



CITY OF IOWA CITY MEMORANDUM

02-15-18

IP8

Date: February 15, 2018
To: Geoff Fruin, City Manager
From: Liz Ford, Animal Services Supervisor
Re: Urban Wildlife - Deer

Current Deer Population, Accidents, and Complaints

Attached are the report of White Buffalo, Inc. entitled "Iowa City White-Tailed Deer Population Estimate January 2018." Also attached is a copy of my memo to City Council dated November 21, 2017 showing the yearly deer/vehicle accident numbers for 2013 through November 2017 and resident complaints. To provide a history of what the City has previously undertaken to control deer, the City Attorney's Office has provided a Memorandum that is also in your packet.

The survey conducted by White Buffalo Inc. in January 2018 resulted in counts they estimate are likely 3 times as many as there were ten years ago and what they call a "density similar to what was present when we initiated the sharpshooting program in 2000".

Unfenced urban gardens and landscaping adjacent to parks and other wild areas provide a perfect, welcoming food source and habitat for deer to thrive. Residents purposely feeding the deer (grains and corn) to attract them habituate the deer to humans creating nuisance animals that simply won't move on to more appropriate less populated areas. There are no longer predators to keep the deer population in check. The next likely occurrence with the overcrowded deer will be disease within their species - nature's way of culling the herd.

Deer are an important and beautiful part of our landscape and ecosystem but left unchecked a deer overpopulation problem can cause a damaging effect on the surrounding native landscape and other species as well as a threat to public safety (deer/vehicle accidents).

Solving the overpopulation problems and bringing to deer population to a manageable and healthy level should involve education and non-lethal efforts on the part of both residents and city staff and with guidance from the Department of Natural Resources (DNR).

City Council Action Steps

In addition to the above, Council needs to consider whether or not to reduce the deer population by more aggressive means. The two options are:

1. A Department of Natural Resources Deer Management Zone- hunting with bow and arrow in prearranged zones by volunteer hunters, managed by the City of Iowa City.
2. A reduction program conducted by private contractor- sharp shooting in prearranged areas, managed and conducted by a professional depredation contractor.

Deer Depredation

Deer are under the jurisdiction of the State of Iowa. For the City to be able to reduce the deer population next winter (2018/2019) via a hunt, the City will need to request authorization from the Natural Resources Commission (NRC). The NRC is a 7-person body appointed by the Governor and confirmed by the Senate that manages the state's resources including deer.

Authorization to use bow hunting to reduce the population is processed through the Iowa DNR depredation biologist for our region. This request must be made to the biologist by April 15th, 2018 and a letter of intent must be received by the NRC Wildlife Bureau Chief by May 25th, 2018.

Authorization to use sharp shooting to reduce the population is coordinated directly with the NRC Wildlife Bureau Chief. City staff is waiting to hear back from the Bureau Chief on the required process and any additional deadlines for this option to be considered.

Options

Below are some pros and cons of each option:

Bow Hunting: A bow hunting reduction program would be managed by the City of Iowa City. Other municipalities such as Coralville and Cedar Rapids coordinate such programs which must be approved by the Iowa DNR each year. Fire or Police departments are commonly involved due to the risks associated with these hunts. Hunters volunteer their skills but must qualify in proficiency.

Pros:

- The Iowa DNR is favorable to bow hunting and approves yearly requests for urban bow hunts in many Iowa cities.
- If the population is at a manageable level, annual bow hunting programs can keep the population at that level quite effectively.
- Bow hunting may be perceived as less threatening to the public because it is quieter (no gun shot)
- A bow hunting plan would involve volunteer hunters. The expenses would be in City staff time and management of the program. Additional city staff required estimated at \$10,000/year based on rough estimates and with information from neighboring cities (Coralville and Cedar Rapids).

Cons:

- These programs are generally labor intensive and would require the city to assign additional resources (hunter qualifications including proficiency tests, tags, checking in the animals, transportation, processing, and problems must all be coordinated and managed)
- Because bow hunting is less lethal than sharp shooting, it is less likely to be accepted by animal advocates. Deer not fatally shot will run off, suffer, and require tracking (possibly on to neighboring private properties) and multiple shots with arrows to bring them down and kill them. Some may not be found, leaving the animal to suffer.
- Missed and unrecovered arrows are a weapon and may be discovered by children.
- Bow hunting involves multiple hunters. Private landowners may not want multiple hunters unknown to them on their property.
- Multiple hunters complicate holding specific hunters accountable for their actions.
- Bow hunting takes longer to cull enough deer to be at a manageable level because the DNR does not allow baiting. Hunters must sit and wait for the deer. At that rate it can be hard to keep up with the breeding rate particularly when your population is already 2-3 times higher than a manageable level.
- A longer hunt period means privately and publicly owned hunted land areas are unavailable for other use for longer periods of time.
- Some bow hunters may be proficient in target practice but may be untrained in the practice of hunting and tracking which can result in animals being driven into neighborhoods and housing developments.
- Deer learn to avoid humans if the hunting period takes longer, this can change their behavior patterns, limiting efficacy. They become more elusive over time.

- City would need to consider hiring staff to manage the program and would need to identify a space to bring the dead animals for reporting.

Sharp Shooting: A sharp shooting reduction program would be conducted by private contractor. The City of Iowa City utilized the services of White Buffalo Inc. in the past.

