

USING SCENT LURES AND CAMERA TRAPS TO DETECT THE PRESENCE AND SCENT
CHOICES OF MESOCARNIVORES IN URBAN PARKS

by

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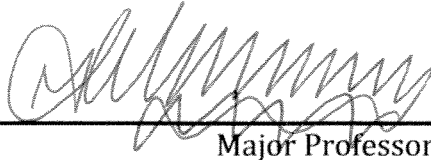
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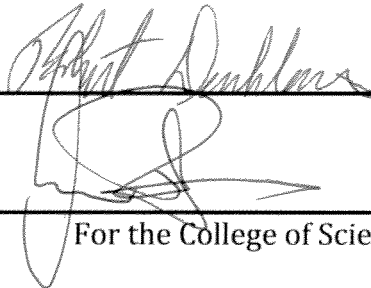
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Introduction

As urban populations continue to increase and cities continue to sprawl, fragments of urban green space become progressively more important as habitat for wildlife (Ordeñana et al. 2010; Crooks 2002). Urban green space can occur in many forms, but city parks are one of the most common kinds and can provide valuable habitat space and travel corridors for urban mammals such as raccoons (*Procyon lotor*), opossums (*Didelphis virginiana*), coyotes (*Canis latrans*), and bobcats (*Lynx rufus*) (Curtis and Hadidian 2010; Ordeñana et al. 2010; Crooks 2002). Urban carnivores can serve as indicators of the overall health of urban ecosystems because of their role near the top of most food webs, but varying public perceptions of carnivores can also mean they are sources of human-wildlife conflicts, especially when they occur in widely used public spaces such as parks (Crooks et al. 2010; Curtis and Hadidian 2010). Knowledge of potential sources of human-wildlife conflict can reduce the potential for it by allowing resource managers to educate citizens about living with the species that occur in their local neighborhoods and parks while also managing urban green spaces with wildlife habitat needs in mind (Curtis and Hadidian 2010).

The primary objectives of this study were to use motion-activated cameras and scent lures to assess the presence of mesocarnivore species in Fort Worth's city parks and to determine which scent lures were most effective at attracting the various species. The methods used in his study were intended to be cost effective and easily replicable for future urban studies. The methods and results of this study can serve as a guide for future urban mammal studies, which will be important for making

management decisions, educating citizens, and minimizing conflicts between urban growth and wildlife communities.

Originally this study was intended only to assess the population of free-ranging cats (*Felis catus*) in Fort Worth's city parks. The city is in the process of passing legislation regarding the legalization of trap-neuter-release colonies, and as other studies have shown (Schmidt et al. 2007; Levy and Crawford 2004), it is important to know the size of a local free-ranging cat population before trying to reduce its numbers. Free-ranging cats are known to be prevalent around the city, with animal control officials taking in about 5,000 cats per year, most of which are euthanized (Hanna 2011). Since free-ranging cats are thought to consume billions of small mammals and millions of birds each year in the U.S. (Coleman et al. 1997; Hatley 2003; Marks and Duncan 2009), it would seem likely that these wild predators would thrive in habitat spaces such as city parks along with other carnivores. Overtime this study evolved a broader focus on techniques for detecting the presence of cats and other mesocarnivores with cameras and determining which scent lures were most attractive to each species. Fieldwork for this study was completed from August through December of 2012.

Studies of this type have been done in the past both on a broad range of species (Andelt and Woolley 1996) and on free-ranging cats specifically (Clapperton et al. 1994). However, past studies have not focused specifically on urban mammals or in city parks. The methodological techniques used in this study could be easily replicated in other urban areas, and the results found regarding scent lures could help future urban mammal studies become more species specific.

Methods

Study Area

This study focused on public parks within the city of Fort Worth, which is located on the west side of the Dallas-Fort Worth metroplex in the cross timbers and prairies ecological region of north-central Texas (Texas Parks and Wildlife Department [TPWD] 2013). Fort Worth encompasses a land area of approximately 350 square miles and has a population of over 750,000 people (City of Fort Worth 2013a). Within the city limits there are over 200 city parks of various sizes and habitat types, and 24 of these were used as study sites (City of Fort Worth 2013b). Parks were selected so that those being used at the same time were within the same operating district of the city. Within each operating district (Central, North, South, East, and West), parks were then chosen based on the availability of tree coverage away from high traffic areas such as pools and playgrounds and the lack of major obstacles such as construction projects or temporary closures to public access. The selected study sites contained a variety of habitats from well-manicured lawns to more natural woods and riparian habitats. Study sites were also located within diverse areas of the city ranging from residential and commercial areas to remnant green spaces along riverbanks (Figure 1). See Appendix I for a complete list of study sites and the GPS locations of individual camera-scent stations within each site.



Figure 1. Map of Study Sites.

Data Collection

A total of 15 RECONYX Silent Image RM30 cameras (Reconyx, Holmen, Wisconsin) were used to collect data for this study. For security purposes, the cameras were contained within welded angle iron cages and padlocked to trees with 3/16-inch steel cable after being mounted in place with zip ties (Figure 2). Cameras were mounted an average of 1.5-2 feet high on tree trunks and were programmed to take three photographs 0.5 seconds apart when activated to maximize photographs available to identify individual free roaming cats and dogs (Grompper et al. 2006; Heggin et al. 2004).



Figure 2. Photograph showing the security measures used with each camera.

Combining motion-activated cameras with scent stations has had various levels of success with mammals in the past (Harrison et al. 2002; Hegglin et al. 2004; Kays and DeWan 2004; Long et al. 2003). Traditional scent stations involve the use an olfactory lure (scented object placed on a stake or pedestal) surrounded by sandy soil or some other means of collecting the tracks of the animals that approach the scent lure (Schiller and Horn 1997). Since this method does not allow for identifying individual animals and can often lead to overestimation of populations based on track counts (Sargeant et al. 2003), in recent years studies have used cameras to monitor scent stations. This method has been used on various carnivore species and was found to be more successful than physical trapping or spotlight surveys with endangered swift foxes (*Vulpes velox*) in New Mexico (Harrison et al. 2002). Cameras and scent stations were

also used successfully to detect fox species in Switzerland (Hegglin et al. 2004) and house cats in a U.S. nature preserve (Kays and DeWan 2004). While cameras and scent stations were unsuccessful methods for monitoring elusive mountain lions (*Puma concolor*) (Long et al. 2003), in a comparison of noninvasive carnivore survey techniques, Gompper et al. (2006) found that midsized carnivores such as raccoons, opossums, and free-ranging cats were well detected by cameras as well as scent stations. Since midsized mammals were expected to make up the majority of local urban park wildlife populations, I decided to assess this technique for this study.

Five cameras were used at each study site, with each camera being paired with a different type of scent. Camera arrays at each park were set to operate for a total of 14 trap nights (TN; a single 24-hour trapping period) at each of the 24 study sites, yielding a total of 336 TN for this study. At each study site a primary location was chosen to avoid high human traffic areas such as around playgrounds, tennis courts, or swimming pools, when possible. Within the selected location, cameras were placed 30-40 yards apart to allow animals equal opportunity to encounter each scent. This placement created a lack of independence between each camera, but it could not be avoided given the small total area of some parks. For this reason, each park as a whole rather than each camera was used to determine the total TN, and only the total sightings of most species could be determined rather than counts of individuals. Given the variable sizes of the study sites and the variable presence of trees within each park, uniform transects (Andelt and Woolley 1996) or circular placement patterns (Kays and DeWan 2004) were not possible for the cameras and scent stations (Figure 3).



Figure 3. Camera placement at Lake Como Park (left) and Linwood Park (right).

Scent lures were placed an average of 6-7 feet in front of the cameras. Each scent lure was comprised of a plastic specimen cup (Dynarex, Orangeburg, NY) screwed onto a 12-inch tall wooden stake (Figure 4). Scent cups had holes drilled around the sides at various heights as well as in the lid. This allowed the scents to serve as lures rather than baits, because it prevented animals from consuming the materials. A 24-inch tall wooden stake marked with one-inch increments was placed next to each scent post for use as a height-reference when trying to distinguish between animals.



Figure 4. Photograph from Cobb Park site showing arrangement of scent lures, height post, and camera.

A control (water) was used as well as the four different scents: used cat litter, liquid catnip extract (HoneyCombs Industries, Montrose, CO), a mixture of Hawbaker's Wildcat 1 and 2 (Hawbaker and Sons, Fort Loudon, PA), and sardines. These four lures covered all scent categories described by Clapperton et al. (1994) for use with free-ranging cats: food odors (sardines), social odors (used litter), synthetic odors (Hawbaker's wildcat lures), and plant-derived odors (catnip oil). Used litter and sardines were placed directly into the plastic cups, while the two liquid scents, catnip oil and Hawbaker's, were poured over cotton balls. For the purpose of keeping all scent lures uniform throughout the study, used litter was obtained from a single male cat, and the same natural, unscented Arm and Hammer Essentials litter (Church and Dwight Co., Inc, Princeton, NJ) was used throughout the duration of the study.

Cameras and scents were placed at study sites on Sunday of the first week and were checked at least once during the week to ensure cameras were not tampered with and scents remained in place. After the first week, photos were collected from each camera and scents were refreshed or replaced, in the case of sardines, to avoid rotting. Photographs were then analyzed and captures were catalogued for each study site according to scent. At the end of each two-week period, cameras and scents were moved to the next set of study sites.

Analysis

I totaled the number of times each species was seen at each park. Any independent sighting of an animal was counted, meaning that prolonged observations in which an animal remained in front of the camera were still counted as only one sighting. Based on the actions of animals observed in the photographs, I was also able to determine the total number of times each species actively investigated or interacted with the scents by sniffing it, trying to open the specimen cups, urinating on the scent posts, etc. (Figure 5).



Figure 5. Photographs showing an opossum investigating a scent versus a gray fox captured only in passing at Harmon Field and Forest Park sites, respectively.

For free-ranging cats and domestic dogs the total number of unique individuals was determined using the guidelines described by Heilbrun et al. (2003) for determining when an individual had been recaptured on camera. As has been done with jaguars (*Panthera onca*) and bobcats, unique features such as pelage patterns, scars, or manmade features (collars, clipped ears, etc.) were looked for to uniquely indentify each animal (Figure 6; Silver et al. 2004; Heilbrun et al. 2003; Heilbrun et al. 2006). However, based on the low number of cats observed (N=61 total for all sites), mark-recapture estimators and catch per unit effort calculations were not possible.



Figure 6. Photographs of 2 individual cats showing similar coat patterns. The cat on the left is distinguished from the cat on the right by the amount of white fur on each front leg and the back right leg.

For each species I was able to determine what percent of the total sightings showed the animals actually investigating one of the scents rather than being caught (photographed) only in passing. A sighting was considered any time an animal was seen in a photograph and could be identified to the species level. Similarly, I was able to determine on what percent of the total TN (n= 336) each species was observed (observed TN/total TN), and this percentage was used to determine the relative abundance status of each species (Table 1). Relative species abundance was determined

based on the percent of total TN on which a species was observed at any scent station at least once, with observation on over 45% of trap nights being considered abundant, between 10% and 45% of trap nights being considered common, and below 10% of trap nights being considered uncommon. This ranking system is loosely based on Dickins et al.'s (1999) ranking of species with in an urban park where observation on over 75% of TN was considered abundant, on 25-75% of TN was common, and on under 25% was rare. This modified system is based on knowledge of local species and is intended only to apply to city parks. Abundance classes are elevated relative to the Dickins et al. (1999) ranking because only one method (camera traps) was used to observe species while Dickins et al. employed six different methods to observe mammals in a single park. Most urban species also utilize lawns, empty buildings, undeveloped land, etc. and their populations would therefore likely receive a higher overall ranking across an entire city than they do in parks alone. For the purposes of only considering free-roaming or wild species, dog observations were only considered when animals were not on leashes or with a discernable owner.

To determine which scents were most attractive to each species, one-sample t-tests were done based on the difference of means for how many times a species investigated each scent compared to the control. For each species the mean number of investigations at each scent lure (Table 2) was subtracted from the mean number of investigations at the control to create a new variable. This difference of means was used to normalize the data because there was a high amount of skew in the frequency distributions of scent investigations at an individual level for each species. This normalization allowed the data to meet all of the assumptions for a t-test. All of the data

coding and calculations for the t-test were done using the program SPSS © .The t-tests yielded significance values (p-values) that could be used to determine at what level each species' choice of the different lures is significantly different than their choice of the control.

