CITY OF IOWA CITY
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October 23, 2018

Natural Resource Commission
Henry Wallace Building
502 E. 9th St.
Des Moines, IA 50309

In re: November 8, 2018 Business Meeting
Urban Deer Management Zone—Special Harvest/Request to Sharp Shoot Deer

Dear Commissioners:

Thank you for the placing this request by the City of Iowa City on the agenda of your November 8, 2018 business meeting. The following City staff will be appearing at your meeting: Captain Bill Campbell of the Iowa City Police Department and Assistant City Attorney Sue Dulek.

Earlier Request.
After listening to your comments and those of Dr. Garner at the May 2018 meeting, City staff took a variety of actions. First, a web page was created to provide the public with information on deer management. Here is a link to the web page-- https://www.icgov.org/project/deer-population-management-project. Second, a committee was formed consisting of City residents and staff. Third, the committee hosted a public forum on deer management on August 14. The forum was recorded and is available on the City's website. Fourth, the deer committee issued a memo to the City Council, which the Council discussed at its work session meeting on October 2 (copy is attached as Exhibit A). The City Council directed staff to make a second request to sharp shoot this upcoming winter.

Request.
Pursuant to 571 Iowa Admin. Code 105.5, the City of Iowa City (the City) is requesting NRC approval of an urban deer management zone during the winter of 2018-2019. Additionally, the City is requesting that the special harvest be conducted under the following conditions:

1. The deer management area is defined as all public and private land within the corporate limits as designated by the City Council. Property owners will need to provide the City with permission.
2. The number of deer to be killed will not bring the deer to a density of less than 25 deer per square mile.
3. The deer management program will be conducted solely by professional wildlife biologists trained as sharp shooters.
4. Bait may be used to attract deer to select sharpshooting locations. (The City understands that bait is an issue to many but this is not a recreational hunt.) As recommended by Dr. Garner, all baiting will be discontinued immediately and all remaining bait shall be removed if a CWD positive test result is confirmed. If no

CWD positive test result is confirmed, all bait will be removed at the end of the sharp shooting effort.

5. The deer carcasses will be individually identified (i.e., tagged) and transported whole (i.e., not field dressed) to a locker. All deer ages 1 year and older will be frozen and tested for chronic waste disease (CWD) and held in individual containers until CWD test results are known. The City and the IDNR will enter into a contract for CWD testing and all costs borne by the City. The contract will contain further testing details.
6. After receiving a "not detected" CWD test result, all deer meat will be distributed free of charge at the Crisis Center that operates our local food bank. If there is a positive CWD test, the carcass will be properly disposed of.
7. All antlers will be sawed off above the pedicle and turned over to the DNR. The locker will keep the hides.
8. Deer sharp shooting activities may occur from December 1, 2018 through March 31, 2019.

Previous NRC Action/Historical Background.

The City began its deer management just over twenty (20) years ago with discussions in 1996 with the DNR. As recommended by the DNR, the City formed a committee in 1997 to determine the best methods for the City to manage the deer population consisting of representatives of a variety of groups, such as a resident living in areas heavily populated with deer, resident in areas not heavily populated with deer, animal rights, science/biology background, and Iowa Wildlife Federation. After spending 5 months deciding whether to reduce the number of deer and how to do so, the committee recommended to City Council reduction by sharp shooting and trap and kill, but not bow hunting. The NRC approved the request to sharp shoot, and the City entered into a contract with the U.S. Department of Agriculture (USDA) to sharp shoot, but in February 1999, a lawsuit was filed against the USDA alleging a violation of the National Environmental Policy Act. The Court entered a temporary restraining order which terminated the sharpshooting that spring and ended the City's relationship with the USDA.

Beginning the following winter of 1999-2000 and continuing annually through 2009-2010 (with the exception of the winter of 2002-2003), the City contracted with White Buffalo, Inc. to sharp shoot. In each of those winters the City applied for authorization from the NRC to shoot, and in each year, the NRC granted the application.

Because the numbers of deer were at a reasonable population level, the City notified the NRC in May 2010 that it was not seeking authorization to sharp shoot the following winter. The City's Deer Task Force was also dissolved that spring.

For your information, attached as Exhibit B is a copy of the report by White Buffalo, Inc. from the operation of the winter of 2009-2010, which includes a summary of the number of deer harvested in each of the winters the City engaged White Buffalo, Inc.

Current Deer Population.

