Population Analysis for White-tailed Deer
in the Village of Cayuga Heights, New York

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Paul D. Curtis, Michael L. Ashdown, and Jason R. Boulanger
Department of Natural Resources
Cornell University, Ithaca, NY 14853

Introduction

Many communities face overabundant populations of white-tailed deer (*Odocoileus virginianus*) in suburban areas and a concomitant increase in human–wildlife conflicts (DeNicola and Williams 2008, DeNicola et al. 2000, DeNicola et al. 2008). Knowing the abundance and distribution of white-tailed deer is important for making population management decisions, and estimates of population size before and after a management action is how the success of a management program is often judged (Lancia et al. 1994).

Camera-trapping has been recently used to estimate population size for big cats (Karanth and Nichols 1998) and free-ranging deer (Jacobsen et al. 1997, Koerth et al. 1997). This method has the advantage that physical "recapture" of animals is not needed to get reliable data to use with capture-recapture models. Curtis et al. (2009) documented that using infra-red triggered cameras and the program NOREMARK (White 1996) was a reliable method for estimating abundance of suburban white-tailed deer herds. Data gathered during earlier deer studies conducted in Cayuga Heights were used to validate this technique and models.

The capture and tagging of deer during December 2012 in the Village of Cayuga Heights provided a known, marked population of deer necessary for an abundance estimate using mark-recapture analyses (DeNicola 2012, Table 1). By conducting a photo survey with infrared-triggered cameras soon after the deer tagging and sterilization was completed, we are able to estimate herd size with good confidence in the results.

Methods

The Village of Cayuga Heights (1.8 square miles) was divided into 12 equally-sized sections by overlaying a grid of approximately 100-acre blocks over a map of the community.

Twelve infrared-triggered, digital cameras (Cuddeback, Non Typical, Inc. Green Bay, WI) were deployed over bait piles on properties with high probability of deer activity within each block. It was intended that each camera would "capture" a large sample of the deer population for that 100-acre block. In accordance with our NYSDEC permit, technicians were granted permission by each landowner before setting up the cameras and putting out bait for deer.

Camera sites were baited daily with approximately 14 pounds of dry, shelled corn for two days prior to the camera deployment on 4 January 2013. Once the cameras were operating, the bait was increased to as much as 30 pound per day at sites with higher deer activity and less than 14 pounds if there was bait left from the previous day. The short pre-baiting period was sufficient considering that the deer were acclimated to bait sites with corn for deer trapping less than one month prior to the camera survey, and the deer recognized the corn bait quickly. The cameras were set to run continuously for 24 hours per day, with a preset delay of 4 minutes between pictures. Every other day during the field survey, the memory cards in the cameras were changed so that technicians could confirm the cameras were functioning properly.

On 12 January 2013, the photo survey was completed, and cameras were removed. Technical difficulty with one of the cameras resulted in the loss of pictures for the first 3 days but enough pictures were taken in 5 days (n = 3,764 photos) with all 12 cameras functioning to run the statistical analysis for population estimation.

After the cameras were removed from the field, all the pictures containing deer were sorted by site and numbered. Each picture was then closely studied, and any legible ear tag number was recorded. We also recorded the total number of deer, the number of unmarked deer, and the number of unidentifiable marked deer for each photo. The number of bucks was recorded in each picture, but these data were not completely reliable, as some bucks had shed their antlers by early January. From these photographic data, the total number of times each identifiable, marked deer was observed was entered into the program NOREMARK (White 1996), along with the total number of unmarked deer, and the total number of marked deer known to be alive in the population during the survey.

In addition to program NOREMARK, we also experimented with hierarchical capture-recapture models (Royle and Young 2008, Gardner et al. 2009, Royle et al. 2009) that incorporate trap-site and camera-location data into the population estimate. These techniques use spatial information to include the likelihood of finding an animal in the population based on

animal movements associated with camera recaptures. These analysis methods include the GPS coordinates for wherever individuals are detected. This method may provide an improvement over previous techniques that provided only a single point estimate of abundance or density. While these spatially-explicit, capture-recapture (SECR) methods are computationally more intensive, they allow researchers and wildlife managers to identify and understand patterns, such as potentially associating hotspot areas of greater deer density with habitat, road, or housing densities.