Pearson's *r* was used to determine whether there was a correlation between the amount of vegetation surrounding a scent and whether or not each species investigated the lure. Each scent location was categorized as either open (there was no vegetative cover other than short grasses/forbs around the scent lure) or brushy (brush at least 12 inches tall occurred within an 3 foot radius of the camera and scent post; Figure 7). This categorization can be seen for all study sites in Appendix I. I used this correlation to determine if species were more likely to investigate the scents if they were surrounded by vegetation than if scents were placed in wide-open locations. This same correlation was also used to determine if the total acreage of a park was related with increased observed species richness.



Figure 7. Photographs from S.Z. Boaz Park demonstrating an “open” site versus a “brushy” site.

Results

A total of 14 species of mammals were observed throughout this study (Table 1). Since the data did not yield itself to determining specific population estimates, a relative abundance status was determined for each species based on the classification system model used for urban mammals by Dickins et al. (1999), and this is also shown in Table 1. Based on the developed park classification system, two of the observed species were considered abundant, (fox squirrels (*Sciurus niger.*) and raccoons), and cats, opossums, dogs (*Canis lupus familiaris*), gray foxes, and rabbits were considered common. Only domestic cats and dogs were uniquely identified, and a total of 61 and 162 individuals, respectively, were found (Appendices III and IV). All other species were only quantified in terms of total observations.

Table 1 also shows the relative number of active investigations of the scent lures by species. I found that 8 species investigated the scents on multiple occasions (Figure 8). Four of the observed species (armadillo (*Dasypus novemcinctus*), striped skunk (*Mephitis mephitis*), mice (*Muridae* spp.), and beaver (*Castor Canadensis*)) were never captured investigating any of the scent lures, and bobcats and deer (*Odocoileus virginianus*) were only observed investigating lures at one site each. Only dogs were captured investigating the lures more than one third of the times they were observed (43.182%). Raccoons and opossums both investigated the lures on almost a third of their total sightings (32.994% and 32.353%, respectively). The original target species, free-ranging cats, only investigated the scent lures 20.118% of the times they were observed by the cameras. Based on counts alone (Table 1), raccoons investigated the lures more often than any other species (n=227 investigations), and were the second

most observed species (n=688), with squirrels being observed slightly more often (n=696).

Table 1. Total sightings, total scent investigations, percentage of time scents were investigated, total observed trap nights, percentage of trap nights on which species were observed, and abundance status of all observed species in Fort Worth, TX parks

Species	Total Sightings	Total Scent Investigations	% of Time Investigated	Total Observed Trap Nights	% of Nights Observed	Abundance Status*
Squirrel, <i>Sciurus niger</i>	696	42	6.034	180	53.571	Abundant
Raccoon, <i>Procyon lotor</i>	688	227	32.994	156	46.429	Abundant
Dog, <i>Canis lupus familiaris</i>	484	209	43.182	119	35.417	Common
Virginia Opossum, <i>Didelphis virginiana</i>	476	154	32.353	147	43.75	Common
Cat, <i>Felis catus</i>	338	68	20.118	147	43.75	Common
White-Tailed Deer, <i>Odocoileus virginianus</i>	183	3	1.639	12	3.571	Uncommon
Gray Fox, <i>Urocyon cinereoargenteus</i>	117	37	31.624	53	15.774	Common
Rabbit, <i>Sylvilagus</i> spp.	96	4	4.167	42	12.5	Common
Coyote, <i>Canis latrans</i>	51	5	9.804	29	8.631	Uncommon
Nine-Banded Armadillo, <i>Dasypus novemcinctus</i>	17	0	0.000	13	3.869	Uncommon
Bobcat, <i>Lynx rufus</i>	6	1	16.667	4	1.19	Uncommon
Striped Skunk, <i>Mephitis mephitis</i>	6	0	0.000	4	1.19	Uncommon
Mouse, <i>Muridae</i> spp.	2	0	0.000	1	0.298	Uncommon
Beaver, <i>Castor canadensis</i>	1	0	0.000	1	0.298	Uncommon

* Species considered abundant if observed on over 45% of trap nights, common if observed on 10-45% of trap nights, and uncommon if observed on less than 10% of trap nights (modified from Dickens et al. 1999).

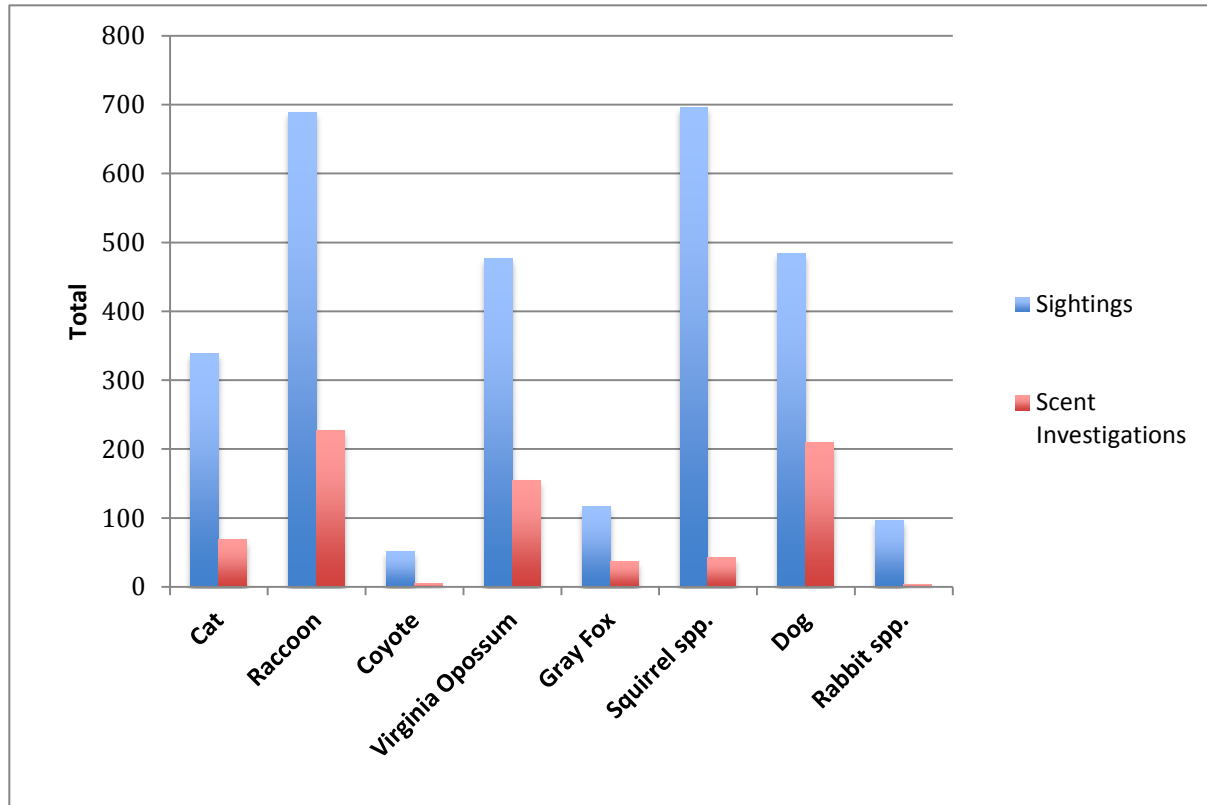


Figure 8. Total number of sightings and scent investigations for 8 species observed in Fort Worth, TX parks.

Table 2 shows the total acreage and total species sightings for each individual study site. The highest number of total species sightings occurred at Linwood Park (n=421), even though only 5 different species were found at this park. Cobb Park and Buck Sansom Park both had 9 unique species observed, although the total number of sightings was not high at either site (n=62 and n=177, respectively) compared to parks such as Linwood or Mosque Point (n=421 and n=254, respectively). The correlation value when total park acreage is compared to the total number of species at each park is 0.1785, which indicates a very weak positive correlation between increased size and species richness. Crooks (2002) found a similarly weak positive correlation between the size of urban habitat fragments and the total species richness.

Table 2. Total acreage and species sightings of 24 study sights in Fort Worth, TX.

Study Site	Total Size (Acres)	Total Species Sightings														Total	# of Species	
		Cat	Raccoon	Coyote	Opossum	Gray Fox	Armadillo	Fox Squirrel	Bobcat	Striped Skunk	Dog	Rabbit spp.	Mouse spp.	Deer	Beaver			
Trinity Park	252.00	14	54	9	3	0	0	0	0	0	0	0	0	0	0	0	80	4
Botanic Gardens	116.56	0	68	0	10	1	8	3	0	0	0	0	0	0	0	0	90	5
Forest Park	181.91	10	14	0	7	16	1	1	0	0	0	0	0	0	0	0	49	6
Sycamore Park	88.02	11	147	2	66	0	0	15	0	1	6	0	0	0	0	0	248	7
Cobb Park	224.47	1	9	2	5	17	0	8	1	0	12	7	0	0	0	0	62	9
Oakland Lake Park	69.00	20	26	0	50	1	0	30	0	0	1	0	0	0	0	0	128	6
Quanah Parker Park	68.00	3	68	0	96	0	2	44	4	0	0	5	0	0	0	0	222	7
Gateway Park	635.11	1	30	0	21	0	2	25	1	0	0	3	2	0	0	0	85	8
Harmon Field	97.50	0	1	11	60	0	0	42	0	0	27	17	0	0	0	0	158	6
Linwood Park	4.00	82	115	0	13	0	0	145	0	0	66	0	0	0	0	0	421	5

Study Site	Total Size (Acres)	Total Species Sightings														Total	# of Species
		Cat	Raccoon	Coyote	Opossum	Gray Fox	Armadillo	Fox Squirrel	Bobcat	Striped Skunk	Dog	Rabbit spp.	Mouse spp.	Deer	Beaver		
Lake Como Park	59.14	29	15	0	7	30	0	18	0	1	34	0	0	0	0	134	7
South Z Boaz Park	134.38	7	33	0	23	2	0	42	0	0	113	0	0	0	0	220	6
Lincoln Park	7.00	21	0	0	2	0	0	11	0	0	21	0	0	0	0	55	4
Buck Sansom Park	131.60	19	29	11	28	2	0	37	0	3	46	2	0	0	0	177	9
Mosque Point Park	80.00	17	16	0	14	11	1	2	0	0	10	0	0	183	0	254	8
Fairfax Park	4.00	16	1	0	0	0	0	18	0	0	13	0	0	0	0	48	4
Prairie Dog Park	39.56	13	18	7	0	1	0	16	0	0	8	0	0	0	1	64	7
Tandy Hills Park	105.25	11	1	5	0	5	0	0	0	1	38	45	0	0	0	106	7
Carter Park Site	163.11	21	1	0	16	7	0	3	0	0	43	9	0	0	0	100	7

Kellis Park	16.30	6	0	0	0	0	0	14	0	0	19	0	0	0	0	39	3
Foster Park	11.92	32	3	0	8	11	0	31	0	0	4	0	0	0	0	89	6
Quail Ridge Park	7.33	2	6	1	4	0	0	66	0	0	18	2	0	0	0	99	7
Oakmont Park	127.17	0	24	3	7	0	3	65	0	0	2	6	0	0	0	110	7
Overton Park	48.68	2	9	0	36	13	0	60	0	0	3	0	0	0	0	123	6
Total		338	688	51	476	117	17	696	6	6	484	96	2	183	1		
Pearson's r for Total Acreage and Total Number of Species:																	0.1785

Scent Selections

A difference of means t-test analysis was used to determine scent choices of each species. Table 3 shows the descriptive statistics used to generate the differences of means for the t-tests; these results are shown in Table 4. T-tests were only run for the 8 species that were captured investigating at least one of the scent lures at more than one study site. For this reason, bobcats and white-tailed deer were not included in this analysis even though on one occasion each investigated the wildcat lure and deer twice investigated the used cat litter. Graphs in Appendix II show comparisons between each species' mean numbers of investigations (Table 3) at each scent lure. Raccoons had the highest mean number of scent investigations for the control (N=0.88) and all lures except the wildcat lure, for which free-ranging dogs (N=3.25) and opossums (N=3.33) had the highest number of investigations. However, as the standard error bars show (Appendix II), when comparing between species for each lure there is a high amount of overlap among the data.