Pros:

- Utilizing a professional contractor would require less City staff time. The contractor does all the documentation and management of the program.
- Death by bullet is quicker. It is not painless but animals suffer less.
- Studies indicate that more deer can be killed in a shorter time using sharp shooting versus bow and arrow because baiting is allowed with sharp shooting and therefore manageable population levels could be achieved in a shorter time period.
- Fewer hunters reduce risk and increase accountability

Cons:

- Gunfire is louder than bow hunting however the professional contractor can use a suppression device.
- The DNR has not been favorable to the sharp shooting approach.
- Contracting a professional sharp shooting company to conduct the depredation is more expensive than a volunteer hunter and City staff managed bow hunt. Previous year expenses reached up to \$100,000/year, depending on the number of deer harvested.

Time Line

The time line is:

April 15, 2018: Deadline to submit a request for an urban bow hunting deer management zone to the Department of Natural Resources depredation biologist responsible for the area that includes Iowa City.

May 25, 2018: Deadline for the City to submit the letter of intent to the NRC.

June 2018: The NRC at its June meeting will review the request.

Fall 2018/Winter 2018-19: Hunt will occur.

Therefore, if the City wishes to reduce the deer population with a hunt during the winter of 2018-2019, it must decide to do so by early April.



CITY OF IOWA CITY MEMORANDUM

DATE: FEBRUARY 14, 2018
TO: CITY COUNCIL
FROM: SUSAN DULEK, ASSISTANT CITY ATTORNEY
RE: DEER MANAGEMENT HISTORY

The purpose of this Memo is to provide a history of the City's deer management efforts.

1996

In discussions with the City, the Iowa Department of Natural Resources (DNR) recommends that the City form a committee to determine the best methods for the City to manage the deer population.

1997

City Council establishes a 13-member committee consisting of 3 City staff members and representatives of the following groups: Project Green, resident living in area heavily populated with deer, resident in area not heavily populated with deer, animal rights, science/biology background (2 persons), Iowa Wildlife Federation, City of Coralville, Coralville resident living in area heavily populated with deer, and Board of Supervisors. The Committee spends 5 months deciding whether to reduce the number of deer and how to do so. The Committee recommends reduction by sharp shooting and trap and kill, but not bow hunting. Council adopts Resolution No. 97-367 establishing the first deer management plan.

1998

The City enters into a contract with the U.S. Department of Agriculture (USDA) to sharp shoot.

1999

In January 1999, the USDA begins sharpshooting deer. In February 1999, three out-of-state animal rights organizations, the University of Iowa Animal Rights Coalition, and four Iowa City residents file a federal lawsuit in Washington DC against the USDA alleging a violation of the National Environmental Policy Act. The Court enters a temporary restraining order which terminates the sharpshooting that spring, and the City ends its relationship with the USDA.

1999-2000

The City contracts with White Buffalo, Inc. for the first time to sharp shoot during the winter of 1999/2000.

2001

City Council formalizes the ad-hoc deer committee into a 9-member Deer Task Force in Resolution No. 01-80, which included a sunset provision for 2004. Members represent the following categories: 2 animal welfare advocates, 1 gardener, 1 hunter, 1 biologist/scientist, 1 non-government conservationist, and 3 at-large.

2004

Council extends the sunset provision for the Deer Task Force to March 15, 2007 in Resolution No. 04-225.

2005

The Task Force recommends that Council consider bow hunting in addition to sharp shooting. The City Manager and the Police Chief recommend against bow hunting, and Council votes 5-2 against bow hunting.

2007

In Resolution No. 07-123, Council extends the sunset provision of the Deer Task Force to March 15, 2008.

2008

The Deer Task Force dissolves consistent with the sunset provision, and the Task Force recommends to Council that a standing City board for deer management not be established.

2000 to 2009

The City contracts with White Buffalo, Inc. in each of these years. Following each winter, White Buffalo, Inc. issues a summary report to the City, and attached is the last report, 2010 Summary Report of White Buffalo, Inc. Table 2 on page 2 of the report sets forth the number of deer harvested each year.

Except for the last year, the annual cost ranges from approximately \$60,000 to \$95,000. A large expense (approximately \$15,000) is to process all the deer meat at a local locker and store the meat, which is distributed free through the Crisis Center.

During these years, the Deer Committee and then the Deer Task Force recommend to City Council two deer management plans, a long-term plan and an annual plan. The long-term plan requires Council to review it annually and also approve an annual plan. There was not a significant difference between the two plans and in 2008 they were combined into one plan. Council approved the last deer management plan in Resolution No. 09-130. These plans were the basis for the City's request each spring to the Iowa Natural Resources Commission (NRC) to allow sharp shooting the following winter. Although members of the NRC often comment during the meetings that they want the City to allow recreational bow hunting, a majority of the NRC always approves the City's request to shoot. In addition to the recommendation of killing deer, the long term and annual plans call for educating the public and taking steps to minimize deer/vehicle accidents.

2010

Because the numbers are at a reasonable population level, the Interim City Manager in a letter to the NRC dated May 10, 2010 does not seek authorization to sharp shoot the following winter.

Enc.

Copy w/enc. to:

Eleanor M. Dilkes, City Attorney

Geoff Fruin, City Manager

Kellie K. Fruehling, City Clerk

Jody Matherly, Police Chief

Bill Campbell, Capt. ICPD

Liz Ford, Animal Services Coordinator

SUMMARY REPORT

2010 Deer Management Program

Iowa City, Iowa

by

White Buffalo, Inc.