Royle et al. (2009) developed SPACECAP, an SECR model developed in R programming, which is not only uses the photographic images and capture history, but also uses camera-trap location data to address the issues related to individual heterogeneity in estimating capture probabilities that is prevalent in the conventional capture-recapture analyses. We attempted to use the program SPACECAP to analyze camera-trap data for deer in the Village of Cayuga Heights, and compared results to those for program NOREMARK. This required completely reformatting the camera data with deer sightings, and creating 3 different input files to run SPACECAP. Once data were input, the program took approximately 10 hours to run the analysis and provide output information.

Results

The total number of marked deer that were identifiable in the pictures was 138. The total number of marked deer in the Village of Cayuga Heights used for analysis was 171 (Table 5). We adjusted this number to remove 2 marked deer that died before the photo survey was conducted, and then added 3 deer marked by Cornell University that were identified in pictures. For deer not seen in the camera survey, several were located and observed while tracking collared marked deer using radio-telemetry (Table 4). Therefore, those deer were known to be alive and in the Village during the photo survey. For deer that were not collared, and not moving with a radio-collared deer, it is impossible to know for certain if they were still in the community and alive. Because of this uncertainty, deer that were not photographed and found on the extreme edges of the village were identified (Tables 8 and 9). We decided to run the analysis 2 times; once with all the possible live deer included in the total, and once without deer living near the edge of the community.

Since deer capture and tagging were completed in December 2012, there have been 15 recorded deaths for marked deer (Tables 6 and 7). Seven of the deer died as a result of deer vehicle collisions. Two of the deaths were assumed to be caused by the complications of old age because those deer were trapped during earlier deer studies conducted in the Village, and both were at least 13 years old. Two deer dispersed from Cayuga Heights, and were legally killed by hunters on Cornell University lands. One deer died shortly after release, and this animal was presumed to have succumbed from complications associated with either capture or surgery. It was not possible to determine the cause of death for 3 deer because their carcasses were too decomposed.

Initial deer population estimates generated by program NOREMARK were conducted in two ways. The first population estimate (n = 214) and associated 95% confidence interval (201-227) include all deer known to be alive (via photo confirmation or radio-telemetry observations) in the area during the time of the survey (see Tables 8 and 9). The second population estimate (n = 227) and 95% confidence interval (213-242), includes an additional 10 deer likely to be alive in the community (Table 8), but that did not appear on photos during the camera survey. A reasonable estimate of deer abundance in Cayuga Heights based on these two analyses is 225 deer, or a density of approximately 125 deer per square mile.

The SECR model provided an unreliable estimate of deer abundance in the Village using spatial information based on the camera locations. SECR models utilize a binomial process (e.g., a marked deer is seen on a particular day, or not). Thus we lose all of the daily data we have (e.g., multiple pictures of a tagged deer at one or more camera stations in a given 24-hour period). Also, the SPACECAP model does not utilize unmarked deer whatsoever in the population estimate. After consultation with program developers, we determined that these issues with SECR models made them inappropriate for our deer photo dataset. The output from program NOREMARK will provide a reliable estimate of deer abundance as it has in the past.

Based on our photo survey and discussions with A. DeNicola concerning untagged female deer observed while trapping, we believe there may be 6 untagged, adult female deer in the community during early January 2013. These observations include: 1 doe near 109 Cayuga Heights Rd (with doe C112); 2 adult does in Palmer Woods; 1 doe with an unmarked fawn near south North Sunset Drive; 1 doe with an unmarked fawn near north North Sunset Drive; and a lame doe in the The Parkway/Upland Rd. area. It is impossible to know for certain if there are

more untagged, female deer in the Village, as it is sometimes difficult to distinguish button bucks from female deer. Also, a single untagged doe may appear at more than one camera location. If our estimate of 6 untagged adult female deer is correct, then approximately 95% of the breeding female deer in the Village were tagged, and 93% were surgically sterilized.

There were several tagged deer (Tables 8 and 9) that did not appear in any of the photos obtained from the infra-red triggered camera survey conducted during the January 4-12, 2013. Some of these deer were captured near the Village boundary (Table 9), and these deer may spend little time in the community. Other deer may have been reluctant to visit bait sites, as many were captured less than one month earlier at baited drop-net sites. Given the large number of pictures taken (n = 3,764 photos), these unobserved deer should not influence the population estimate.