The frequency observations for scent investigations are somewhat skewed (Table 3), so taking of the difference of each mean from the control was used to normalize the data for analysis with the t-test. This made it possible to see which scents were significantly more attractive to each species as compared to the control. Overall, the t-test (Table 4) showed that the synthetic wildcat lure and the sardine lure were both chosen and visited more frequently than the control by 4 species (raccoons, foxes, opossums, and dogs; cats, raccoons, opossums, and dogs; respectively), while the used litter lure was chosen more frequently by 3 different species (cats, opossums, and

squirrels), and the catnip oil was not chosen more frequently than water by any observed species.

Cats did not seem to choose sardine lures more than other lures initially (Table 3). However, the t-test (Table 4) showed that cats visited the sardine lures and used litter more frequently than water ($t=0.026$ and $t=0.034$, respectively; $p<0.5$). Sardines also seemed to be the most attractive scent for raccoons (Table 3). Raccoons' visited sardines ($t=0.033$, $p<0.5$) and synthetic wildcat lure ($t=0.004$, $p<0.01$) more frequently than water and these values were also higher than expected if animals were visiting the lure because of their novelty alone.

Foxes did not obviously select any of the scents more than the control based on means or maximum visitation values (Table 3), but the t-test showed that they visited the synthetic wildcat lure more than water ($t=0.056$, $p<0.10$). Coyotes never investigated the used litter or the catnip oil, so a difference of means t-test could not be run for those two scents. The t-test did not reveal a significantly higher selection among coyotes for either the wildcat lure or the sardines. Opossums initially seemed to be highly interested in the wildcat lure and sardines (Table 3). However, they actually selected sardines ($t=0.008$, $p<0.01$), wildcat lure ($t=0.025$, $p<0.05$), and used litter ($t=0.011$, $p<0.05$) more frequently than the control.

Dogs displayed a strong interest in used litter, wildcat lure, and sardines (Table 3). The t-test only showed this interest to be significantly different from the control for sardines and wildcat lure, however. Dogs chose sardines most frequently ($t=0.01$, $p<0.05$) but also chose the synthetic wildcat lure more than water ($t=0.084$, $p<0.10$). Squirrels did not seem to chose any of the scents more than the control based on the

raw data (Table 3), but the t-test showed they selected the used litter scent ($t=0.009$, $p<0.01$) and the wildcat lure ($t=0.07$, $p<0.10$) more than water. Among rabbits there was no significant choice of any of the scents more than water.

Table 3. Descriptive statistics of scent investigations for 8 species in Fort Worth, TX parks

	Mean	Std. Dev.	Min.	Max.
Cats				
Water	0.17	0.48	0	2
Used Litter	0.71	1.04	0	4
Catnip Oil	0.25	0.61	0	2
Wildcat Lure	0.42	1.28	0	6
Sardines	1.29	2.37	0	11
Raccoons				
Water	0.88	1.75	0	5
Used Litter	1.54	2.54	0	11
Catnip Oil	0.96	1.57	0	6
Wildcat Lure	2.00	2.57	0	8
Sardines	4.08	7.96	0	38
Foxes				
Water	0.04	0.20	0	1
Used Litter	0.42	1.10	0	5
Catnip Oil	0.29	1.04	0	5
Wildcat Lure	0.58	1.28	0	5
Sardines	0.21	0.59	0	2
Coyotes				
Water	0.00	0.00	0	0
Used Litter	0.00	0.00	0	0
Catnip Oil	0.00	0.00	0	0
Wildcat Lure	0.08	0.28	0	1
Sardines	0.13	0.45	0	2
Opossums				
Water	0.21	0.66	0	3
Used Litter	0.96	1.49	0	4
Catnip Oil	0.08	0.41	0	2
Wildcat Lure	3.33	6.27	0	23
Sardines	1.83	3.23	0	14
Dogs				
Water	0.58	1.32	0	5
Used Litter	1.21	3.22	0	15
Catnip Oil	0.37	0.92	0	3
Wildcat Lure	3.25	7.10	0	33
Sardines	3.25	4.63	0	17
Squirrels				
Water	0.04	0.204	0	1

Table 3 (Cont.)

Used Litter	0.79	1.382	0	5
Catnip Oil	0.04	0.204	0	1
Wildcat Lure	0.75	1.824	0	6
Sardines	0.13	0.448	0	2
Rabbits				
Water	0.04	0.20	0	1
Used Litter	0.00	0.00	0	0
Catnip Oil	0.08	0.41	0	2
Wildcat Lure	0.00	0.00	0	0
Sardines	0.04	0.20	0	1

Table 4. Difference of means, standard error of mean, t-values, and significance level of results for 8 species observed investigating scents in Fort Worth, TX parks.

	Mean Diff.	S.E of Mean	t-value	Significance Level
Cats				
Water - Used Litter	-0.542	0.241	-2.251	0.034**
Water - Catnip Oil	-0.083	0.119	-0.700	0.491
Water - Wildcat Lure	-0.250	0.284	-0.881	0.388
Water - Sardines	-1.125	0.471	-2.387	0.026**
Raccoons				
Water - Used Litter	-0.667	0.630	-1.058	0.301
Water - Catnip Oil	-0.083	0.288	-0.289	0.775
Water - Wildcat Lure	-1.125	0.353	-3.191	0.004***
Water - Sardines	-3.208	1.414	-2.269	0.033**
Foxes				
Water - Used Litter	-0.375	0.224	-1.676	0.107
Water - Catnip Oil	-0.250	0.219	-1.141	0.266
Water - Wildcat Lure	-0.542	0.269	-2.013	0.056*
Water - Sardines	-0.167	0.130	-1.282	0.213
Coyotes				
Water - Used Litter	-	-	-	-
Water - Catnip Oil	-	-	-	-
Water - Wildcat Lure	-0.083	0.058	-1.446	0.162
Water - Sardines	-0.125	0.092	-1.366	0.185
Opossums				
Water - Used Litter	-0.750	0.271	-2.769	0.011**
Water - Catnip Oil	0.125	0.139	0.901	0.377
Water - Wildcat Lure	-3.125	1.304	-2.396	0.025**
Water - Sardines	-1.625	0.554	-2.931	0.008***
Dogs				
Water - Used Litter	-0.625	0.675	-0.926	0.364

Table 4 (Cont.)

Water - Catnip Oil	0.208	0.262	0.794	0.435
Water - Wildcat Lure	-2.667	1.475	-1.808	0.084*
Water - Sardines	-2.667	0.947	-2.815	0.01**
Squirrels				
Water - Used Litter	-0.750	0.264	-2.840	0.009***
Water - Catnip Oil	0.000	0.060	0.000	1.000
Water - Wildcat Lure	-0.708	0.373	-1.897	0.07*
Water - Sardines	-0.083	0.103	-0.811	0.426
Rabbits				
Water - Used Litter	0.042	0.042	1.000	0.328
Water - Catnip Oil	-0.042	0.095	-0.440	0.664
Water - Wildcat Lure	0.042	0.042	1.000	0.328
Water - Sardines	0.000	0.060	0.000	1.000
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ - Species did not investigate scent, no variation between control and scent lure				

Correlations (Table 5) between vegetative cover and scent investigations were weak for most species and scent combinations, and for coyotes and rabbits some correlations could not be run because of a lack of investigations. The strongest correlations found were the weak negative correlations that occurred between cats and catnip oil, foxes and wildcat lure, and dogs and catnip oil (-0.325, -0.325, and -0.321, respectively). The negative values indicate that these species were slightly more likely to visit those scents in open areas versus areas with more vegetative cover. Cats also displayed weak negative correlation with water and the wildcat lure (-0.274 and -0.280, respectively). Foxes also showed a weak negative correlation with sardines (-0.280) and a weak positive correlation with water (0.269). Opossums and rabbits both showed a weak positive correlation with catnip oil, while rabbits also showed a weak correlation with sardines, and squirrels showed a weak correlation with water (all 0.269). All other correlation values were less than 0.250 or -0.250 and considered insignificant.

Table 5. Correlation (Pearson's r) between vegetation surrounding scent lures and scent investigation by 8 species in Fort Worth, TX parks.

Species	Water	Used Litter	Catnip Extract	Wildcat Lure	Sardines
Cat	-0.274	-0.176	-0.325	-0.280	-0.060
Raccoon	-0.094	0.082	0.189	-0.134	0.224
Fox	0.269	-0.163	0.200	-0.325	-0.280
Coyote	-	-	-	0.051	-0.221
Opossum	-0.117	-0.045	0.269	0.243	0.232
Dog	0.050	-0.165	-0.321	-0.188	0.115
Squirrel	0.269	-0.172	-0.162	0.166	0.172
Rabbit	-0.162	-	0.269	-	0.269

Discussion

Populations

The results of this study showed that the large known free-ranging cat population of Fort Worth, TX is not likely to be concentrated in its city parks. Over 10% of the city's parks, with sites in all four operating districts, were sampled, and a maximum of 9 individual cats were detected at any site. See Appendix III for a complete list of individual cats. In total 61 individual cats were identified during the study period from all 24 sites. Only one tended or managed colony was observed at any of the study sites, and only 3 individual cats were found at that site. Based on observations, cats were more prevalent in parks nearer neighborhoods and other developments (although none wore collars to indicate ownership) as opposed to more secluded areas on the outer edges of the city. This observation and the lack of high populations in the large habitat tracts provided by parks makes it seem likely that the free-ranging cat population of Fort Worth is more concentrated in areas where human subsidized food is more easily attainable such as in neighborhoods or behind shopping/restaurant areas with large constant anthropogenic food supplies. Meckstroth et al. (2007) found

in a survey of free-ranging cat diets in San Francisco, CA that although birds and small mammals were a sizeable portion of their diets, garbage made up at least 30% of the cats' diets year round and cat food was an important part of their daily food intake. Those findings show the importance of human subsidized resources to free-ranging cats. Evidence of human support of cats was only observed at one of these study sites in Fort Worth where a shelter was constructed and food was brought to three resident cats daily. All three of these cats were observed in person, and they were the only three cats photographed at this study site.

Well-manicured parks with little understory seemed to contain a lower diversity of species compared to more natural parks with a wider array of habitat spaces, although data was not collected to directly quantify this observation. Larger carnivores such as bobcats and coyotes were only captured in parks with large tracts of brushy, un-mowed habitat. While data are sparse from this study, similar results have been found in other studies. Randa and Yunger (2006) found that larger carnivores such as red foxes (*Vulpes vulpes*) and coyotes occurred more often in rural habitat while raccoons were found throughout the rural-urban gradient and often occurred in highly urbanized areas. This study found similar occurrences for raccoons, which were observed at 22 of the 24 study sites and had the second highest percentage of trap nights (46.429%), behind only squirrels. Larger carnivores, however, occurred in much fewer of the study sites, with coyotes being observed at 9, gray foxes at 13, and bobcats at only 3. Randa and Yunger (2006) also found that red foxes often occurred in areas where coyotes were not observed, and in this study gray foxes and coyotes were only observed at 4 of the same study sites, 3 of which contained large areas of natural woods

and all of which contained at least intermittent waterways. Another study of small mammals in riparian parks in Pennsylvania found that populations were lower and less diverse in well-manicured parks while parks that were left more natural supported a wide diversity of small mammal species (Mahan and O'Connell 2005).

Another interesting finding within many of the parks was the abundance of unattended (free-roaming or feral) dogs. Dogs were only counted for this study if they were not on leashes or otherwise obviously in the company of an owner. Unattended dogs were observed at 19 of the study sites, and they were the third most observed species overall, behind only raccoons and squirrels. A total of 162 individual dogs were identified throughout this study. Of these, 99 of the dogs were observed wearing either collars, chains, or harnesses to indicate ownership. Dogs, both with and without collars, were often observed travelling in pairs and packs during this study, a behavior that is typical of feral dogs (Beck 1975; Daniels and Bekoff 1989). While owned and cared for, free-roaming dogs can still have significant impacts on local ecosystems through hunting, especially of small and mid-sized mammals (Campos et al. 2007; Young et al. 2011). Much like free-roaming cats, dogs (free-roaming or feral) can also impact the surrounding ecosystem by spreading disease and competing with native species for resources, which are often limited in urban areas (Young et al. 2011; Beck 1975; Hatley 2003; Longcore et al. 2009). Far fewer studies have been done regarding free-roaming and feral dogs than have been done on feral cats, but given the high number of unattended dogs observed within city parks in this study, further research into their impacts in urban areas is recommended.