Unfortunately, the deer population in the City has grown since 2010 and has returned to the level of twenty (20) years ago. I am attaching as Exhibit C a copy of the report by White Buffalo, Inc. entitled "Iowa City White-Tailed Deer Population Estimate January 2018."

White Buffalo, Inc.
White Buffalo, Inc. is a nonprofit organization with considerable experienced in deer management in urban and suburban settings by means of professional sharpshooting. Its web site is https://www.whitebuffaloinc.org/ As I said earlier, the City contracted with White Buffalo, Inc. for 10 years without incident and will do so again this year if the NRC approves this request. I am attaching as Exhibit D the sharpshooting protocol employed by White Buffalo, Inc.

Bow Hunting.
I know that some commissioners stated at the May meeting that they wanted to see the City offer bow hunting as an option to manage the deer within the City limits. I also understand that bow hunting is successful in many communities. The current City Council, as did previous Councils, prefers to manage the deer population in Iowa City by means of sharp shooting. Additionally, bow hunting will not kill enough deer to bring the numbers down to the number acceptable to City residents. As we did previously, the City will contract with a local locker to package and freeze all the deer meat to be distributed free of charge at the Crisis Center that operates our local food bank.

Conclusion.
City staff looks forward to the opportunity to meet with you, answer your questions, and address your concerns. If you find that you need additional information, we will provide that to you either in writing and/or in person. If authorization to proceed with sharp shooting is approved, I will provide the NRC with a report next spring summarizing the operation.

Thank you very much for your time and consideration.

Sincerely,

Geoff Fruin
City Manager

Enc.

Copies w/enc. to:

Jody Matherly, Chief of Police
Bill Campbell, Capt. Iowa City Police Dept.
Susan Dulek, Ass't. City Attorney

MEMORANDUM

TO: CITY COUNCIL

FROM: DEER COMMITTEE

RE: PUBLIC FORUM - DEER MANAGEMENT

DATE: 9/26/18

As requested in the March 6, 2018, City Council work session and suggested by the Iowa Natural Resource Commission (NRC), a committee was formed to discuss possible approaches for Iowa City's deer population management.

This committee was made up of the following five City staff members and five community members:

City Staff	Community Members
Bill Campbell – Police	Brian Mildenstein
Derek Frank – Police	Jan Ashman
Sue Dulek – City Attorney's Office	Ana Arnold
Juli Seydell Johnson – Parks and Recreation	Laura Goddard
Liz Ford – Animal Control	Erin Irish

The initial committee meeting was held on July 30, 2018, and included an in-depth discussion about past culling efforts in Iowa City, differing opinions on possible methods, and organizing a public forum to gauge community opinions on the need to reduce the deer population as well as methods to accomplish this, including sharpshooting and bow hunting.

Following that meeting, a page was created on the City website with information that included the Council work session transcript, the letter to the NRC from City Manager Geoff Fruin asking for special permission for a special harvest, and exhibits with historical and updated information about the deer count in Iowa City. The page also included details about the public forum that was to be held on August 14, 2018. For those not able to attend the forum, an email address was made available to allow for opinions to be submitted to the committee. Information about the forum was also distributed via various social media outlets.

Approximately 60 people attended the public forum, which included Tony DeNicola of White Buffalo, Inc., who presented data on the city's current deer count. He also offered information about his experience sharpshooting deer in Iowa City, and answered questions from several attendees, committee members, and residents.

A wide range of opinions were expressed at the public forum and via email submissions. Suggestions included, but are not limited to; not influencing the deer population at all, exploring and adopting non-violent methods of control, allowing bow-hunting, and hiring a professional service to reduce the numbers through a sharpshooting approach. There were many points brought up but not thoroughly considered due to time limitations. These include the amount of land developed in the Iowa City area since the last period of annual culling and how that affects deer distribution as well as control strategies,

the effects of deer overpopulation on home gardens/local food production and on the natural areas surrounding Iowa City, the costs of sharpshooting compared to bow hunting as well as practical considerations of how long and where in the city each could be deployed.

This forum is available to view online on the City's website and YouTube.

The committee met again on August 28, 2018, and discussed the forum. While exact numbers were not collected the night of the forum, it is the committee's conclusion that most of the comments and opinions expressed favored acting soon to control the deer population. Dr. DeNicola made a strong case for a sharpshooting approach: the majority of those who favored control found his presentation persuasive.