Family groups of deer do occasionally enter or leave the Village. For example, a group of 4 deer (C105, C106, C107, and C108) tagged and sterilized after drop-net capture near Triphammer and Sheldon Roads, were observed on April 30, 2013, in a yard at 49 Turkey Hill Road. This was about 2.8 miles from their original capture site. It will be interesting to see if these deer return to the Village during peak fawning season in late May and early June.

Discussion

It is clear that deer are overabundant in the Village of Cayuga Heights based on homeowner complaints, vehicle collisions, and plant damage. More tagged deer were killed in vehicle collisions (46.7%, n= 7; Table 7) than for any other mortality factor. A few marked deer (13.3%, n= 2) wandered into areas open to hunting on Cornell lands. As long as mortality exceeds immigration and births, the deer population in Cayuga Heights will slowly decline. However, it is clear that a very low immigration and birth rate (e.g., 15-20 immigrants and new-born fawns) may keep the population stable for many years. Consequently, it will be extremely important to capture and sterilize any new or untagged female deer to maintain sterilization rates around 95% or higher over time. Population reduction will be very slow, and it may take 5 years or more to see a significant reduction in deer numbers.

If lethal removal of adult female deer can be implemented, the population will decline much more rapidly. The Village Board should consider alternatives and potential modification of their SEQR documents to include other methods for reducing the deer population more quickly. Currently, the primary form of deer removal in the community is via deer-vehicle

collisions. This has high cost and safety risks for motorists, and is an inhumane way to manage a deer herd. Professional, lethal control would be much more humane for the deer involved, and there is greater likelihood the deer would be fit for human consumption.

Continued monitoring of the deer herd via a survey with infra-red triggered cameras will be critical to document the impacts of the program. It will be important to clearly show whether the deer herd actually declines, and over what time frame significant differences are observed. It is clear from past deer-modeling studies (Merrill et. al. 2003, Merrill et. al. 2006) that immigration of female deer, and difficulty with capturing some adult females, may significantly reduce the success of a deer sterilization program.

Recommendations

Based on the current population analysis and knowledge of deer behavior, we make the following recommendations:

1. During summer, the DPW crew should watch for spotted fawns, and note their locations. That should help us focus follow-up trapping efforts in areas where reproducing female deer have established home ranges.
2. Continue to record locations of dead, tagged deer. The Village Police and DPW staff have been very helpful in providing us with information concerning know deer mortalities. This will help us with future population estimation.
3. Plan for follow-up deer trapping in fall and/or early winter. Trapping and sterilization efforts should focus on immigrant, untagged does, and female fawns. Discussions should occur with A. DeNicola, P. Curtis, and DEC staff (S. Joule, DEC Region 7, Cortland) to plan for follow-up deer capture efforts and LCP renewal.
4. Conduct a camera survey of deer in winter 2014. It will be important to monitor for any untagged female deer, and estimate deer abundance to determine the success of these research and management efforts. The deer camera survey should occur in the same time frame (January 2014), using the same camera locations, as much as possible.
5. Continue to pursue socially-acceptable options for deer removal. Additional deer mortality will be needed to lower deer abundance in a reasonable time frame. The Village Board should discuss and pursue additional management options to supplement the ongoing deer sterilization program.

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Table 1. Female deer captured, ear-tagged, and sterilized during December 2012 in Cayuga Heights, NY.