Site Description

Iowa City contains a matrix of suburban/commercial development, agricultural fields, parks and open grasslands. As a result of no legal hunting opportunities and fertile soils, the deer population had increased to a level incompatible with some land uses and human activities. Although deer physical condition is not an issue, there is concern regarding deer/vehicle collisions and damage to garden and landscape plantings. As part of the 2010 comprehensive deer management program under the authorization of the Iowa Department of Natural Resources this is the 10th year, taking the 2002-2003 winter off, in which a population reduction program was implemented.

Deer Management Program Overview

Prebaiting was conducted from 18 December 2009 – 10 January 2010. Deer removal activities conducted from 11 - 21 January 2010. Eleven days of fieldwork were required to achieve the harvest of 57 deer.

Field Methods

We followed the operations protocol outlined in the contract. Seventeen bait sites were selected throughout the area of operation. Bait sites were shut down during the program as productivity declined, initial prebaiting activity demonstrated little deer activity, or weather conditions deemed the sites inaccessible.

Deer were shot on a first opportunity basis. This means that deer were shot only when, 1) a safe opportunity presented itself, and 2) maximal harvest efficiency would be achieved. Carcasses were then tagged and delivered to Ruzicka's Meats for processing.

Harvest Demographics

The entire data set generated from harvested deer is represented in the spreadsheet entitled "City of Iowa City – Deer Harvest by Date: 11 - 21 January 2010" (Appendix A). We harvested 39 females (68%) and 18 males (32%). The overall harvest demographics are summarized in Table 1. Eighteen (32%) fawns and 39 (68%) adults were harvested.

Table 1. Age class and sex distribution of deer harvested in Iowa City, Iowa from 11–21 January 2010.

AGE	# MALE (%)	# FEMALE (%)	# COMBINED
Fawn	11 (19.3)	7 (12.3)	18
Adult	7 (12.3)	32 (56.1)	39

Harvest by Deer Management Zone

To allow for a more comprehensive population management program, we summarized all the harvest data by management zone (Table 2) relative to deer concentration identified by the City’s 2008 aerial snow count, no count was conducted in 2009. The most productive sites were within Zone D and the combination of Zone H&I, where 22, 7, and 15 deer were removed respectively (77% of the total harvest).

Table 2. Ten year comparison of harvest data by deer management zone.

ZONE	1999-2000	2001	2002	2004	2005	2006	2007	2008	2009*	2010
A	15	2	27	-	-	-	-	-	-	-
B	186	74	48	31	13	19	8	3	6	3
C	57	123	51	49	44	17	13	7	18	6
D	102	122	93	117	48	66	29	33	23	22
F	-	19	10	3	8	7	20	2	4	4
H & I	-	-	21	-	41	41	129	44	18	22
Total	360	340	250	200	154	150	199	89	69	57

Discussion

Three sites initially prepared for culling operations were shut down before removal efforts began based on our inability to access the sites due to the persistent deep and drifting snow. All three sites were located on University of Iowa property. Two additional sites were shut down due to lack of deer activity. Of the remaining 12 sites, all but two received two sharpshooting attempts (removal effort). In every case the second seated attempt resulted in a significant decline in productivity (deer harvested/man hour).

Harvest demographics this year indicate fawn recruitment to be 0.56 fawns per adult doe. This ratio is further confirmed by the limited number of fawns seen in the field (i.e., those not harvested). Many times, adult does harvested in groups would have no fawns present. Historical fawn recruitment based on past cull data was ~1.1 fawns per adult doe. This is the second year in a row where fawn recruitment is significantly below the historical average.

Adult male (males that had shed their antlers) harvest is similar to past years (~12.5%), with the exception of 2009 where 15% more adult males were harvested due to a later start date of operations (i.e. more males had shed their antlers). As stated in previous years, we would likely remove ≤1% adult males if the entire permit were valid starting 1 December.

Thirty six antlered males were observed while field operations were being conducted, additional antlered males were observed though infrared camera data. Individual animals were identified based on antler characteristics, no male was counted twice and if any doubt existed they were not added to the total. If snow counts are conducted, they should be interpreted with caution as, generally, there are a significant number of adult males (relative to adult females) present at most harvest sites. The ratio of observed yearling/adult males to yearling/adult females was ~1:1. Therefore, the population growth

potential relative to observed density will be greatly diminished. Again, next year's harvest projections should reflect this change in demographics.

Recreational feeding of deer on Saint Joseph's Cemetery continues to hamper our ability to manage deer in the Northwest corner of Hickory Hill Park and the surrounding area. Deer densities in this area appear (based on track sign and visual observations) to be significantly higher than the rest of town. The wood lot on the Southeast corner of Interstate Highway 6 and Hawkins Road also has substantial feeding activity from the residents of the Hope House (University of Iowa). Nine percent of the deer/vehicle strikes in town occur proximate to this location.

Deer vehicle strikes are down significantly from 1999 when 103 collisions were recorded. Thirty three collisions were recorded in 2009 (a 68% reduction), with 15 (45%) of those occurring on Highway 218 or Interstate 80, where town boundaries prevent adequate management activities to occur.

Total harvest has dropped significantly from 2007 to 2010. There are a number of reasons for this decline; however it should be noted that our effort per site has increased (at most sites) as deer densities continue to fall. Trend data suggest an overall herd reduction in all zones where culling activity occurs. A good example of this is Zone B, 186 deer were removed in 1999-2000 cull operations, only 3 animals were removed this year with two seated attempts. Harvest in this zone has stabilized in the single digits. Similar results occur in all zones.