In addition, the Committee received emails (including from some who also spoke at the forum) that largely urged non-lethal action to address deer management.

The committee members understand that deer population management is a complex subject with multiple aspects to consider. We suggest as the Council moves forward with this consideration, that they routinely revisit Iowa City's need for deer population management and continue to explore all available options to keep the numbers at an acceptable and sustainable level for Iowa City residents.

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	36	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

2009 Deer-Vehicle Accidents (Page 1)

ID	Date	Time	Accident Location	Reflector #	Accident Report Filed	Victim's Town of Residency	Property Damage	# Vehicles Involved	# Deer Seen	# Deer Hit	Conditions: Day	Night	Dusk	Dawn	Clear	Fog	Ice	Overcast	Rain	Snow	Speed	Driver Age: 14-21	22-40	41-65	66+	Human Injury: None	Minor	Major	Result to Deer: Ran Away (Unk. Injury)	Killed by Impact	Shot by Officer	Miscellaneous Comments
1	Jan 18	5:45pm	100 N Scott Blvd		Y	Iowa City	$2,000	1	1	1		X									30			X		X				X		600 ft north of Rochester St
2	Jan 20	12:14am	Hwy 218 (mm 91)		N	Coralville		1	1	1		X									55		X			X			X			minor damage; declined report; just south of Hwy 1 Interchange
3	Feb 08	7:00pm	2600 S Gilbert St		Y	Iowa City	$1,200	1	1	1		X									45			X		X			X			just south of Napoleon Ln
4	Feb 20	8:35am	2100 Act Circle		N				1	1	X							X			25					X			?			deer carcass on road
5	Mar 07	12:21pm	I-80 (mm 249)		N			1	1	1	X										55					X			X			deer carcass on road near eastbound off-ramp
6	Mar 19	11:21pm	2200 S Riverside Dr		N			1	1	1		X									45					X			X			deer carcass on road
7	Mar 21	9:59pm	1500 Rochester St		Y	West Branch	$400	1	1	1		X			X						25			X		X				X		
8	Mar 29	4:35pm	1000 Hwy 6 W		Y	Iowa City	$2,000	1	1	1	X							X			35		X			X					X	near Newton St intersection
9	Apr 18	2:23pm	Hwy 218 (mm 91)		Y	Ladora	$2,000	1	1	1	X							X			55			X		X				X		within Hwy 1 Interchange
10	May 12	5:00am	I-80 (mm 244)		Y	Iowa City	$3,500	1	1	1		X		X							55		X			X		X				unknown injury to deer (driver did not stop at scene)
11	May 14	2:42am	Hwy 218 (mm 93)		N			1	1	1		X									65					X			X			deer carcass on road
12	May 30	1:30pm	1100 Hwy 6 W		Y	Coralville	$500	1	1	1	X							X			35		X			X			X			deer carcass on road just east of Rocky Shore Dr;
13	Jun 01	5:10pm	Hwy 218 (mm 92)		Y	North Liberty	$2,000	1	1	1			X					X			55			X		X		X				unknown injury to deer (driver did not stop at scene)
14	Jun 03	3:55am	Hwy 218 (mm 92)		N			1	1	1		X						X			65					X			X			deer carcass on road 1/2 mile north of Hwy 1
15	Jun 06	9:00pm	600 Mormon Trek Blvd		Y	Iowa City	$1,800	1	1	1			X								35		X			X		X				unknown injury to deer (driver did not stop at scene); south of Hawkeye Park Rd
16	Jun 09	7:28am	I-80 (mm 249)		Y	Iowa City	$2,000	1	1	1	X				X						65				X	X			X			within Dodge St Interchange
17	Jun 14	7:49am	100 Camp Cardinal Rd		N			1	1	1	X										25					X			X			deer carcass on road
18	Aug 05	6:41am	1100 N Dubuque St		Y	Iowa City	$2,500	1	1	1				X	X						35		X			X				X		
19	Aug 30	12:03am	1100 Hwy 6 W		N			1	1	1		X									55					X			X			deer carcass on road just west of Rocky Shore Dr
20	Sep 15	9:09am	600 Mormon Trek Blvd		N			1	1	1		X		X		X					55					X			X			deer carcass on road just south of Hawkeye Park Rd
21	Oct 04	4:09am	I-80 (mm 249)		Y	West Liberty	$2,500	1	1	1		X						X			65			X		X			X			immediately west of Dodge St Interchange
22	Oct 07	7:55pm	1100 N Dubuque St		N			1	1	1		X									35					X			X			uncertain whether vehicle struck live deer or carcass
23	Oct 12	10:28pm	2100 N Dubuque St		N			1	1	1		X									35					X			X			deer carcass on road just south I-80 interchange
24	Oct 22	4:38am	I-80 (mm 244)		Y	Bungawa, VA	$5,000	1	1	1		X							X		65			X		X			X		
25	Nov 02	9:09pm	Hwy 218 (mm 91)		Y	Quincy, IL	$1,000	1	1	1		X			X						55			X		X		X				southbound on-ramp from Hwy 1
26	Nov 06	5:31pm	2100 S Riverside Dr		Y	Buffalo Center	$1,001	1	1	1		X			X						30		X			X		X				just north of Mormon Trek Blvd
27	Nov 06	10:43pm	I-80 (mm 244)		N			1	1	1		X									65					X			X			deer carcass on eastbound on-ramp from Dubuque St
28	Nov 06	7:51pm	I-80 (mm 249)		Y	Lake Bluff, IL	$80	2	1	1		X			X						65			X		X			X			truck struck deer without stopping; deer then hit by 2nd vehicle
29	Nov 09	6:12pm	Hwy 218 (mm 93)		Y	Decorah*	$7,000	2	1	1		X			X						55		X	X		X		X				*2nd driver from Mapleton, MN; deer struck by car then truck
30	Nov 19	4:00pm	Hwy 218 (mm 91)		Y	Washington	$1,900	1	1	1			X					X			65			X		X		X				southbound on-ramp from Hwy 1
31	Nov 25	6:00am	2100 N Dubuque St		Y	Iowa City	$2,000	1	1	1				X	X						35			X		X				X		immediately south of I-80 overpass
32	Dec 01	11:14pm	3000 S Gilbert St		Y	Marion	$2,500	1	1	1		X			X						35			X		X				X		just south of McCollister Blvd
33	Dec 02	12:07am	3400 N Scott Blvd		Y	North Liberty	$3,800	1	1	1		X			X						35			X		X		X				just east of 1st Av
34																																
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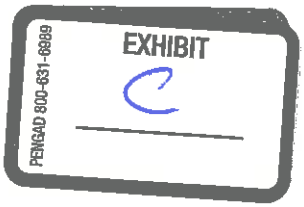