Scent Lures

The low percentages of time species investigated the scents (Table 1) shows that the majority of observations were made as animals just happened to be passing by the cameras. Dogs were photographed investigating the scents more than any other species (43.182% of the time), but even for this species scent investigations did not comprise a majority of total observations. While some of the species were indeed interested in the scents, this does indicate that cameras alone could be good means of observing most species in park habitats. Even for species such as raccoons and opossums that had high instances of investigating the lures, they were most often captured simply walking by the cameras.

Clapperton et al. (1994) found that cats in both captivity and the wild were attracted to plant based (catnip and matatabi) lures more than any other scents. In this study, though, catnip oil was not an effective lure for any observed species (Table 3). However, the finding that free-ranging cats are significantly more attracted to sardines than the control is consistent with the findings of Andelt and Woolley's (1996) study in Colorado. Andelt and Woolley (1996) did not find a significant attraction of dogs and raccoons to sardines as this study did, however.

The strongest attractions between species and scents found in this study were between raccoons and wildcat lure ($t=0.004$, $p<0.01$), opossums and sardines ($t=0.008$, $p<0.01$), and squirrels and used litter ($t=0.009$, $p<0.01$). While the attraction of foxes to used litter was not statistically significant ($t=0.107$), personal observations from photographs showed that on many occasions foxes would display strong behavior towards the used litter lures, chewing on the cups repeatedly, trying to steal the lure,

and jumping around the posts. None of the lures used in this study seemed entirely species specific, meaning that two or more species were significantly attracted to each lure except for catnip oil. Despite this fact, though, this study did discover some broad species preferences and showed that nontraditional/noncommercial lures such as used cat litter can be effective for many species without adding to the costs of a study.

There was not a strong correlation between surrounding vegetation and the interactions of any species with any the scent lures (Table 5). Even though three of the correlations had values over -0.3 (cats and dogs with catnip oil and foxes with wildcat lure), those are still very weak values and can lead to no strong conclusions about the likelihood of animals to visit scents in vegetated or open areas. It is interesting to note, though, that cats were the only species to show a negative correlation to every lure, which suggests that they are slightly more likely to visit scent lures in open areas. While these findings are useful, future urban park studies should focus more on the diversity of habitat types available in parks as well to detect possible relationships between overall park vegetation and species richness.

Methodological Issues

A primary focus of the study methods was on security, since cameras often had to be placed in plain sight in parks without prevalent understory. Even though photos revealed people tampering with cameras by moving them, pulling on them, and even kicking them and hitting them with sticks, only one camera was stolen over the entire 5-month study period. The lack of damage suffered by the equipment was a testament to the strength of the constructed angle iron cages, and although a heavier gauge of

steel cable or lock may have prevented the one theft, it shows that the level of security used seemed to deter most serious vandalism. This is particularly important to note given the high observed transient population living in some of the parks who often displayed negative or violent behavior towards the cameras.

One issue experienced with these methods was wildlife stealing the scent lures, sometimes by opening the specimen cups, other times by breaking them off of their posts. The majority of these cases were remedied by using heavy packing tape to seal around the lids of the cups and by placing washers in the bottom of the cups so screws could not be easily pulled out. The sardines were so attractive to some species, particularly raccoons and large mammals such as foxes and dogs, that some would spend prolonged periods of time trying to get to the lure. This problem was identified while at the first set of study sites, and future losses of sardine lures were prevented by drilling holes in tin cans and putting the plastic cups in these before attaching them to their posts. The extra security measure prevented the sardine scent lures from becoming bait. Regularly scheduled checks of all study sites throughout the week prevented scent lure losses from affecting the study for more than a few hours at a time.

Other issues with the methods occurred with the cameras. Even though pictures were set to take at 0.5-second intervals, on at least two occasions early on, the cameras were not triggered when something pulled down the scent posts. These seemed to be fairly isolated events and overall the cameras were very sensitive to movement even by branches and grasses, but it still raises questions about wildlife or other scent interactions being missed.

While there were some minor issues encountered with the methods throughout the study, overall it proved effective at detecting a variety of urban wildlife. It should be noted that small mammals such as mice were detected only on a few occasions during this study, resulting in an abundance ranking of “uncommon.” This indicates that this methodology is not effective at capturing small mammals, and should therefore focus on species at least as large as fox squirrels, which were readily detected by cameras. In particular, this method worked well with free-ranging cats, which were the target of the original study goal. Although cats were not interested in all of the scents, even those captured only in passing could be identified to the individual level based on fur patterns and size. This allowed a catalog of individual cats to be created, and while this catalog was not used to estimate populations at the study sites, such methods could be very useful in future studies. Although these methods were not tested at any trap-neuter-return (TNR) colonies, they would be especially useful at TNR sites where managers need to monitor for new introductions in order to ensure as many members of their population as possible are neutered to prevent unwanted population growth. To have effective TNR, studies have shown that 71-94% of the cats in a colony should be neutered and new immigration and abandonment must be prevented (Foley et al. 2005; Longcore et al. 2009). The methods used in this study would thus be useful for monitoring colonies to determine their true sizes and to ensure the maximum number of resident cats is identified.

Conclusions

In the future, the methods used in this study could easily be replicated for general studies of urban wildlife or for more species specific surveys based on the more attractive scent lures. Further studies would be necessary to determine more specific lures for larger mammals such as coyotes and bobcats, which were only observed in small numbers during this study. Given the limited number of free-ranging cats observed in parks in this study, further research is also recommended both in Fort Worth and in other cities to determine what urban space is most used by free-ranging cats so that naturally formed colonies can be more easily located. As Fort Worth moves forward with implementing its new trap-neuter-return colony regulations, using methods such as these may prove to be a viable, cost-effective option for monitoring populations for long-term growth trends to determine the success of their efforts. On a broader scale, the results and methods of this study can assist with studies of many other types of urban carnivores whose populations need to be closely monitored to anticipate and mitigate human-wildlife conflicts.

Appendix I: Site Locations and Vegetative Categories

Study Site (District)	Scent (Code)	Scent Coordinates	Vegetative Category
Trinity Park (Central)	Water (TR1)	32°44'44.688"N 97°21'7.25"W	Open
	Used Litter (TR2)	32°44'45.396"N 97°21'6.338"W	Open
	Catnip Oil (TR3)	32°44'46.165"N 97°21'6.986"W	Open
	Wildcat Lure (TR4)	32°44'45.668"N 97°21'5.717"W	Brushy
	Sardines (TR5)	32°44'44.703"N 97°21'5.356"W	Brushy
Fort Worth Botanical Gardens (Central)	Water (BG1)	32°44'2.366"N 97°21'52.249"W	Brushy
	Used Litter (BG2)	32°44'2.032"N 97°21'52.116"W	Open
	Catnip Oil (BG3)	32°44'2.536"N 97°21'51.841"W	Brushy
	Wildcat Lure (BG4)	32°44'2.772"N 97°21'51.167"W	Open
	Sardines (BG5)	32°44'2.988"N 97°21'51.301"W	Open
Forest Park (Central)	Water (FR1)	32°43'12.804"N 97°21'10.871"W	Brushy
	Used Litter (FR2)	32°43'11.944"N 97°21'10.002"W	Brushy
	Catnip Oil (FR3)	32°43'7.556"N 97°21'8.456"W	Open
	Wildcat Lure (FR4)	32°43'9.034"N 97°21'8.596"W	Open
	Sardines (FR5)	32°43'10.003"N 97°21'8.459"W	Open
Sycamore Park (East)	Water (SY1)	32°44'3.144"N 97°17'33.792"W	Open
	Used Litter (SY2)	32°44'2.148"N 97°17'32.508"W	Open
	Catnip Oil (SY3)	32°44'4.296"N 97°17'34.080"W	Brushy
	Wildcat Lure (SY4)	32°44'5.334"N 97°17'34.830"W	Open
	Sardines (SY5)	32°44'5.814"N 97°17'35.976"W	Brushy
Cobb Park (East)	Water (CB1)	32°42'54.876"N 97°17'48.258"W	Open
	Used Litter (CB2)	32°42'56.964"N 97°17'47.742"W	Open
	Catnip Oil (CB3)	32°42'55.488"N 97°17'46.254"W	Brushy
	Wildcat Lure (CB4)	32°42'58.266"N 97°17'43.488"W	Brushy

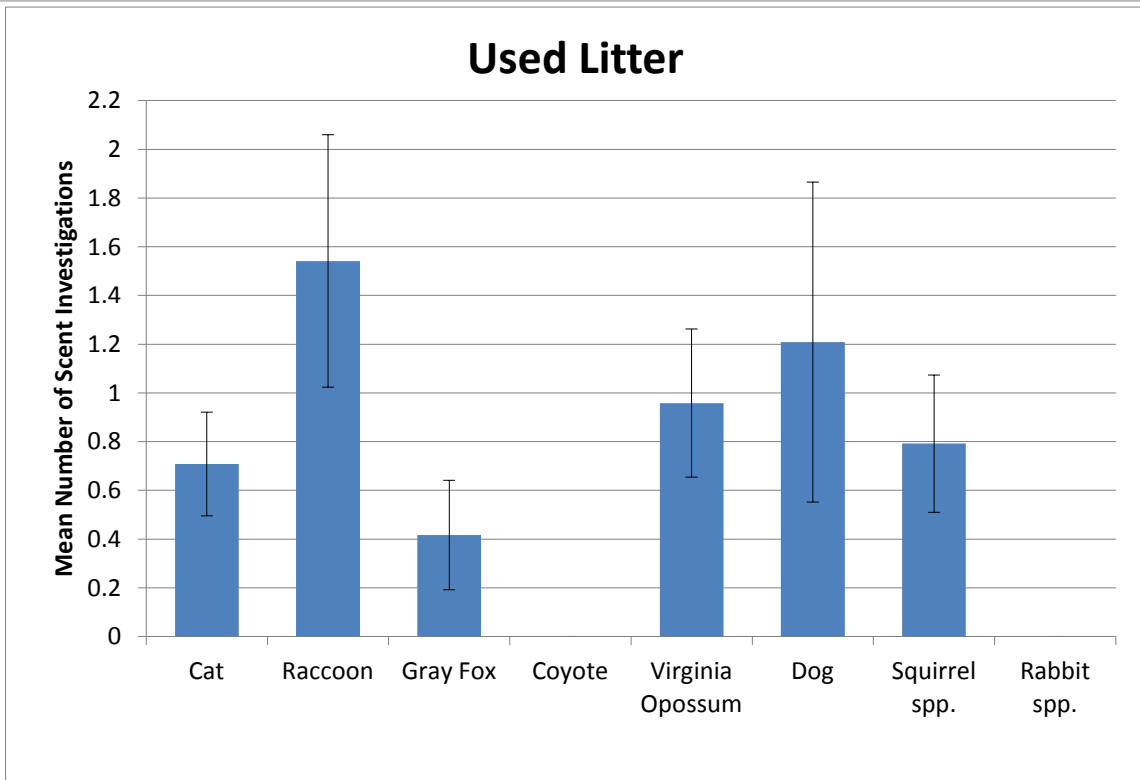
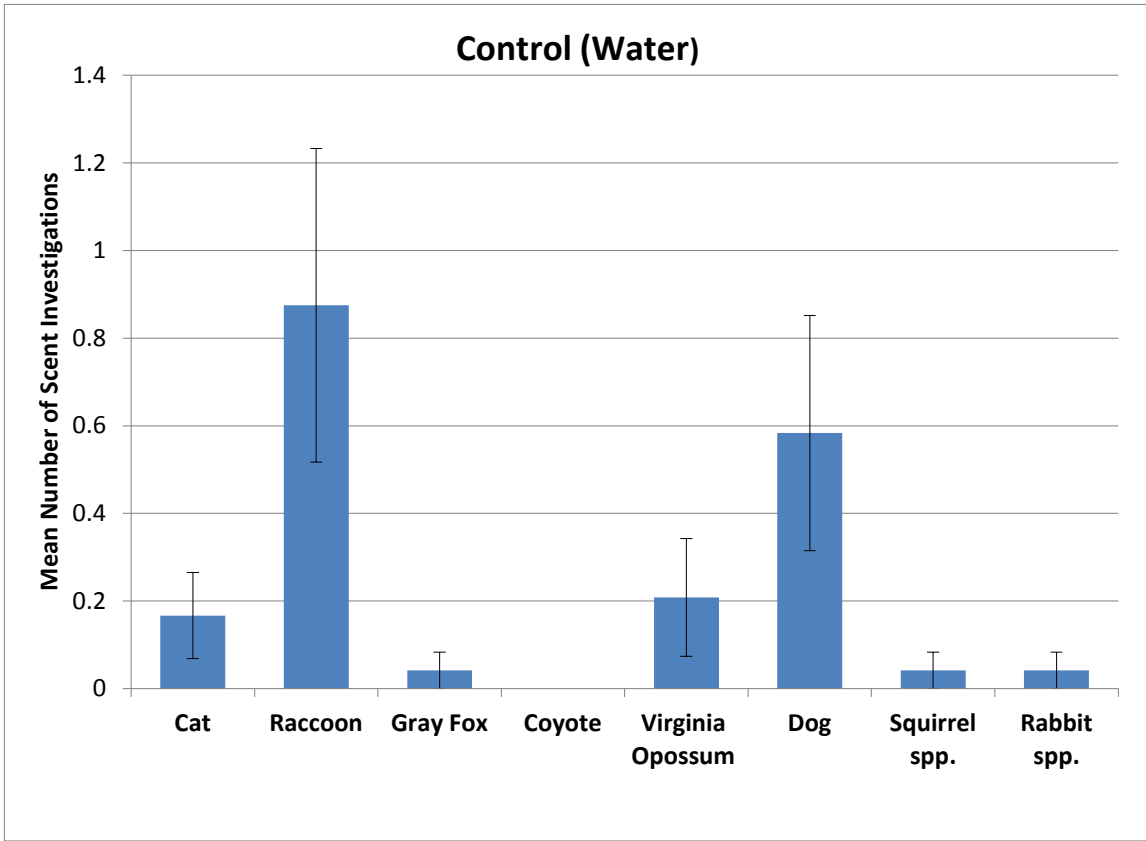
Study Site (District)	Scent (Code)	Scent Coordinates	Vegetative Category
	Sardines (CB5)	32°43'0.618"N 97°17'41.766"W	Open
Oakland Lake Park (East)	Water (OL1)	32°45'13.242"N 97°15'31.284"W	Brushy
	Used Litter (OL2)	32°45'12.528"N 97°15'31.284"W	Open
	Catnip Oil (OL3)	32°45'10.482"N 97°15'30.192"W	Open
	Wildcat Lure (OL4)	32°45'11.214"N 97°15'29.796"W	Open
	Sardines (OL5)	32°45'12.162"N 97°15'29.382"W	Brushy
Quanah Parker Park (North)	Water (QP1)	32°46'20.670"N 97°14'51.786"W	Brushy
	Used Litter (QP2)	32°46'21.876"N 97°14'56.538"W	Brushy
	Catnip Oil (QP3)	32°46'22.644"N 97°14'46.980"W	Brushy
	Wildcat Lure (QP4)	32°46'21.720"N 97°14'46.620"W	Brushy
	Sardines (QP5)	32°46'20.604"N 97°14'47.046"W	Brushy
Gateway Park (North)	Water (GT1)	32°45'42.624"N 97°16'20.154"W	Open
	Used Litter (GT2)	32°45'43.878"N 97°16'19.878"W	Open
	Catnip Oil (GT3)	32°45'44.838"N 97°16'19.602"W	Brushy
	Wildcat Lure (GT4)	32°45'46.062"N 97°16'19.122"W	Brushy
	Sardines (GT5)	32°45'46.950"N 97°16'19.122"W	Brushy
Harmon Field (North)	Water (HF1)	32°45'6.270"N 97°18'43.356"W	Open
	Used Litter (HF2)	32°45'4.992"N 97°18'43.884"W	Open
	Catnip Oil (HF3)	32°45'3.150"N 97°18'40.722"N	Brushy
	Wildcat Lure (HF4)	32°45'3.012"N 97°18'38.964"W	Brushy
	Sardines (HF5)	32°45'6.114"N 97°18'40.236"W	Open
Linwood Park (West)	Water (LW1)	32°45'16.614"N 97°21'29.958"W	Open
	Used Litter (LW2)	32°43'44.634"N 97°24'3.870"W	Open
	Catnip Oil (LW3)	32°43'44.634"N 97°24'4.104"W	Open
	Wildcat Lure (LW4)	32°43'44.928"N	Open