Future Program Suggestions

Based on low recruitment over the last two years, dramatically reduced deer vehicle strikes (and corresponding deer densities), and a generally insignificant amount landscape damage we suggest that Iowa City consider delaying any additional deer management activities until winter of 2011-2012. At this time the State permit will again need to be made valid early to maintain the reduced densities on the University property (i.e., during the Christmas break). Also, if the State sees value in protecting males, I recommend that the general City-wide permit be made active by 1 December so males can be avoided (nearly all yearling and adult males will have visible antlers).

Acknowledgments

We would like to thank Kathi Johansen, City Manager's Office, Glenn Pauley, Iowa City Fire Department, Jeff Ruzicka of Ruzicka's Meats and his crew, and all the participating landowners for their cooperation and continued support. We also are grateful to IDNR for continued support of this program.

Iowa City Aerial Deer Counts														
Zone	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
A	37	*	60	74	64	29	76	*	71	*	170	80	*	71
B	69	*	154	81	33	30	30	*	19	*	5	2	*	7
C	78	*	90	99	39	36	60	*	43	*	46	33	*	21
D	65	*	127	140	38	25	100	*	88	*	65	36	*	25
E	0	*	0	7	12	0	12	*	9	*	41	19	*	0
F	11	*	15	48	42	15	74	*	65	*	80	32	*	31
G	3	*	0	4	0	0	0	*	5	*	43	35	*	29
H	6	*	31	48	24	23	42	*	6	*	53	26	*	11
I	49	*	79	197	99	43	169	*	109	*	101	39	*	27
Total	318	0	556	698	351	201	563	0	415	0	604	302	0	222

* Not Flown

Aerial count conducted on February 11, 2010 by Greg Harris, Wildlife Depredation Biologist, Iowa DNR



CITY OF IOWA CITY MEMORANDUM

11-16-17
IP7

Date: November 14, 2017
To: Geoff Fruin, City Manager
From: Liz Ford, Animal Services Supervisor
Re: Urban Wildlife - Deer

Iowa City Animal Services operates as a public safety and enforcement agency for the protection of the public and animals, including wildlife. Our division frequently fields and responds to calls regarding wildlife in our area. For the past three years we have been collecting information and monitoring the urban deer population issues. There are three areas we consider: The number of deer/vehicle accidents, the number of resident generated calls about deer, and the number of deer.

1.) Number of car/deer vehicle accidents in the City of Iowa City

This data has been collected by the police department for several years. The last five years are summarized in the table below. To view accident locations for the most recent two years, refer to the attached maps.

Year	Number of incidents
2013	35
2014	30
2015	31
2016	51
2017	34*

*2017 data is year-to-date as of November 7, 2017

2.) Number and type of resident generated calls to Animal Services regarding deer issues

Below is a summary of the calls by year and nature of each call. This data was not documented prior to late 2015. Other city departments have been advised to refer calls to Animal Services for consolidation.

In 2015 - 3 calls logged (1 regarding plants, 2 generally too many deer)

In 2016 - 14 calls logged (9 regarding plants, 1 sick deer, 4 generally too many deer)

In 2017 - 15 calls logged (6 regarding plants, 1 erosion, 1 dead animal, 1 deer kicked dog, 2 opposed to hunt, 4 generally too many deer)

To view call locations by year, refer to the attached map. Each year is designated by a color.

3.) The number of deer

Historically, the City of Iowa City has paid the Iowa Department of Natural Resources to perform deer surveys using a helicopter. Although budgeted for, these surveys have not occurred in the last several years due to a combination of factors including a lack of resources (lack of DNR staff and lack of appropriate helicopter services) and inadequate survey conditions.

Animal Services will be utilizing White Buffalo Inc. to perform a deer survey by camera in January 2018. This is done by setting up a 100-150-acre grid, placing cameras within the grid, and using a formula to calculate population estimates. White Buffalo Inc. will provide survey results and a recommendation on any further action.

If the survey results indicate that a species reduction program should be considered City staff may recommend one of two options:

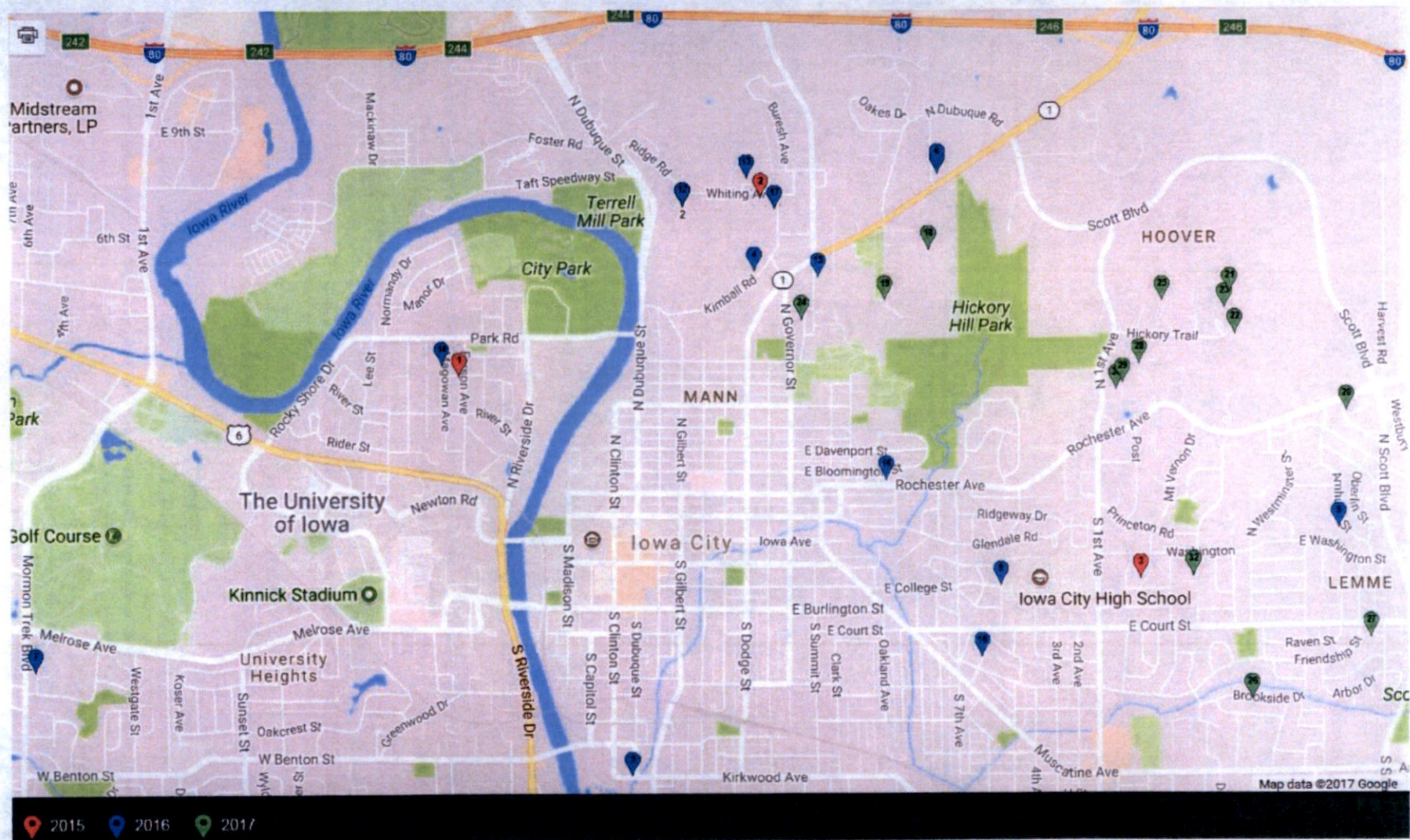
1. A reduction program managed by the City of Iowa City. Other municipalities coordinate such programs with approval from the Iowa DNR. Fire or Police departments are commonly involved due to the risk and weapon danger. These programs are generally labor intensive and would require the city to assign additional resources.
2. A reduction program conducted by private contractor. The City of Iowa City utilized the services of White Buffalo Inc. from 2000 to 2009 for this type of program.

A reduction program can take months and would use a legal lethal method (such as sharpshooting or bow and arrow hunting). The program must consider public safety, community acceptance, and effectiveness in reducing the population to the desired number.

A reduction program must be approved by the Iowa DNR regardless of how the program is arranged or executed. The deadline to submit a request for a program (specifically a managed hunt) to the DNR is April 15th, 2018 if the intent is a fall 2018 hunt. The DNR submits the request to the Wildlife Bureau on the City's behalf and it is subject to approval by the commissioners in June 2018.

Animal Services believes more information is needed including population survey results before recommending a reduction program. We will continue to work with the Iowa DNR and White Buffalo Inc. to that end.