White Buffalo Inc.
Conserving Native Species and Ecosystems

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-mile^2 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_a/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 mi^2, the minimum estimated density was 57.5 deer/mile^2. 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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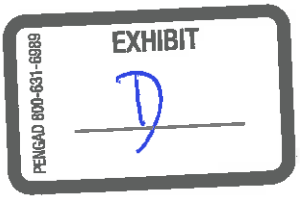
White Buffalo Inc.
Conserving Native Species and Ecosystems



SHARPSHOOTING PROTOCOL

Subsequent to a decision by the landowner/s and the state wildlife management agency to implement a controlled deer reduction using White Buffalo Inc., the following procedures are used:

1) **Prior to initiating any field activities the target area/s and surrounding properties are thoroughly surveyed using digital aerial images followed by field confirmation. By knowing the location of every occupied structure and areas of human use we are better able to work safely, discretely, and efficiently;**

2) **Bait sites are selected with the involvement of the landowner/s and the cooperating state agency. Each site is selected based on safety concerns and deer activity;**

3) **We conduct field operations during hours of lowest human activity. In addition, during the removal operation we search intensively for people and non-target animals to avoid mishaps;**

4) **Deer of all ages and sexes are harvested, however, adult does are prioritized. Deer are shot from a vehicle with a rifle during the night with the aid of spotlights. Some deer are shot over bait from a tree stand with a rifle during the day or at night. Night-vision equipment and suppressed firearms (only in states where they are legal to possess) are used to expedite field procedures and to ensure discrete operations;**

5) **During suburban deer reductions there will be continuous open communication between community members, municipality officials, and White Buffalo Inc. to keep people well informed regarding field activities to avoid conflicts;**

6) **When in doubt, never shoot;**

7) **All deer carcasses are transported and dressed with the highest degree of discretion;**

8) **When desired, we are willing to be responsible for the disposal of all by-products and transport of deer carcasses to a USDA inspected facility for processing and subsequent donation to the needy.**