Tag#	Capture Date	Age 12'	Radio Freq.	Previous Treatment	Treat 2012	Capture Method	Comments
C01	12/1/2012	A			OV	DN	Back Tag reads C101
C02	12/1/2012	F			OV	DN	Back Tag reads C102
C03	12/1/2012	3.5			OV	Dart	
C04	12/2/2012	A			OV	DN	w/C08 and H18
C05	12/2/2012	A			OV	DN	
C06	12/2/2012	F			OV	DN	
C07	12/2/2012	F			OV	DN	
C08	12/2/2012	5.5			OV	DN	w/C04 and H18
C09	12/2/2012	3.5			OV	DN	
C10	12/2/2012	F			OV	DN	
C11	12/2/2012	4.5			OV	DN	
C12	12/2/2012	F			OV	DN	
C13	12/2/2012	F			OV	DN	
C14	12/2/2012	5.5			OV	DN	
C15	12/2/2012	A	151.523		OV	DN	w/C123, H06, H07
C16	12/2/2012	4.5			OV	Dart	
C17	12/2/2012	3.5			OV	Dart	w/C19
C18	12/2/2012	F			OV	Dart	
C19	12/2/2012	1.5			OV	Dart	w/C17
C20	12/3/2012	6.5			OV	Dart	
C21	12/3/2012	10+			OV	Dart	w/H06
C22	12/3/2012	2.5			OV	Dart	
C23	12/3/2012	A			OV	DN	w/C24, 25, 103
C24	12/3/2012	2.5			OV	DN	w/C23, 25, 103
C25	12/3/2012	0.5			OV	DN	w/C23, 24, 103
C26	12/3/2012	A			OV	DN	w/C72
C27	12/3/2012	6.5			OV	Dart	w/C53
C28	12/3/2012	3.5	151.503		OV	Dart	w/C118 2bb C114
C29	12/4/2012	3.5			OV	Dart	w/C30-C33 and bb
C30	12/4/2012	3.5			OV	Dart	w/C29, C31-C33, bb
C31	12/4/2012	1.5			OV	Dart	w/C29, 30, 32, 33 bb
C32	12/4/2012	F			OV	Dart	w/C29-C31, C33, bb
C33	12/4/2012	F			OV	Dart	w/C29-C32 and bb
C34	12/4/2012	A			OV	DN	w/H10
C35	12/4/2012	F			OV	DN	w/H10
C36	12/4/2012	A			OV	DN	
C37	12/4/2012	A			OV	DN	w/bb
C38	12/4/2012	2.5			OV	DN	
C39	12/4/2012	1.5			OV	DN	
C40	12/4/2012	F			OV	DN	
C41	12/4/2012	2.5			OV	DN	
C42	12/4/2012	6.5			OV	DN	

C43	12/5/2012	4.5		OV	DN	
C44	12/5/2012	6.5		OV	DN	w/H16
C45	12/5/2012	4.5	151.643	OV	DN	w/C46, C47 H12 H01
C46	12/5/2012	3.5		OV	DN	w/C45, C46 H12 H01
C47	12/5/2012	F		OV	DN	w/C45, C47, H12
C48	12/5/2012	2.5		OV	Dart	
C49	12/5/2012	1.5		OV	Dart	
C50	12/6/2012	2.5	151.302	OV	Dart	w/C54 and C128
C51	12/6/2012	1.5	151.623	OV	Dart	w/C88 and C87
C52	12/6/2012	4.5		OV	Dart	
C53	12/6/2012	2.5		OV	Dart	w/C27
C54	12/6/2012	6.5		OV	Dart	3 legs w/50W C128
C55	12/6/2012	3.5	151.323	OV	Dart	w/92 94 95 122 H26
C56	12/6/2012	4.5		OV	DN	w/bb
C57	12/6/2012	8.5		OV	Dart	w/ 2 F
C58	12/7/2012	5.5	151.422	OV	Dart	w/H19 and bb
C59	12/7/2012	4.5		OV	Dart	w/C83 and C109
C60	12/7/2012	1.5	151.403	OV	Dart	w/C84
C61	12/7/2012	3.5		OV	Dart	w/C62, C127
C62	12/7/2012	8.5	151.603	OV	Dart	w/C61, C127
C63	12/7/2012	1.5		OV	DN	w/C64 and H20
C64	12/7/2012	3.5		OV	DN	w/C63 and H20
C65	12/7/2012	6.5	151.363	OV	DN	w/C66, C98 and H14
C66	12/7/2012	6.5		OV	DN	w/C65, C98 and H14
C67	12/7/2012	3.5		OV	Dart	w/H??
C68	12/7/2012	5.5		OV	Dart	w/H15 and C78
C69	12/7/2012	F		OV	Dart	w/C70 and bb
C70	12/7/2012	6.5		OV	Dart	w/C69 and bb
C71	12/7/2012	3.5		OV	Dart	w/unmarked bb
C72	12/8/2012	F		OV	Dart	w/C26
C73	12/8/2012	3.5		OV	DN	w/C74 H24 C111, bb
C74	12/8/2012	4.5	151.443	OV	DN	w/C73, H24 C111 bb
C75	12/8/2012	5.5		OV	Dart	Solo
C76	12/8/2012	2.5		OV	Dart	w/bb
C77	12/8/2012	4.5		OV	Dart	w/C79
C78	12/8/2012	F		OV	Dart	w/C68 and H15
C79	12/9/2012	3.5	151.382	OV	Dart	w/C96 and C77
C80	12/9/2012	F		OV	Dart	w/C81 and H21
C81	12/9/2012	8.5		OV	Dart	w/C80 and H21
C82	12/9/2012	3.5		OV	Dart	w/C60, C62, 2 bb
C83	12/9/2012	F		OV	Dart	w/C59, C109
C84	12/9/2012	2.5		OV	Dart	w/C60 and C62
C85	12/9/2012	F		OV	Dart	w/C20 and bb
C86	12/9/2012	F		OV	DN	w/H23, H30, H31
C87	12/9/2012	A		OV	DN	w/C88