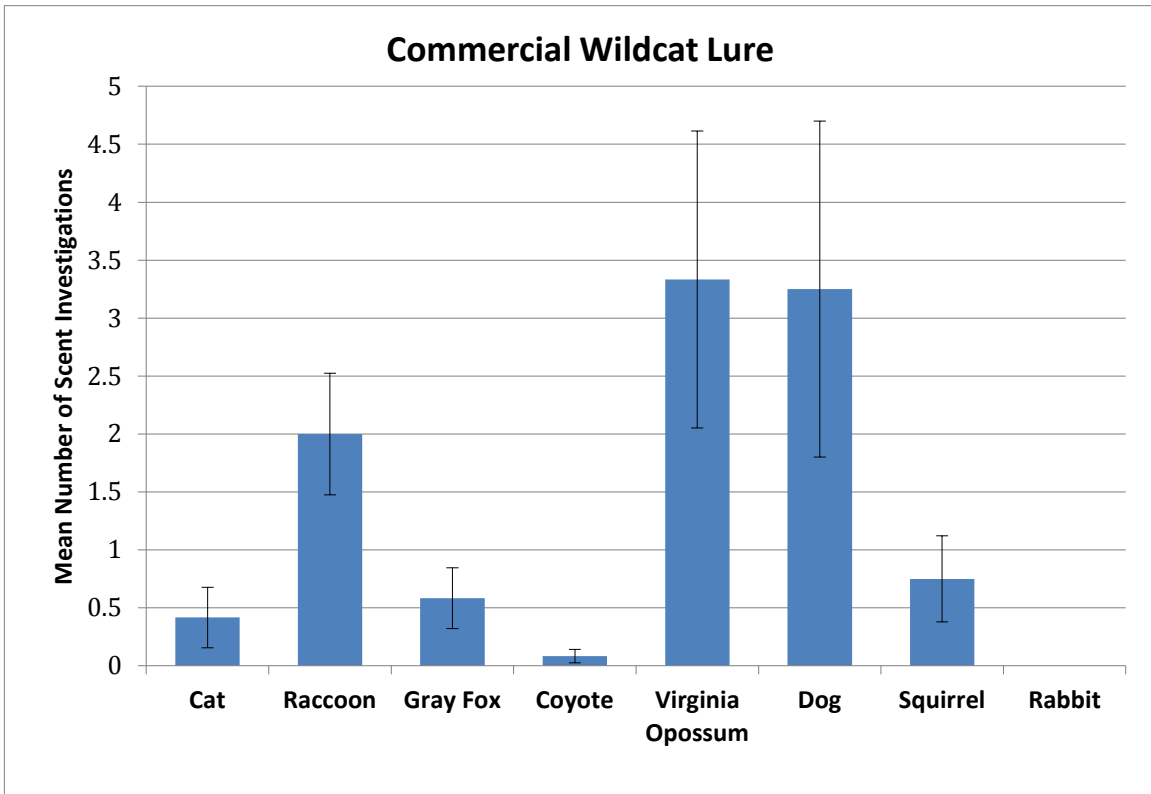
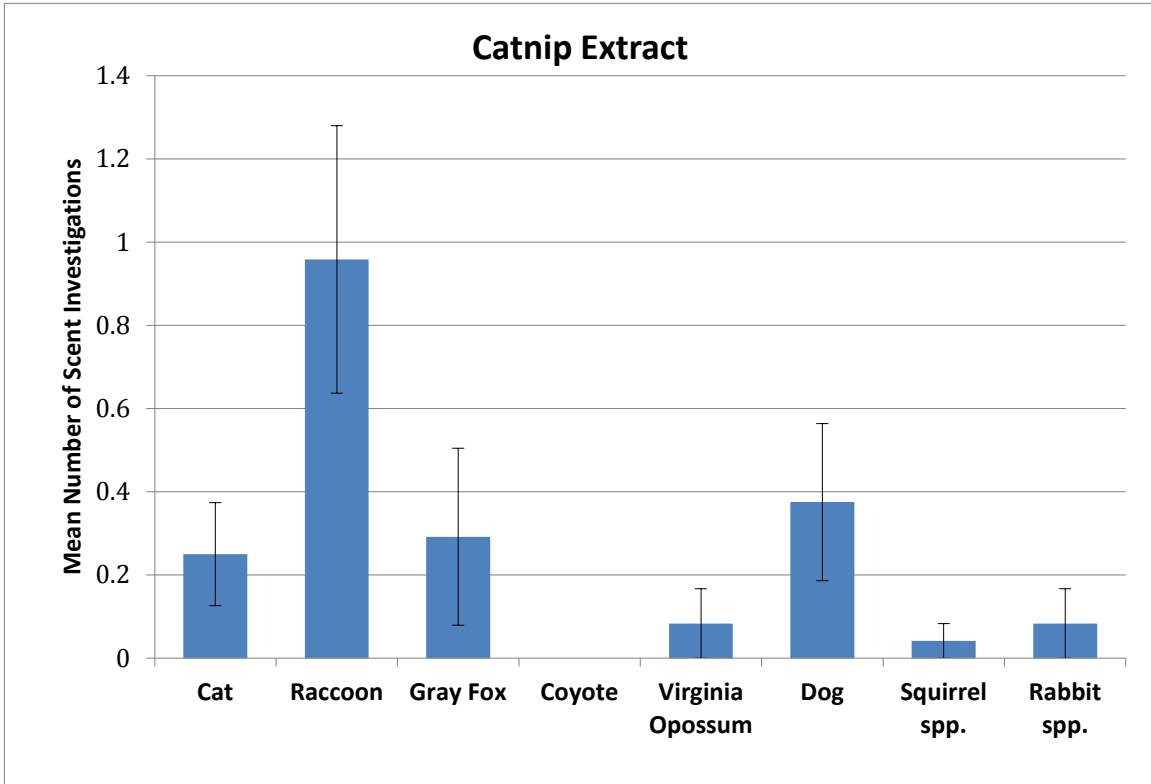
Study Site (District)	Scent (Code)	Scent Coordinates	Vegetative Category
	Sardines (LW5)	97°24'4.620"W 32°43'44.844"N 97°24'5.982"W	Open
Lake Como Park (West)	Water (LC1)	32°43'42.660"N 97°24'2.916"W	Open
	Used Litter (LC2)	32°43'43.626"N 97°24'3.870"W	Open
	Catnip Oil (LC3)	32°43'44.634"N 97°24'4.104"W	Open
	Wildcat Lure (LC4)	32°43'44.928"N 97°24'4.620"W	Open
	Sardines (LC5)	32°43'44.844"N 97°24'4.620"W	Open
South Z Boaz Park (West)	Water (SZ1)	32°41'34.560"N 97°27'11.712"W	Brushy
	Used Litter (SZ2)	32°41'35.664"N 97°27'10.476"W	Open
	Catnip Oil (SZ3)	32°41'36.258"N 97°27'10.170"W	Open
	Wildcat Lure (SZ4)	32°41'36.270"N 97°27'07.746"W	Open
	Sardines (SZ5)	32°41'36.138"N 97°27'6.252"W	Brushy
Lincoln Park (North)	Water (LN1)	32°47'53.364"N 97°21'35.286"W	Open
	Used Litter (LN2)	32°47'53.310"N 97°21'34.560"W	Open
	Catnip Oil (LN3)	32°47'53.214"N 97°21'33.960"W	Open
	Wildcat Lure (LN4)	32°47'52.488"N 97°21'32.826"W	Open
	Sardines (LN5)	32°47'52.266"N 97°21'31.788"W	Open
Buck Sansom Park (North)	Water (BS1)	32°48'43.572"N 97°22'37.512"W	Open
	Used Litter (BS2)	32°48'44.034"N 97°22'36.096"W	Brushy
	Catnip Oil (BS3)	32°48'44.436"N 97°22'34.722"W	Open
	Wildcat Lure (BS4)	32°48'44.370"N 97°22'32.778"W	Open
	Sardines (BS5)	32°48'44.184"N 97°22'31.542"W	Open
Mosque Point Park (North)	Water (MP1)	32°48'13.854"N 97°27'47.634"W	Open
	Used Litter (MP2)	32°48'14.214"N 97°27'48.906"W	Open
	Catnip Oil (MP3)	32°48'13.554"N 97°27'49.698"W	Open

