	27 (15.0%)	15 (11.1%)	12 (26.7%)
90-99	4 (2.2%)	3 (2.2%)	1 (2.2%)
100 or older	1 (0.6%)	1 (0.7%)	0 (0.0%)
Total	180 (100%)	135 (100%)	45 (100%)
Average Age	65.1	63.0	71.2
Median Age	64	63	74

The last question asked about occupation. Most of our respondents were retired. Overall, after carefully examining these data, we consider the sample populations similar enough that our different survey methods did not impact our results.

Based on these data, we are able to correlate people's perceptions of deer with support for various management options. We have found that Hamilton citizens' past experiences with deer have led them to perceive the current deer population to be problematic and that the majority supports hunting as a form of management.

Discussion:

We chose to conduct a phone survey on the Hamilton, NY, community's perception on deer overabundance in an effort to determine how these past interactions influenced their perception of different management strategies. Through our survey we were able to gather a wide range of information about Hamilton residents and their perceptions of and interactions with deer.

The frequency of deer sighting impacts perceptions of deer; those who see deer more often usually have stronger opinions about them (Green, 1997). Despite the fact that village residents see deer less often than those living outside the village, village residents were also more likely to think the population should be reduced (78.4%). This may indicate that residents of the village are having more negative interactions with deer than people outside of the village. Another possibility is that this discrepancy is due to is a greater proportion of hunters living outside the village (77%) than in the village (23%).

We found seemingly contradictory results in that 76.8% of respondents think deer cause problems in Hamilton while 64.9% enjoy seeing deer around town. These results highlight the aesthetic value of deer that is often difficult to quantify. This valuation can pose a problem when trying to convince the community that the herd should be significantly reduced, even if it means

seeing deer less often. Towns are more likely to support lethal management when residents are experiencing more significant damages due to deer, such as car accidents and incidents of Lyme disease as opposed to more aesthetic impacts like lawn damage (Kilpatrick et al., 2007).

A majority of residents had been involved in a deer-vehicle collision before (64.9%) and of the majority of those accidents have occurred in the last 5 years. This may indicate an increase in accidents due to the increasing deer population. More specific data, such as the number, date and location of each accident would be needed to make a more conclusive statement. The results from our questions about negative interactions with deer confirm our hypothesis that the deer population is causing a significant amount of damage and losses for residents. The fact that most of the survey respondents have had at least one negative interaction with deer suggests that most Hamilton residents will support intentional management of the deer population. It is highly unlikely that all of the different stakeholder groups will support the same form of management. The level of damages experienced by individuals will also likely influence their support for management and it is difficult to quantify the severity of these damages. The only measure of severity we were able to collect is in terms of monetary losses. This type of categorization often poorly reflects people's frustrations and annoyances, which will likely also influence their opinions on management.

When also we categorized some questions based on hunting experience, those who were hunters or had a family member who hunted were less likely to think the population needed to be reduced (48.9%) than non-hunters (78.2%). This dichotomy between hunters and non-hunters has been a significant factor in almost every discussion of deer management across the country. Hunters have a very strong lobbying voice despite often being a minority. Hunters are also likely to believe that the deer population should be increased even in areas where deer are actually overabundant (Swihart and DeNicola, 1997). We were surprised to find that almost half of hunters in Hamilton think that the population of deer should be reduced. This indicates likely less hunter opposition to culling the herd, however, it would still be prudent to consider including the local hunters in whichever strategies are proposed rather than hiring an outside contractor.

The next section of questions on the survey was aimed at discovering respondents' current understanding and opinion of management options. It is encouraging to see that a majority of respondents (61.5%) agree that local government should be involved in management and only about a quarter disagree. We also found that in response to this question, many respondents commented that the New York Department for Environmental Conservation (DEC) should be in charge of management. We predict that a joint effort of coordinating plans between the DEC and Hamilton government would likely have widespread support in the community.