C88	12/9/2012	F		OV	DN	w/C87and C51
C89	12/9/2012	A		OV	DN	w/C90 and C91
C90	12/9/2012	A		OV	DN	w/C89 and C91
C91	12/9/2012	2.5		OV	DN	w/C89 and C90
C92	12/11/2012	1.5		OV	Dart	w/C55, C94, C95 122
C93	12/11/2012	1.5	151.584	OV	Dart	w/antlerless?
C94	12/11/2012	1.5		OV	Dart	w/C55, C92, C95 122
C95	12/11/2012	1.5		OV	Dart	w/C55, C92, C94 122
C96	12/11/2012	1.5		OV	Dart	w/C79
C97	12/11/2012	1.5		OV	Dart	
C98	12/11/2012	F		OV	Dart	w/C65, C66 and H14
C99	12/11/2012	2.5		OV	Dart	w/C100
C100	12/11/2012	F		OV	Dart	w/C99
C103	12/12/2012	3.5		OV	Dart	w/C23
C105	12/12/2012	1.5		OV	DN	w/C106-108
C106	12/12/2012	F		OV	DN	w/105,107, 108, 126
C107	12/12/2012	F		OV	DN	w/105,106, 108, 124
C108	12/12/2012	2.5	151.464	OV	DN	w/C105 – 107
C109	12/12/2012	3.5		OV	Dart	w/C59
C111	12/12/2012	F		OV	Dart	w/C73, C74, H24, bb
C112	12/12/2012	5.5	151.483	OV	Dart	w/H27, unmarked YF, bb
C113	12/13/2012	F		OV	Dart	w/C115, 116, 117 bb
C115	12/13/2012	3.5		OV	Dart	w/C113, 116, 117 bb
C116	12/13/2012	5.5		OV	Dart	w/C113, 115, 117 bb
C117	12/13/2012	F		OV	Dart	w/C113, 115, 116 bb
C118	12/13/2012	F		OV	Dart	w/C28 and 2bb
C119	12/13/2012	1.5		OV	Dart	
C120	12/13/2012	3.5		OV	Dart	w/C121
C121	12/13/2012	F		OV	Dart	w/C120
C122	12/13/2012	F		OV	Dart	w/C55, 92 94 95 H26
C123	12/13/2012	2.5		OV	Dart	w/C15, H06, H07
C124	12/14/2012	2.5		OV	Dart	w/C107
C125	12/14/2012	3.5		OV	Dart	w/3 fawns
C126	12/14/2012	2.5		OV	Dart	w/C106
C127	12/14/2012	F		OV	Dart	w/C62 and C61
C128	12/14/2012	4.5		OV	Dart	w/C50 and C54
C129	12/14/2012	3.5		OV	Dart	w/Cornell 310
C130	12/14/2012	F		OV	Dart	
C131	12/14/2012	2.5		OV	Dart	w/fawn
C132	12/14/2012	2.5		OV	Dart	w/Cornell 316
C133	12/14/2012	4.5		OV	Dart	w/AD and DF
C134	12/15/2012	4.5		OV	Dart	
C135	12/15/2012	4.5		OV	Dart	w/fawn
C136	12/15/2012	F		OV	Dart	
		Total		**131**		

Table 2. Tagged female white-tailed deer from previous studies that were recaptured and sterilized during December 2012 in Cayuga Heights, NY.