Number of resident generated calls to Animal Services regarding deer issues

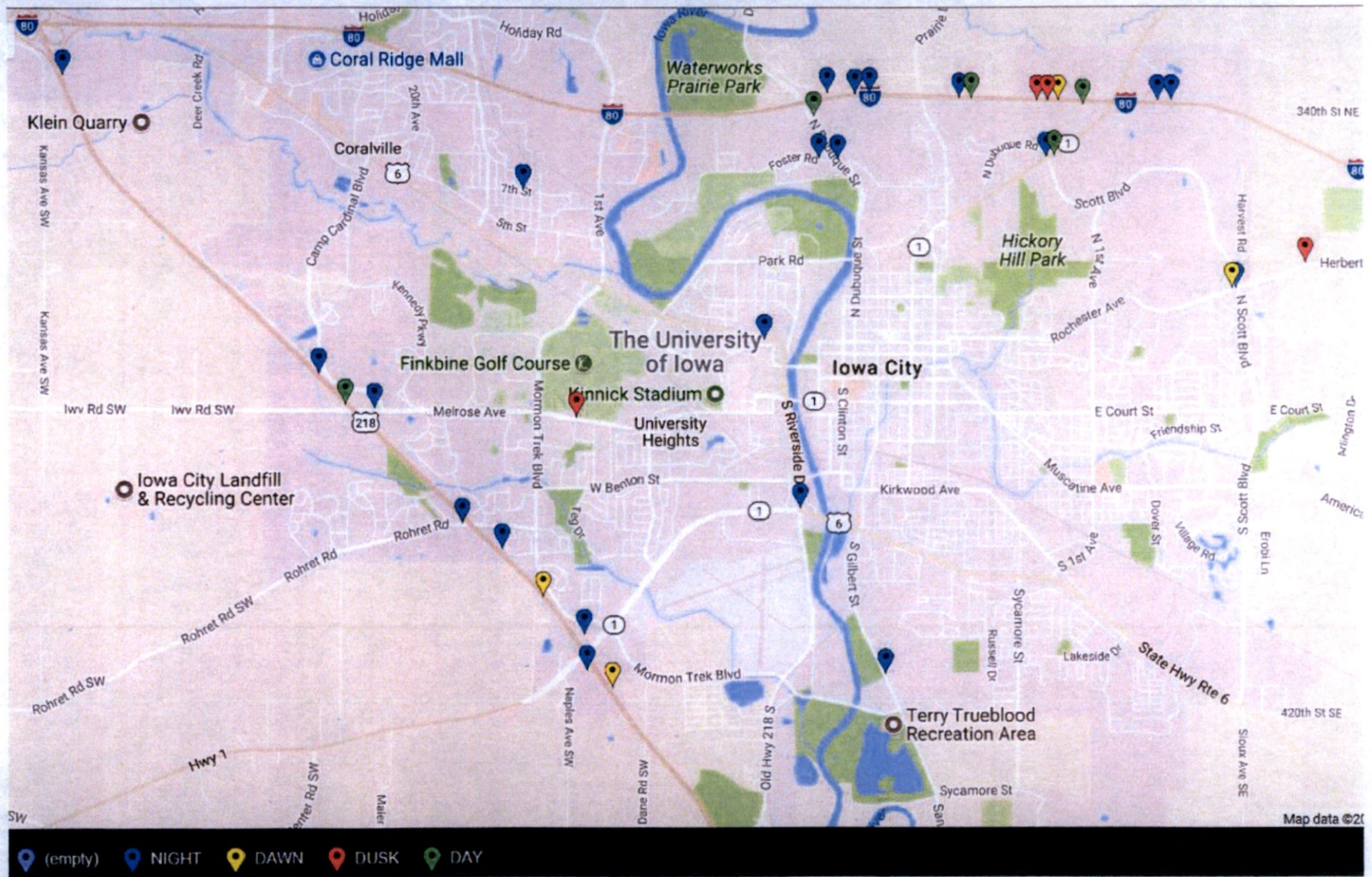


2015: 3 calls logged (1 regarding plants, 2 generally too many deer)

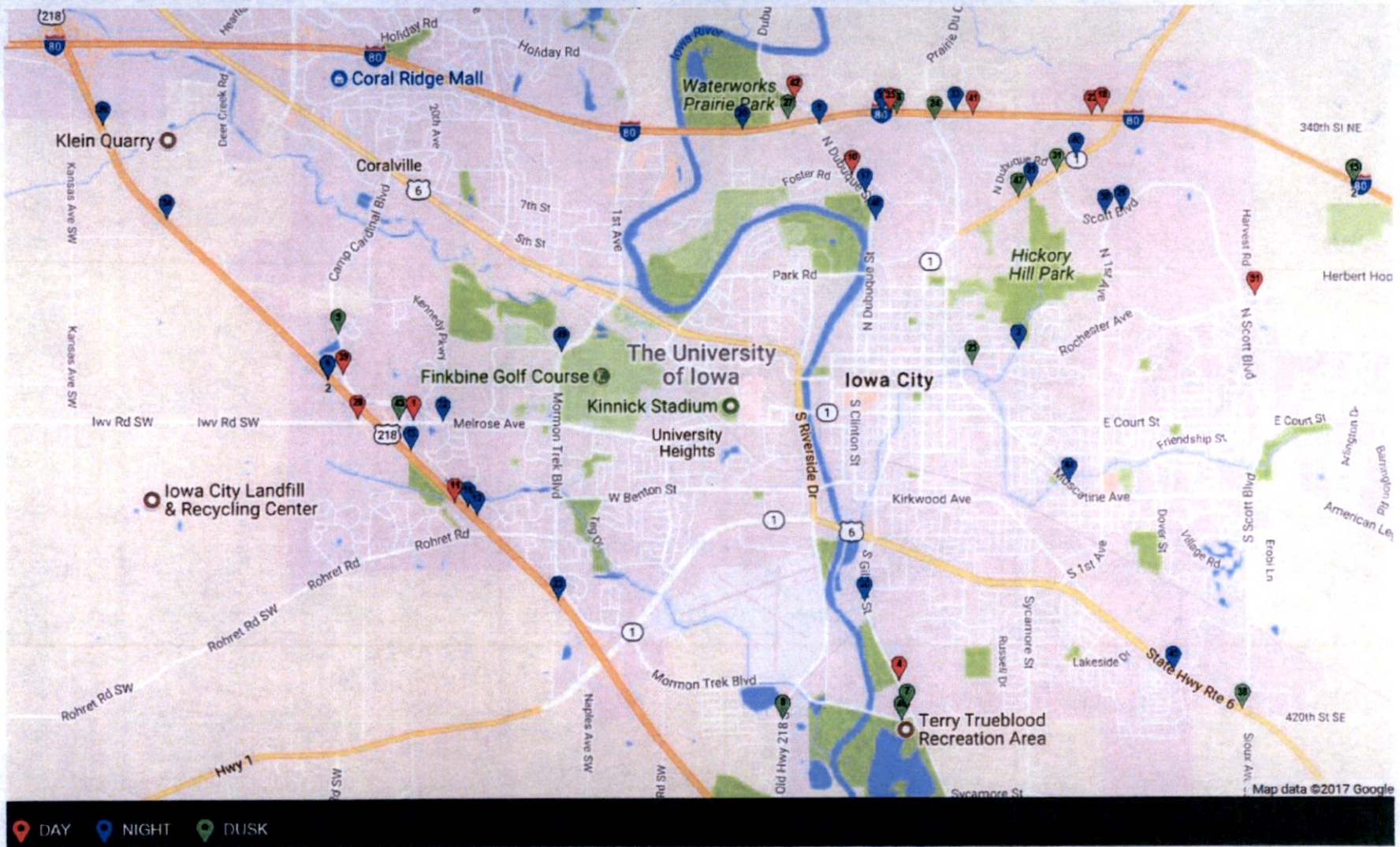
2016: 14 calls logged (9 regarding plants, 1 sick deer, 4 generally too many deer)