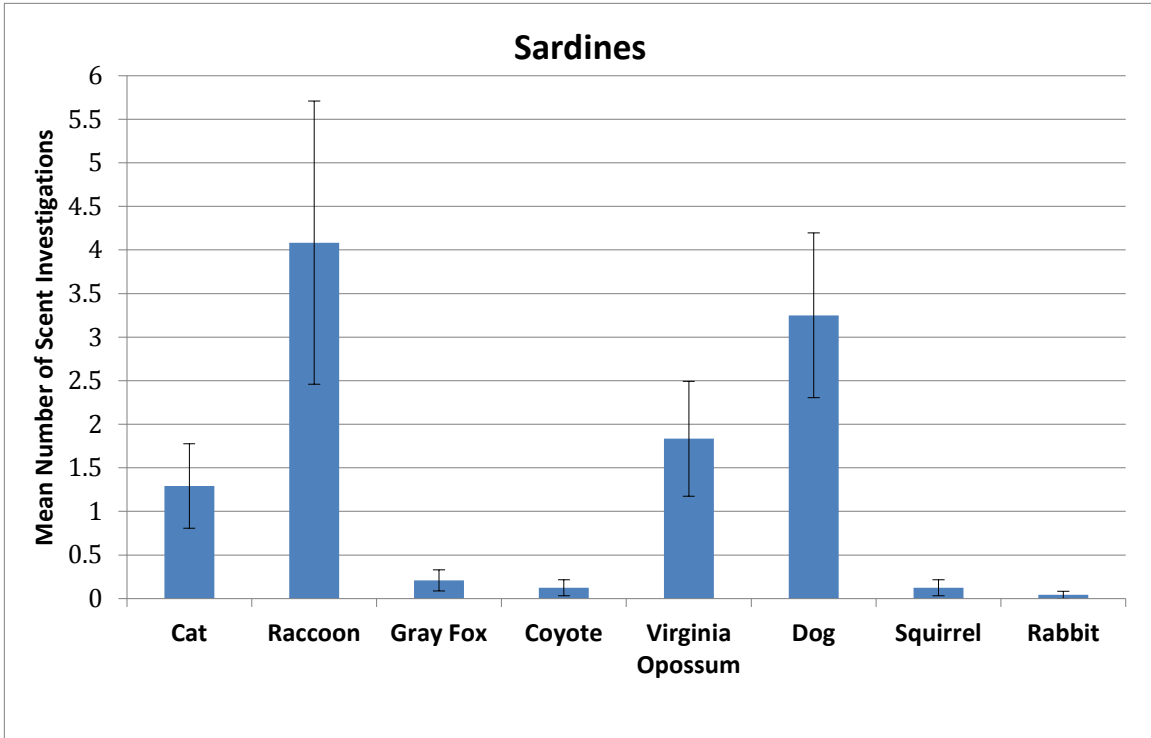
Study Site (District)	Scent (Code)	Scent Coordinates	Vegetative Category
	Wildcat Lure (MP4)	32°48'12.438"N 97°27'49.044"W	Brushy
	Sardines (MP5)	32°48'11.814"N 97°27'47.718"W	Open
Fairfax Park (East)	Water (FF1)	32°41'10.998"N 97°15'57.672"W	Brushy
	Used Litter (FF2)	32°41'14.316"N 97°15'54.624"W	Brushy
	Catnip Oil (FF3)	32°41'15.246"N 97°15'53.364"W	Brushy
	Wildcat Lure (FF4)	32°41'15.9240"N 97°15'51.264"W	Brushy
	Sardines (FF5)	32°41'16.488"N 97°15'52.092"W	Open
Prairie Dog Park (East)	Water (PD1)	32°41'11.514"N 97°15'27.384"W	Open
	Used Litter (PD2)	32°41'3.766"N 97°15'28.236"W	Brushy
	Catnip Oil (PD3)	32°41'13.398"N 97°15'29.334"W	Open
	Wildcat Lure (PD4)	32°41'12.126"N 97°15'31.452"W	Brushy
	Sardines (PD5)	32°41'12.552"N 97°15'33.258"W	Brushy
Tandy Hills Park (East)	Water (TH1)	32°44'46.776"N 97°16'35.988"W	Open
	Used Litter (TH2)	32°44'47.334"N 97°16'35.094"W	Open
	Catnip Oil (TH3)	32°44'48.876"N 97°16'33.876"W	Brushy
	Wildcat Lure (TH4)	32°44'48.600"N 97°16'32.592"W	Brushy
	Sardines (TH5)	32°44'49.650"N 97°16'31.614"W	Brushy
Carter Park Site (South)	Water (CR1)	32°40'41.277"N 97°18'37.077"W	Brushy
	Used Litter (CR2)	32°40'40.923"N 97°18'36.387"W	Brushy
	Catnip Oil (CR3)	32°40'39.171"N 97°18'36.825"W	Brushy
	Wildcat Lure (CR4)	32°40'38.337"N 97°18'36.471"W	Brushy
	Sardines (CR5)	32°40'38.097"N 97°18'36.831"W	Brushy
Kellis Park (South)	Water (KL1)	32°40'49.626"N 97°22'12.867"W	Open
	Used Litter (KL2)	32°40'50.541"N 97°22'12.495"W	Open
	Catnip Oil (KL3)	32°40'51.603"N	Open

Study Site (District)	Scent (Code)	Scent Coordinates	Vegetative Category
	Wildcat Lure (KL4)	97°22'12.195"W 32°40'52.191"N	Open
	Sardines (KL5)	97°12'12.585"W 32°40'52.269"N	Open
Foster Park (South)	Water (FO1)	97°22'30.813"W 32°41'7.449"N	Brushy
	Used Litter (FO2)	97°22'31.689"W 32°41'7.809"N	Brushy
	Catnip Oil (FO3)	97°22'32.067"W 32°41'8.997"N	Brushy
	Wildcat Lure (FO4)	97°22'32.283"W 32°41'9.441"N	Open
	Sardines (FO5)	97°22'32.355"W 32°41'10.725"N	Open
Quail Ridge Park (South)	Water (QR1)	97°25'26.295"W 32°39'12.755"N	Open
	Used Litter (QR2)	97°25'24.447"W 32°39'12.003"N	Open
	Catnip Oil (QR3)	97°25'24.723"W 32°39'10.779"N	Open
	Wildcat Lure (QR4)	97°25'25.377"W 32°39'9.663"N	Open
	Sardines (QR5)	97°25'25.071"W 32°39'9.171"N	Open
Oakmont Park (West)	Water (OK1)	97°25'48.879"W 32°40'2.571"N	Brushy
	Used Litter (OK2)	97°25'49.743"W 32°40'3.591"N	Brushy
	Catnip Oil (OK3)	97°25'50.523"W 32°40'3.579"N	Open
	Wildcat Lure (OK4)	97°25'50.931"W 32°40'4.263"N	Open
	Sardines (OK5)	97°25'50.925"W 32°40'3.697"N	Open
Overton Park (South)	Water (OV1)	97°23'6.315"W 32°42'26.175"N	Open
	Used Litter (OV2)	97°23'5.853"W 32°42'27.111"N	Open
	Catnip Oil (OV3)	97°23'5.007"W 32°42'26.127"N	Open
	Wildcat Lure (OV4)	97°23'5.205"W 32°42'25.125"N	Open
	Sardines (OV5)	97°23'4.905"W 32°42'23.673"N	Open

Appendix II: Mean Number of Scent Investigations and Standard Error for Each Scent Lure




















Appendix III: Cat Catalog


Central Operating District	
Trinity Park	41
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Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	# Recap.	
Trinity	Looks solid white. Short/med hair. Thin tail.	8/27/12	19:32	TR1	4	
		8/31/12	18:54	TR1		
		8/28/12	08:07	TR2		
		8/30/12	19:08	TR3		
		9/4/12	07:56	TR3		
Trinity	Light colored with some pattern. Bushy tail. Longer hair. Looks like the orange cat observed in person.	8/28/12	09:55	TR1	5	
		9/3/12	14:20	TR1		
		9/4/12	11:46	TR3		
		9/6/12	10:27	TR3		
		8/29/12	07:44	TR4		
		8/29/12	20:20	TR4		
Trinity	Dark, multicolored hair with light colored belly. Shorter hair. Tail has dark and light bands.	9/3/12	21:54	TR5	2	
		9/8/12	10:33	TR1		
		9/4/12	20:28	TR5		
Forest	Dark color (black). Solid, longer hair and bushy tail.	8/17/12	10:35	FR3	8	
		8/30/12	15:48	FR3		
		9/6/12	08:57	FR3		
		9/7/12	10:35	FR3		
		9/8/12	22:01	FR3		
		8/30/12	06:16	FR4		
		9/1/12	17:44	FR5		
		9/5/12	02:10	FR5		
9/6/12	21:15	FR5				




Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	# Recap.	
Forest	Tabby cat. Bold stripe on front, inner left leg. 3 bolder stripes on back right leg. Lighter colored belly.	9/2/12	02:21	FR5	0	
Sycamore	Large skinny cat. Dark colored with tabby pattern and dark tip on tail. Almost 18 inches tall when sniffing.	9/9/12	19:08	SY5	7	
		9/22/12	20:04	SY4		
		9/18/12	00:36	SY5		
		9/18/12	07:02	SY5		
		9/19/12	11:35	SY5		
		9/19/12	19:13	SY5		
		9/19/12	19:43	SY5		
		9/21/12	17:57	SY5		
Sycamore	Skinny. Dark solid color. Height seems less than scent cup so under 12 inches.	9/10/12	00:36	SY1	2	
		9/17/12	11:16 PM	SY5		
		9/23/12	6:59 AM	SY5		




Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	# Recap.	
Cobb	Stocky cat. Solid black. Only seen from behind as walking.	9/20/12	08:52	CB2	0	
Oakland Lake	Light colored. Looks mostly solid colored. Top of ears reach tip of cup. Body height looks less than 12 inches.	9/9/12	22:40	OL4	17	
		9/22/12	05:15	OL2		
		9/22/12	05:30	OL2		
		9/23/12	04:29	OL2		
		9/23/12	05:19	OL2		
		9/20/12	03:03	OL3		
		9/20/12	23:07	OL3		
		9/23/12	05:31	OL3		
		9/12/12	01:51	OL4		
		9/14/12	20:19	OL4		
		9/19/12	03:20	OL4		
		9/21/12	00:20	OL4		
		9/22/12	04:43	OL4		
		9/22/12	05:04	OL4		
		9/19/12	01:31	OL5		
9/19/12	03:07	OL5				
9/20/12	02:57	OL5				
9/22/12	04:39	OL5				
Oakland Lake	Fluff. Mixed colors. Tail striped with dark tip. Top of ears only to bottom of cup when looking at it. Back legs have white coloring inside and out.	9/13/12	19:54	OL4	1	
		9/22/12	19:45	OL4		





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	# Recap.	
Quannah Parker	Tabby patterns. About level with scent post at shoulders (12 inches).	9/24/12	22:04	QP5	0	
Quannah Parker	Solid light color. Has indentation on tail.	10/7/12	01:41	QP3	1	
		10/7/12	02:54	QP4		
Gateway	Solid light color. Short hair. Tail bobbed off.	10/7/12	05:06	GT2	0	






Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	# Recap.	
Linwood	Black back, neck, and tail. Black ears. Legs are all mixed black and white. Front look mostly black with white paws. Back left is about half and half with white on bottom, and back right is almost all white. Bottom of neck is white.	10/7/12	16:41	LW2	43	
		10/14/12	09:40	LW1		
		10/19/12	19:44	LW1		
		10/7/12	17:19	LW2		
		10/8/12	09:30	LW2		
		10/8/12	11:35	LW2		
		10/8/12	12:02	LW2		
		10/8/12	17:59	LW2		
		10/8/12	18:26	LW2		
		10/8/12	18:49	LW2		
		10/9/12	09:06	LW2		
		10/11/12	09:06	LW2		
		10/11/12	09:15	LW2		
		10/15/12	13:42	LW2		
		10/16/12	07:05	LW2		
		10/17/12	09:37	LW2		
		10/17/12	14:28	LW2		
		10/18/12	07:06	LW2		
		10/19/12	09:34	LW2		
		10/19/12	11:09	LW2		
		10/19/12	22:31	LW2		
		10/20/12	09:51	LW2		
		10/7/12	11:09	LW3		
		10/7/12	14:38	LW3		
		10/11/12	09:09	LW3		
		10/11/12	13:26	LW3		
		10/12/12	08:46	LW3		
		10/8/12	09:23	LW4		
		10/8/12	20:21	LW4		
		10/9/12	07:03	LW4		
		10/10/12	21:54	LW4		
		10/15/12	11:03	LW4		
		10/21/12	05:51	LW4		
		10/8/12	21:17	LW5		
		10/9/12	06:58	LW5		
		10/10/12	21:53	LW5		
10/10/12	21:57	LW5				
10/11/12	13:55	LW5				
10/11/12	20:45	LW5				
10/11/12	20:55	LW5				
10/13/12	07:22	LW5				
10/14/12	09:12	LW5				
10/15/12	08:55	LW5				
10/19/12	10:19	LW5				