Tag#	Capture Date	Age in 2012	Radio Freq.	Previous Treatment	Treat 2012	Capture Method	Capture Location	Comments
C110	12/10/2012	8+		tubal ligation	OV	Dart	Comstock	Failed tubal ligation w/C118
C114	12/12/2012	8+		tubal ligation	OV	DN	Highland	Failed tubal ligation w/C28
127	12/4/2012	10+		SpayVac™	OV	Dart	Texas	
128	12/5/2012	8.5		SpayVac™	OV	Dart	Winthrop	
131	12/12/2012	8+		SpayVac™	OV	Dart	Iroquois/Parkway	
133	12/3/2012	7.5		SpayVac™	OV	Dart	Winthrop	
Total	**6**							

Table 3. Previously-marked female deer not captured and surgically treated in Cayuga Heights, NY, during December 2012 because of old age and anticipated short life expectancy.

Tag#	Capture Date	Age in 2012	Radio Freq.	Previous Treatment	Treat 2012	Capture Method	Capture Location	Comments
35	02/24/04	13+	151.059	tubal ligation	None	Clover trap	North Sunset	Originally captured 02/17/2000
59	02/19/04	13+	151.512	hysterec-tomy	None	Clover trap	North Sunset	Originally captured 03/12/2002, complications with usual surgery
73	12/17/02	13+	150.448	ovarectomy	None	Rocket Net	Hanshaw Road	
103	12/14/02	11+	151.551	ovarectomy	None	Clover trap	Lowell Place	
118	03/11/04	10+	150.526	tubal ligation	None	Clover trap	Comstock Rd.	
Total	**5**							

Table 4. Newly-marked male deer captured in Cayuga Heights, NY, during December 2012.

Tag#	Capture Date	Age 12'	Radio Freq.	Previous Treatment	Treat 2012	Capture Method	Comments
H01	12/3/2012	F			Male	DN	w/C45, C46, C47
H02	12/4/2012	2.5			Male	DN	
H03	12/4/2012	F			Male	DN	
H04	12/4/2012	F			Male	DN	
H05	12/5/2012	F			Male	DN	
H06	12/2/2012	F			Male	DN	
H07	12/2/2012	F			Male	DN	
H08	12/2/2012	2.5			Male	DN	
H09	12/4/2012	F			Male	DN	
H10	12/4/2012	F			Male	DN	w/C34 and C35
H12	12/5/2012	F			Male	DN	
H13	12/5/2012	F			Male	DN	
H14	12/7/2012	F			Male	DN	w/C65 and C66
H15	12/7/2012	F			Male	Dart	w/C68 and C78
H16	12/5/2012	F			Male	DN	w/C44
H17	12/5/2012	F			Male	DN	
H18	12/7/2012	F			Male	Dart	w/C04 and C08
H19	12/7/2012	F			Male	Dart	w/C58
H20	12/7/2012	F			Male	DN	w/C63 and C64
H21	12/9/2012	F			Male	Dart	w/C80 and C81
H22	12/9/2012	F			Male	Dart	w/133
H23	12/9/2012	F			Male	DN	w/C86
H24	12/8/2012	F			Male	DN	w/C73 and C74
H25	12/9/2012	F			Male	DN	w/C89, C90, C91
H26	12/13/2012	F			Male	Dart	w/C55, 92 94 95 122
H27	12/15/2012	F			Male	Dart	w/C112 and bb
H28	12/15/2012	F			Male	Dart	Solo
H30	12/9/2012	F			Male	DN	w/C86
H31	12/9/2012	F			Male	DN	w/C86
		Total			**29**		

Table 5. Total marked deer in the Village of Cayuga Heights at the time of the photo survey during January 4 through January 12, 2013.

Female deer tagged and sterilized	137
Previously-marked females not recaptured	5
Male deer captured and marked	29
Total marked deer	**171**

Table 6. Known mortality of tagged deer in Cayuga Heights during December, 2012 through May 1, 2013.