2017: 15 calls logged (5 regarding plants, 1 erosion, 1 dead animal, 1 deer kicked dog, 2 opposed to hunt, 3 generally too many deer)

Car/Deer vehicle accidents in the City of Iowa City 2017



Car/Deer vehicle accidents in the City of Iowa City 2016



Total 51



White Buffalo Inc.

Conserving Native Species and Ecosystems

Iowa City
White-Tailed Deer Population Estimate
January 2018

January 30, 2018

Submitted by:

Dr. Anthony J. DeNicola
White Buffalo Inc.



INTRODUCTION

Deer overabundance and the associated conflicts are pervasive throughout much of the US. Alternative management techniques (i.e., controlled hunting, sharpshooting, trap and relocation, fertility control research) have been explored from Georgia to Texas to Minnesota and back through Maine and nearly all the states contained therein. Throughout this large geographic region, deer are creating both social and ecological conflicts in suburban, corporate, and park environments. Many federal, state and local agencies are struggling to address this ever-increasing problem.

Critical to any management decision and research assessment is an understanding of the abundance and distribution of deer, yet it is often difficult to obtain accurate estimates. There are a variety of estimation methods available to decision makers, and each method has its advantages and disadvantages. The techniques typically used to estimate the abundance of white-tailed deer include: spotlight surveys, aerial infrared-scanning or snow counts, mark-recapture/resight, and population reconstruction (Downing 1980). Mark-resight with infrared triggered camera-traps has successfully been used to estimate population size for free-ranging deer with a portion of the population tagged (Curtis et al. 2009). Jacobson et al. (1997) established that individual antler patterns could be used as a unique mark to identify the approximate number of individual antlered males using the survey area. This unique mark and photo ratios could then be used to successfully estimate population size, assuming all sex and age classes are equally susceptible to the camera-trap (Jacobson et al. 1997). Curtis et al. (2009) documented that using IRCs with the Jacobson method provided a reliable method for estimating the abundance of suburban white-tailed deer herds.

STUDY AREA

Iowa City contains a matrix of suburban/commercial development, agricultural fields, parks and open grasslands. As a result of no legal hunting opportunities and fertile soils, the deer population had increased to a level incompatible with some land uses and human activities in the late 1990s. Although deer physical condition was not an issue, there was concern regarding deer/vehicle collisions and damage to garden and landscape plantings. In 2000, a sharpshooting program was initiated that resulted in a significant deer population reduction, and associated deer-vehicle collisions, over a nearly 10 year period. The population reduction program was implemented through 2009 when it was concluded as deer-human conflicts were no longer of concern. This population estimate was requested given the deer population had not been actively managed for 8+ years and appeared to be increasing.



METHODS

Camera Survey

The camera survey was conducted in a ~3-mile² population estimation area (Figure 1). We divided the sampling area into 15 sections by overlaying a grid of approximately 130-acre blocks. We adjusted the grid for the best fit to deer habitat in each block. We deployed one camera per 130-acre block. The infrared-triggered digital cameras (Moultrie D-80 White Flash camera, Moultrie Feeders, Alabaster, AL, USA) were deployed over bait piles of shelled corn on properties with a high probability of deer activity. Camera sites were baited daily for several days prior to, and during camera deployment, starting on 5 December 2017 until the cameras were removed on 16 December 2017. Each camera was elevated approximately 2 ft off the ground, oriented north to control exposure issues, and placed approximately 12 ft from the center of bait. The cameras were set to run continuously for 24 hours per day, with a preset delay of 5 minutes between pictures. Every other day during the survey the memory cards in the cameras were changed to confirm the cameras were functioning properly. On 16 December, the photo survey was completed, and cameras were removed.

Figure 1. Population estimation area and camera locations.



After the cameras were removed from the field, all of the pictures containing deer were sorted by site. Each picture was closely studied, and we recorded the total number of deer, the number of antlered males, the number of non-branched antlered males that could not be uniquely identified, the number of adult females, and the number of fawns. The number of unique males observed at each site was determined using unique antler patterns.



Population Estimate: Jacobson's BDR Method

With the camera data we used the Jacobson buck:doe ratio (BDR) population estimator. As outlined in Jacobson (1997), "individual branch-antlered males were identified from photographs using antler configuration (# of points, relative length of points, angle of projection of points, and relative location of points on the antler beam), antler mass, pelage characteristics and body traits. We then assigned an identifying number to each antlered male. Branch-antlered males were any antlered males with greater than or equal to 1 branched antler. Photographs were excluded from analysis when identification of an animal was uncertain."