Another notable finding was that 86.6% of respondents support hunting as a means of management. This should mean the community supports lethal management. Some respondents did state some objections to specific lethal options, for example those that are not considered a "fair chase" or if the meat of killed deer is not used for food. One potential obstacle to hunting as management that we found is that only 28.4% of household had a family member who hunts and only 30.5% residents live on land that could potentially be hunted on. Even though the proportion of hunters in Hamilton is much higher than the NYS percentage, less than 3%, the town may still need to hire outside professionals to have sufficient hunters in the area (Batcheller and Riexinger, 2011). If opening more land to hunting was presented as a management option, those residents who own "hunnable" land would have to be convinced to not post their land and hunters would have to be willing to hunt in these areas, possibly in preference to their current hunting grounds.

The next two questions on the survey were targeted at determining Hamilton residents' understanding of how deer impact the environment. We found that in regards to both forest regrowth and impacts on other animals and plants, about a third understood that deer have a negative impact (34.9% and 35.5%, respectively). However, for both of those questions, another third of people were uncertain about the effect (31.3% and 27.5%, respectively). These results suggest that a high portion of respondents are uninformed about the negative impact deer have on the environment. We believe education about this topic is important and that we should make information available about the influence of deer on the environment. This information would allow the public to make more informed decisions when considering management options.

The final section of demographic questions allowed us to determine if our respondent pool was representative the Hamilton population and informed us of any biases in our survey method. We saw no significant difference in the demographics of the participants in the phone survey and the online survey. Since survey method had minimal effects on our results, we were able to combine the data and use it together.

We found that we lacked participants who lived 1-3 miles outside of the village. This may be because many businesses are located in this mile range and we only included residences in our survey. Since most of our respondents have lived in the Hamilton Area for over 10 years it is likely that many have been interacting with local deer and dealing with the associated problems for many years.

We were expecting the respondents to the phone survey to be relatively older than the respondents to the online survey. Contrary to our predictions the median age for the online survey respondents was ten years older than the median age for phone survey respondents. We anticipated an older demographic of respondents for the phone survey because we predicted that the younger population would be more likely to use cell phones instead of landlines, but this was not true in our case. It is difficult to say why the age demographics were distributed this way but more generally Hamilton has an older age demographic than is typical of the country at large. According to the United States Census Bureau (2012), the median age in the United States is 37.3, and our results show a much older median age.

Our intention for the question about respondents' occupation was to see if certain groups were disproportionately affected by negative interactions with deer, or if background knowledge or job experience had any effect on perceptions about deer management. For example, do farmers suffer more monetary loss due to deer than an office professional? Similarly, would a retired Colgate professor understand the ecological impacts of deer overabundance better than a business owner? Most of our respondents were retired, which aligns with our age results. These demographic data we collected are not infallible, but they do offer important information regarding public perception that is useful to us in the progression of this process.

Our main conclusions from the survey are that the town of Hamilton is aware that deer are overabundant and recognize both that is a problem and that something should be done. Based on our research and results, we believe that a lethal form of management would be the most effective and the most widely supported way to reduce the local deer population.

Conclusion:

Overall we have determined that the deer population in Hamilton is both biologically and culturally overabundant. White-tailed deer cause a variety of problems and must be managed in order to maintain the health of the surrounding environment. Stakeholders in the community

should be considered when proposing management options aimed at obtaining a healthy population of deer in Hamilton.

In order to suggest the most effective management option we need to include the public in our decision making process and understand how different strategies will be perceived. The community and important stakeholders must be included in the process to assure acceptance throughout the population. There are a variety of viable deer management options for Hamilton, and further dialogue with the community is needed in order to pick the most appropriate one (Fagliarone et al., 2013). During the community forum that was held on December 4, we proposed a few potential management strategies for the town and we hope this forum will be the beginning of a larger discussion of the issue. Most importantly we hope that it will be the needed impetus for taking action to reduce the local deer population.

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