Tag#	Capture Date	Age	Treatment	Capture Location	Alive?	Recovery Codes*	Recovery Date	Recovery Site
C13	12/2/2012	F	OV	223 Highgate	N	HH	1/30/2013	Cornell Hunting Zone M1
C21	12/3/2012	10+	OV	Winthrop	N	DVC	4/25/2013	2213 N Triphammer Rd.
C58	12/7/2012	5.5	OV	Berkshire/Highgate	N	DVC	2/4/2013	608 Cayuga Heights Rd. right along the edge
C82	12/9/2012	3.5	OV	Upland/Triphammer	N	DVC	2/26/2013	Route 13 hill
C94	12/11/2012	1.5	OV	Winthrop	N	ND	4/16/2013	Sandra Place Walkway west of NE School
C95	12/11/2012	1.5	OV	Winthrop	N	ND	3/24/2013	201 Christopher Lane
C116	12/13/2012	5.5	OV	Wychoff/Cayuga Heights	N	CM	12/18/2012	Lakeview Cemetery
C119	12/13/2012	1.5	OV	Triphammer	N	HH	3/20/2013	Bluegrass Lane, north of Moakley House
C124	12/14/2012	2.5	OV	DPW	N	DVC	3/26/2013	Palmer Woods Creek near Triphammer Rd.
35	02/24/04	>3.5	2004 tubal ligation	336 N. Sunset	N	OC	01/22/13	508 Cayuga Heights Rd.
59	02/19/04	>4.5	2004 hysterectomy	109 N. Sunset	N	OC	02/27/13	Definitive location not provided
73	12/17/02	>3.5	2002 ovarectomy	1008 Hanshaw Road	N	DVC	4/12/2013	820 Hanshaw Rd.
H01	12/3/2012	F	Male	The Parkway	N	DVC	12/21/2012	The Parkway near Upland
H08	12/2/2012	2.5	Male	Lexington	N	DVC	2/17/2013	Along Route 13 north between Triphammer and Warren Roads.
H14	12/7/2012	F	Male	711 Triphammer	N	ND	4/2/2013	107 Sheldon Rd.

*HH= hunter harvest; DVC= deer-vehicle collision; ND= not possible to determine; CM= capture-related mortality; OC= other causes.

Table 7. Causes of deer mortality in Cayuga Heights during December, 2012, through May 1, 2013.

Cause of Death	Total	Percent
Deer-vehicle collision (DVC)	7	46.7%
Hunter harvest (HH)	2	13.3%
Other causes (OC)	2	13.3%
Capture-related mortality (CM)	1	6.7%
ND (unable to determine)	3	20.0%
Total Deer Mortality	**15**	

Table 8. Deer captured and tagged in Cayuga Heights but not photographed during the camera survey during January 4 through 12, 2013.

Tag#	Treatment 2012	Capture Location	Total pictures	Observed during Telemetry
C18	OV	Winthrop	0	N
C33	OV	Parkway/Comstock	0	N
C48	OV	Texas Lane	0	N
C52	OV	Highland	0	N
C70	OV	Comstock	0	N
C81	OV	Texas Lane	0	N
C85	OV	Winthrop	0	N
C87	OV	Highland	0	N
C88	OV	Highland	0	N
C96	OV	Cayuga Heights Rd.	0	N
C97	OV	Comstock	0	N
C117	OV	Wychoff/Cayuga Heights	0	N
C123	OV	Lexington	0	N
C125	OV	DPW	0	N
C133	OV	Lexington	0	N
C135	OV	Triphammer	0	N
H07	Male	Lexington	0	N
H13	Male	Highland	0	N
H21	Male	Texas Lane	0	N
H26	Male	Lexington	0	N
H28	Male	Triphammer	0	N
C15	OV	Lexington	0	Y
C51	OV	Highland	0	Y
C55	OV	Lexington	0	Y
C69	OV	Comstock	0	Y
C92	OV	Winthrop	0	Y
C93	OV	Lexington	0	Y
C94	OV	Winthrop	0	Y
C95	OV	Winthrop	0	Y
C122	OV	Lexington	0	Y
128	OV	Winthrop	0	Y
H22	Male	Warrick	0	Y

Table 9. Deer darted near the borders of Cayuga Heights that were not observed in pictures, and not seen during telemetry tracking of collared deer in January 2013. It is questionable if these deer spend much time in the Village.

Tag#	Treatment 2012	Capture Location	Total pictures	Observed during Telemetry
C18	OV	Winthrop	0	N
C48	OV	Texas Lane	0	N
C81	OV	Texas Lane	0	N
C85	OV	Winthrop	0	N
C117	OV	Wychoff/Cayuga Heights Rd.	0	N
C123	OV	Lexington	0	N
C133	OV	Lexington	0	N
H07	Male	Lexington	0	N
H21	Male	Texas Lane	0	N
H26	Male	Lexington	0	N