Spike-antlered males can be difficult to distinguish individually; therefore, spike:branch-antlered ratios were determined and the estimated total antlered male population was calculated using this ratio:

$$P_s = N_{sa}/N_{ba},$$

where

P_s = ratio of spike:branch-antlered bucks (antlered males),

N_{sa} = total number of spike-antlered deer occurrences in photographs,

N_{ba} = total number of branch-antlered deer occurrences in photographs,

and

$$E_b = (B \times P_s) + B,$$

where

E_b = estimated total buck (antlered male) population,

B = number of individually identified branch-antlered bucks (antlered males)."

The estimated **adult female** population was calculated using the estimated antlered male population and the antlered male:adult female ratio (calculated from the photographs):

$$P_d = N_d/N_b,$$

where

P_d = ratio of does (adult female) : bucks (antlered male),

N_d = total number of antlerless adult deer occurrences in photographs,

N_b = total number of antlered adult deer occurrences in photographs,

and

$$E_d = E_b \times P_d,$$

where

E_d = estimated total doe (adult female) population.

Fawn abundance was calculated in the same manner:

$$P_f = N_f/N_d,$$

where

P_f = ratio fawns: does (adult female),

N_f = total number of fawn occurrences in photographs,



and

$$E_f = E_d \times P_f,$$

where

E_f = estimated total fawn population.

Total population size was estimated by summing each segment of the population. The sex ratio was determined using the ratio of antlered males to adult females in photo observations, where sex ratio = N_d/N_b . The recruitment rate was determined using the ratio of fawns to adult does in photo observations, where recruitment rate = N_f/N_d .

RESULTS/DISCUSSION

Photo summary

We obtained a total of 7,874 usable pictures from the 15 baited camera sites from 5-16 December 2017, which included 10,324 photographic observations of individual deer (Table 1). The total number of branched antlered male images that were identifiable in the pictures was 4,010, the total number of spike antlered male images was 317, the total number of females was 3,050, and the total number of fawns was 2,947 (Table 1).

TABLE 1. Summary of photos observations in Iowa City, IA December 2017.

	Photo Observations				
	# Observations of Deer	# Branched Antlered Males	# Spike Antlered Males*	# Females	# Fawns
Total	10,324	4,010	317	3,050	2,947

*Animal cannot be identified as unique based on antler pattern.

Density Estimate and Recruitment Rate

We estimated the total population in the survey area at 172 (Table 2), and given the area was ~3 mi², the minimum estimated density was 57.5 deer/mile². We estimated the total adult female population at 51 and the total fawn population at 49. This results in a fawn recruitment rate of 1.0.



TABLE 2. Estimated population in sample area using Jacobson BDR method based on photo observation data in Table 1).¹

	A: # Individual Branched Antlered Males ²	B: # Spike Antlered Males ^{1,3}	C: Total Antlered Males	D: Estimated # Adult Females ⁴	E: Estimated # Fawns ⁵	F: Minimum Estimated Total Population
Total	67	5	72	51	49	172

1. If a number is less than 1, we round up to 1, given there is likely a deer in the area. Rounding calculated in separate spreadsheet and numbers may vary slightly due to when rounding is applied.
2. The number of branched antlered males is based on photo capture of these males in camera survey and identification based on unique antler pattern.
3. # Spike Antlered Males (B) = (# Spike Antlered Male Photo Observations (Table 1)/# Branched Antlered Male Photo Observations (Table 1)) * # of Branched Antlered Males (A)
4. # Adult Females (D) = ((# Adult Female Photo Observations (Table 1))/# Antlered Male Photo Observations (Table 1))) * Total Antlered Males (A)
5. # Fawns (E) = (# Fawn Photo Observations (Table 1)/# Adult Female Photo Observations (Table 1)) * Total Adult Females (D)

Camera Survey Bias Adjustments and Sex/Age Class Ratio Ranges

There are potential sex and seasonal biases in attracting deer to bait relative to their occurrence in the population (Koerth and Kroll 2000, McCoy et al. 2011, Chitwood et al. 2017). The type of bias varies for any number of reasons, including food availability, breeding season, fawning period, and ratio of males to females. Given the unlikely ratio of antlered males:adult females:fawns in photos (~1.4:1:1), we believe the population estimate is an absolute minimum. In other words, females and fawns may be underrepresented as antlered males can dominate baited locations (especially after the breeding season while males still have their antlers) limiting the number of photos of females and fawns comparatively.

Typical suburban deer populations have been documented to be 20% antlered males (DeNicola et al. 2008). We believe the percentage of males in Iowa City is higher than the DeNicola et al. (2008) study, but likely not as high as the 42% observed in photos. We have documented approximately 30% antlered males in local populations at other project locations with male mortality rates that may be similar to those in Iowa City (e.g., our research site in Cincinnati, OH had 31.4% antlered males and San Jose, CA had 30% antlered males). **If we adjust the ratio of antlered males to 30% this would increase the population estimate to 80 deer/mile², or 240 deer in the area surveyed.**

The Iowa DNR counted 69 deer in 2008 in the same area of Iowa City. They used helicopter counts over snow. Therefore, there are likely 3 times as many deer now in the survey area as there were ~10 years ago. This reflects a density similar to what was present when we initiated the sharpshooting program in 2000.



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