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	# Recap.	
Linwood	Black back, tail, and neck/ears. Front legs are all white. Back right is white. Back left is black with white paw. White nose but black eyes. Short hair.	10/9/12	12:49	LW2	6	
		10/9/12	15:32	LW2		
		10/10/12	13:09	LW2		
		10/11/12	09:45	LW2		
		10/18/12	14:45	LW2		
		10/20/12	16:14	LW2		
		10/11/12	09:09	LW3		
Linwood	White and dark mix. Back and tail are dark. Tail is bushy. Back has spot pattern. Neck and ears are dark. All legs are white. White extends up onto neck and shoulders and bottom jaw.	10/11/12	22:49	LW2	1	
		10/12/12	22:58	LW2		
Linwood	Light colored. Bushy tail and longer hair. Face is light with darker coloring along nose and tops of ears. Tail looks slightly darker than body fur. Legs are slightly darker too.	10/13/12	21:16	LW2	4	
		10/13/12	21:10	LW4		
		10/19/12	10:53	LW4		
		10/11/12	20:10	LW5		
		10/19/12	10:53	LW5		





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	# Recap.	
Linwood	Tabby cat. Rather skinny. White throat. Front paws have white tips. Back feet are white on front of legs.	10/8/12	09:53	LW3	12	
		10/10/12	22:16	LW4		
		10/18/12	22:17	LW4		
		10/18/12	22:36	LW4		
		10/19/12	20:50	LW4		
		10/19/12	21:29	LW4		
		10/19/12	21:33	LW4		
		10/7/12	21:42	LW5		
		10/8/12	10:18	LW5		
		10/10/12	22:14	LW5		
		10/14/12	20:21	LW5		
		10/17/12	03:56	LW5		
		10/18/12	22:38	LW5		
Linwood	Tabby cat with very bold, swirling dark pattern on sides. Light patch on chest with dark stripe above it and stripe coming down from eyes. Bold stripe on each front leg. Pattern makes three bold lines down back.	10/12/12	23:07	LW5	2	
		10/12/12	23:12	LW5		
		10/14/12	04:11	LW5		
Linwood	Solid black cat. Thicker hair. No distinguishing features.	10/14/12	04:06	LW5	2	
		10/15/12	13:54	LW3		
		10/14/12	04:10	LW5		




Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	# Recap.	
Linwood	Black and white cat. Face is black around eyes/ears, white around mouth. Neck is partly black, but left shoulder is white. Front left leg is black past shoulder; front right leg is white. Body is black, and tops of back legs are black with lower part being white. Tail is black.	10/15/12	17:03	LW4	1	
		10/15/12	18:54	LW5		
Linwood	Tabby pattern cat with white belly and white under throat. Front legs are dark patterned, but back left is light colored. Seen from a distance.	10/20/12	00:15	LW4	1	
		10/20/12	19:38	LW4		
Lake Como	Black and white cat. Face is black over eyes and ears, white between eyes and around mouth. Front left leg is white with black band, front right is all white. Back is black and white mix. Back legs are mostly white with black patches; back left is mostly black with white paw. No tail.	10/8/12	20:38	LC1	6	
		10/8/12	20:37	LC2		
		10/9/12	03:57	LC2		
		10/13/12	04:52	LC2		
		10/8/12	20:15	LC4		
		10/8/12	20:11	LC5		
		10/12/12	23:17	LC5		




Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	# Recap.	
Lake Como	Tabby pattern. Light inner legs. Front right has bold stripe on inner leg. End of tail has bold stripe. One ring/stripe around neck.	10/8/12	23:46	LC2	9	
		10/18/12	01:31	LC1		
		10/20/12	22:23	LC1		
		10/20/12	22:17	LC2		
		10/8/12	20:51	LC4		
		10/8/12	23:46	LC4		
		10/8/12	20:49	LC5		
		10/11/12	07:51	LC5		
		10/11/12	19:54	LC5		
Lake Como	Solid black, has a thin light band around neck (maybe a collar?).	10/8/12	17:03	LC3	1	
		10/13/12	18:37	LC5		
Lake Como	Black cat. White paws. White under chin/neck and belly. White spot on back right leg.	10/8/12	00:37	LC5	5	
		10/14/12	21:56	LC2		
		10/18/12	00:08	LC2		
		10/14/12	21:57	LC3		
		10/18/12	00:10	LC3		
		10/14/12	21:58	LC5		
Lake Como	Tabby patterned cat. Back legs are either white or shaved on lower halves.	10/17/12	21:16	LC1	1	
		10/17/12	21:06	LC5		





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	# Recap.	
Lake Como	Mixed pattern. Right side has swirled pattern with one large spot slightly offset above back leg. Tail is striped with dark end, light stripe, dark stripe, then kind of gray. Neck looks darker behind ears.	10/18/12	01:40	LC1	1	
		10/18/12	01:29	LC2		
S Z Boaz	Dark and light mixed swirl pattern (not like tabby) with longer haired. Tail has very dark end. Looks very skinny and only 10-12 inches high at shoulder.	10/13/12	04:39	SZ2	0	
S Z Boaz	Seen at a distance, but looks rather tall. Mostly dark colored with some subtle mingled pattern. All light colored paws.	10/12/12	03:25	SZ3	0	
SZ Boaz	Tabby cat with dark tip on tail. Relatively short (12 in. or so). Light colored lower half of back left leg.	10/14/12	09:49	SZ3	1	
		10/20/12	16:09	SZ5		
SZ Boaz	Solid black cat, very skinny. Perhaps only 12-14 inches tall at top of head.	10/19/12	22:18	SZ3	1	
		10/19/12	22:02	SZ4		





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	# Recap.	
SZ Boaz	Solid light colored cat. Shorter hair. No obviously distinguishing features.	10/19/12	22:15	SZ4	0	
Lincoln	Tabby cat with three bold stripes on each front leg. One bold stripe on back right leg, solid below that. Body pattern is lighter, with darker line along back.	10/23/12	02:03	LN1	1	
		10/28/12	20:28	LN1		
Lincoln	Black cat. Solid colored. Less than 12 inches tall at shoulders when walking.	10/21/12	19:49	LN5	13	
		11/3/12	19:01	LN1		
		11/3/12	21:22	LN2		
		10/25/12	01:00	LN3		
		10/29/12	18:58	LN3		
		10/31/12	22:28	LN4		
		10/21/12	23:39	LN5		
		10/24/12	23:20	LN5		
		10/25/12	23:27	LN5		
		10/27/12	06:46	LN5		
		10/27/12	20:44	LN5		
		10/28/12	21:02	LN5		
10/31/12	21:07	LN5				
11/2/12	04:57	LN5				
Lincoln	Cat seems to have Siamese pattern. Lighter body with darker tail, legs, and some dark fur on back.	10/23/12	05:04	LN5	2	
		10/30/12	01:26	LN3		
		10/30/12	01:28	LN4		




Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	# Recap.	
Lincoln	Dark and light mixed pattern. Dark is swirled on left side and tail has 4 dark stripes.	10/23/12	21:28	LN5	0	
Lincoln	Dark tabby pattern with white back right leg and white under neck.	10/31/12	03:51	LN5	0	
Buck Sansom	Black cat with white under chin and stomach. Legs look mostly solid black, but one is white on back. Paws not visible because of grass. A little over 12 inches tall at shoulders.	10/21/12	22:45	BS2	18	
		10/24/12	00:03	BS1		
		10/27/12	20:36	BS1		
		10/30/12	20:34	BS1		
		11/2/12	22:53	BS1		
		10/27/12	19:19	BS3		
		10/27/12	20:35	BS3		
		10/29/12	21:31	BS3		
		11/2/12	21:09	BS3		
		11/4/12	07:50	BS3		
		10/23/12	00:50	BS5		
		10/24/12	16:11	BS5		
		10/26/12	14:24	BS5		
		10/26/12	20:57	BS5		
		10/27/12	20:39	BS5		
10/28/12	21:15	BS5				
10/29/12	21:36	BS5				
10/30/12	23:55	BS5				
10/31/12	21:54	BS5				
Mosque Point	Siamese pattern, short haired cat. Light body with darker tail and face. Legs are also darker, especially on back sides and top of paws.	10/22/12	03:55	MP1	6	
		10/27/12	08:39	MP1		
		11/3/12	20:02	MP3		
		10/22/12	03:49	MP5		
		10/24/12	21:27	MP5		
		10/31/12	08:36	MP5		
		11/1/12	02:14	MP5		





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	# Recap.	
Mosque Point	Tabby cat. Lighter solid fur under neck and on bottom of back legs. Legs have bold strips before turning white on bottom. Tail covered in dark stripes.	10/21/12	21:21	MP4	10	
		10/26/12	23:22	MP1		
		10/22/12	10:32	MP2		
		10/22/12	23:18	MP2		
		10/25/12	06:44	MP2		
		10/22/12	23:10	MP3		
		11/4/12	00:43	MP3		
		11/4/12	01:02	MP3		
		10/21/12	21:23	MP5		
		10/24/12	00:39	MP5		
		11/4/12	01:05	MP5		
Fairfax	Tabby cat. Skinny. Front right leg has one bold stripe, front left has many stripes. Back left leg has three bold stripes. Overall pattern is subtle. Short hair. Stands only about 10 inches high at shoulders.	11/5/12	13:29	FF2	3	
		11/7/12	05:12	FF2		
		11/8/12	15:31	FF2		
		11/17/12	12:52	FF4		
Fairfax	Solid looking, but may have some subtle pattern. Very dark fur. Thick/wide face. Less than 12 inches at shoulders (but still taller than FF110512.1).	11/5/12	14:05	FF2	12	
		11/6/12	08:07	FF2		
		11/6/12	10:45	FF2		
		11/7/12	08:18	FF2		
		11/8/12	15:13	FF2		
		11/6/12	10:09	FF3		
		11/6/12	10:20	FF3		
		11/6/12	10:47	FF3		
		11/10/12	09:04	FF4		
		11/12/12	08:44	FF4		
		11/13/12	08:46	FF4		
		11/6/12	08:04	FF5		
		11/6/12	18:23	FF5		

Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	# Recap.	
Prairie Dog	Light colored cat with some very light pattern on face. Almost 12 inches high at shoulders. Legs have light stripes, and sides have a light swirl pattern.	11/5/12	17:15	PD1	11	
		11/6/12	13:22	PD1		
		11/6/12	13:54	PD1		
		11/6/12	18:15	PD1		
		11/12/12	10:37	PD1		
		11/12/12	11:05	PD1		
		11/15/12	09:48	PD1		
		11/15/12	09:59	PD1		
		11/9/12	08:41	PD2		
		11/13/12	14:03	PD4		
		11/17/12	09:46	PD4		
		11/6/12	17:05	PD5		
Prairie Dog	Small black cat, less than 12 inches at shoulders and thin. Solid color on sides, back, and legs. Stomach seems lighter and has some white on underside of neck.	11/9/12	12:55	PD5	0	
Tandy Hills	Mostly black. White paws and white on chest and under neck. On left side, bottom part of snout is white. White on neck comes further up left side.	11/5/12	17:54	TH1	10	
		11/5/12	22:31	TH1		
		11/8/12	22:50	TH1		
		11/12/12	13:06	TH1		
		11/13/12	20:45	TH1		
		11/5/12	17:58	TH2		
		11/5/12	18:06	TH2		
		11/5/12	22:34	TH2		
		11/8/12	21:09	TH2		
		11/9/12	18:19	TH2		
				11/8/12		

Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	# Recap.	
Carter Park	Medium hair. Mostly white with dark patches on back of neck, above hind legs, and on back of each hind leg. Tail is dark with stripes. Top of head is darker around ears.	11/19/12	08:20	CR2	9	
		11/21/12	06:42	CR1		
		11/21/12	06:42	CR1		
		11/22/12	05:52	CR1		
		11/20/12	05:40	CR2		
		11/21/12	06:40	CR2		
		11/24/12	19:23	CR2		
		11/25/12	07:48	CR2		
		11/28/12	11:02	CR2		
	11/25/12	07:35	CR5			
Carter Park	White colored on legs and shoulders. Head/neck and back half of tail are slightly darker but solid colored. Face is even darker (looks tan or gray) as well as a patch on upper right front leg.	11/20/12	07:56	CR2	2	
		11/25/12	07:49	CR2		
		11/25/12	08:10	CR3		
Carter Park	Solid dark colored cat. Bushy tail and longer hair.	11/20/12	18:36	CR2	1	
		12/1/12	20:53	CR2		
Carter Park	Black and white cat. Legs, stomach, chin, and bottom half of neck are white. Head, ears, top of back, top half of legs and tail are black.	11/26/12	10:18	CR1	4	
		11/28/12	13:48	CR1		
		12/1/12	17:25	CR1		
		12/1/12	19:36	CR1		
		11/30/12	19:00	CR5		

Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	# Recap.	
Carter Park	Solid light colored cat. About 12 inches tall. Hair short-medium length.	11/30/12	22:14	CR2	0	
Kellis	White legs and neck/chin. Back, part of left side, and top of head and tail are dark striped.	11/18/12	18:18	KL1	1	
		11/24/12	09:00	KL4		
Kellis	Tabby cat. Very bold dark stripe on end of tail. Cat is about 12 inches high at shoulders.	11/19/12	21:48	KL2	1	
		11/21/12	21:39	KL4		
Kellis	Looks solid gray on body. Legs and tail have dark stripes like a tabby pattern.	11/25/12	04:11	KL4	1	
		11/29/12	19:01	KL1		

Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	# Recap.	
Foster	Solid black cat. Long shaggy hair. No other distinguishing features.	11/18/12	19:31	FO2	22	
		11/23/12	00:16	FO1		
		11/29/12	17:42	FO2		
		12/2/12	11:04	FO2		
		11/19/12	20:07	FO3		
		11/21/12	05:23	FO3		
		11/24/12	00:27	FO3		
		11/24/12	23:43	FO3		
		11/25/12	20:49	FO3		
		11/28/12	17:40	FO3		
		11/19/12	02:22	FO4		
		11/19/12	18:19	FO4		
		11/20/12	03:00	FO4		
		11/21/12	21:49	FO4		
		11/23/12	06:13	FO4		
		11/24/12	19:54	FO4		
		11/26/12	18:48	FO4		
		11/27/12	23:25	FO4		
		11/28/12	17:58	FO4		
		11/30/12	04:22	FO4		
12/2/12	05:56	FO4				
11/22/12	13:58	FO5				
11/25/12	21:19	FO5				
Foster	Tabby cat, very dark pattern. One very bold stripe on front left leg.	11/18/12	22:14	FO4	6	
		11/29/12	00:51	FO2		
		11/30/12	22:54	FO2		
		11/29/12	00:30	FO4		
		11/29/12	01:27	FO4		
		11/30/12	22:58	FO4		
		11/30/12	18:21	FO5		
Foster	Solid light colored cat. Short and thick.	11/26/12	18:55	FO2	0	

Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	# Recap.	
Foster	Solid dark color. Skinny build with short hair. Less than 12 inches tall at shoulders.	11/30/12	20:44	FO3	0	
Quail Ridge	Tabby pattern very mingled with stripes on front legs. Back right leg is solid light color on bottom. Bold stripe down back.	12/8/12	03:38	QR5	1	
		12/13/12	19:10	QR3		
Overton	Solid colored. Back stands about 10-12 inches high. Short-medium length hair. Fur too reflective to tell color, but no pattern present even on tail.	12/5/12	22:19	OV1	0	
Overton	Light tabby pattern. Short hair. No distinguishing features identifiable because only hind end seen.	12/10/12	20:24	OV2	0	

Appendix IV: Dog Catalog

Central Operating District

- Trinity Park (no dogs)
- Fort Worth Botanical Gardens (no dogs)
- Forest Park (no dogs)

North Operating District

- Quanah Parker Park (no dogs)
- Gateway Park (no dogs)
- Harmon Field Park.....62
- Lincoln Park.....82
- Buck Sansom Park.....83
- Mosque Point Park.....85

South Operating District





- Carter Park Site.....94
- Kellis Park.....97
- Foster Park.....100
- Quail Ridge Park.....101
- Overton Park.....104






East Operating District





- Sycamore Park.....60
- Cobb Park.....60
- Oakland Lake Park.....62
- Fairfax Park.....86
- Prairie Dog Park.....89
- Tandy Hills Park.....89




West Operating District



- Linwood Park.....63
- Lake Como Park.....66
- South Z Boaz Park.....69
- Oakmont Park.....104




Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Sycamore	Short, shaggy dark hair. Wearing harness.	9/20/12	01:30	SY4	1	
		9/20/12	01:32	SY5		
Sycamore	Bigger male dog. Short white fur. Looks part pit bull. Wearing collar.	9/20/12	18:30	SY4	1	
		9/20/12	18:31	SY5		
Sycamore	Seen with previous dog. Brown fur, black muzzle. Male. NO collar.	9/20/12	18:30	SY4	1	
		9/20/12	18:31	SY5		
Cobb	Taller dog. Shaggy hair looks brown or gray. Large pointy ears like Sheppard. Very thick build. NO Collar	9/18/12	20:17	CB3	4	
		9/20/12	01:24	CB3		
		9/16/12	23:27	CB4		
		9/18/12	03:21	CB4		
		9/19/12	04:59	CB5		




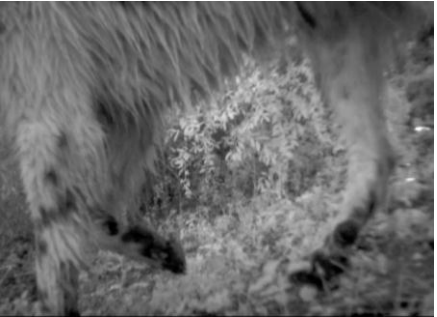
Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Cobb	Seen with previous dog. Black and lighter color mixed. Short hair. Tail light color underneath. NO collar	9/18/12	20:17	CB3	1	
		9/20/12	1:24 AM	CB3		
Cobb	German Sheppard. Rather skinny. Mingle of light and dark fur (on back). Tail is skinny. Face not seen. NO collar.	9/21/12	10:05	CB4	0	
Cobb	Male dog. Light colored short hair with black/dark brown muzzle. Wearing collar.	9/20/12	00:48	CB5	0	
Cobb	Male dog. Part of a small pack of 3. White/light colored dog with dark patch at base of tail. Short ears. NO collar.	9/20/12	01:36	CB5	0	
Cobb	Darker than previous dog, maybe light brown or gray fur. Male, short hair. About 20 inches high at shoulders. Black muzzle. NO collar.	9/20/12	01:36	CB5	0	





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Cobb	White dog with black patches over right eye and on right side and on tail. About 18 inches tall at shoulders. NO collar.	9/20/12	01:36	CB5	0	
Oakland Lake	Mostly black dog with white patches on neck. Male. Very shiny short hair. Has collar.	9/15/12	22:54	OL4	0	
Harmon Field	Looks like a Sheppard. Brown with black saddle pattern. Skinny looking. Dark muzzle. NO collar.	10/3/12	02:16	HF1	4	
		9/24/12	03:32	HF2		
		9/26/12	16:29	HF4		
		9/27/12	20:16	HF4		
		10/6/12	01:47	HF4		
Harmon Field	Light colored dog with dark muzzle. Skinny. With Sheppard. NO collar.	9/24/12	03:32	HF2	2	
		9/25/12	20:33	HF4		
		9/25/12	22:48	HF4		


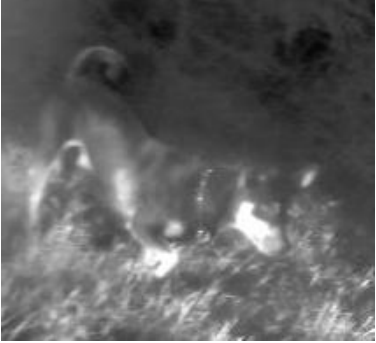


Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Harmon Field	Hound looking dog, longer ears. Solid light color with short hair. NO collar.	9/24/12	06:11	HF2	16	
		9/27/12	20:58	HF2		
		9/30/12	13:25	HF2		
		9/30/12	13:43	HF2		
		9/30/12	20:11	HF2		
		10/2/12	18:49	HF2		
		10/4/12	07:11	HF2		
		10/4/12	19:34	HF2		
		10/6/12	05:49	HF2		
		9/23/12	20:11	HF4		
		9/24/12	06:10	HF4		
		9/24/12	20:24	HF4		
		9/24/12	23:10	HF4		
		9/28/12	01:34	HF4		
		10/1/12	00:22	HF4		
10/1/12	20:23	HF4				
10/2/12	18:57	HF4				
Harmon Field	Solid black dog. Looks like a lab. NO collar.	9/28/12	09:58	HF2	0	
Linwood	Face looks like pit bull. Brown on back, with white patches on neck, chest, and legs. White line between eyes and white muzzle. NO collar.	10/7/12	13:28	LW1	11	
		10/7/12	15:47	LW1		
		10/7/12	15:50	LW1		
		10/10/12	00:59	LW1		
		10/12/12	04:04	LW1		
		10/15/12	18:24	LW1		
		10/19/12	13:32	LW1		
		10/10/12	00:32	LW2		
		10/10/12	01:57	LW3		
		10/7/12	13:35	LW4		
		10/10/12	01:08	LW5		
	10/12/12	02:45	LW5			





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Linwood	Solid brown or tan dog with cut off tail. NO collar.	10/7/12	15:32	LW1	3	<p>(furthest dog)</p> 
		10/8/12	22:55	LW3		
		10/12/12	03:05	LW3		
		10/11/12	00:27	LW4		
Linwood	Shaggy haired dog. Outside of back legs are black, white under belly, inside of back legs, bottom of front legs, and on neck. White spot on nose. Wearing collar.	10/7/12	23:37	LW1	26	
		10/7/12	23:42	LW1		
		10/8/12	01:08	LW1		
		10/8/12	01:30	LW1		
		10/9/12	00:53	LW1		
		10/9/12	09:07	LW1		
		10/9/12	19:20	LW1		
		10/9/12	21:02	LW1		
		10/10/12	01:04	LW1		
		10/10/12	03:19	LW1		
		10/11/12	03:10	LW1		
		10/11/12	05:09	LW1		
		10/11/12	05:58	LW1		
		10/12/12	02:06	LW1		
		10/12/12	04:00	LW1		
		10/7/12	23:41	LW2		
		10/10/12	00:32	LW2		
		10/11/12	01:10	LW2		
		10/8/12	22:55	LW3		
		10/9/12	20:50	LW3		
		10/10/12	01:57	LW3		
		10/11/12	01:10	LW3		
		10/12/12	03:05	LW3		
10/11/12	00:27	LW4				
10/10/12	01:08	LW5				
10/11/12	00:38	LW5				
10/12/12	01:00	LW5				




Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Linwood	Light colored dog with dark markings on face around eyes and muzzle. Has short ears folded over. Seen with pit bull. Wearing collar.	10/10/12	00:59	LW1	16	
		10/10/12	21:19	LW1		
		10/11/12	23:57	LW1		
		10/12/12	00:56	LW1		
		10/12/12	09:27	LW1		
		10/10/12	00:32	LW2		
		10/8/12	22:55	LW3		
		10/11/12	01:10	LW3		
		10/12/12	03:05	LW3		
		10/11/12	00:27	LW4		
		10/12/12	02:44	LW4		
		10/20/12	00:28	LW4		
		10/9/12	21:07	LW5		
		10/10/12	01:08	LW5		
		10/11/12	00:38	LW5		
10/12/12	1:00	LW5				
10/12/12	02:45	LW5				
Linwood	Short haired, mostly solid brown/gray dog with white front right leg and white spot on tip of nose. Pointy ears. NO collar.	10/7/12	11:45	LW2	2	
		10/7/12	11:43	LW3		
		10/7/12	23:46	LW3		
Linwood	Longer haired dog. Looks black/brown and white. Back half is mostly black, neck is white with black spots. Front left leg is white, lower half of right front is white. NO collar.	10/11/12	01:10	LW2	1	
		10/11/12	00:14	LW5		




Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Linwood	Very small black dog. Fluffy fur. Less than 10 inches tall. Wearing collar.	10/12/12	18:11	LW4	1	
		10/18/12	18:23	LW4		
Linwood	Medium colored dog with pointy ears and curly tail. Front legs lighter color. Wearing collar.	10/18/12	07:42	LW4	4	
		10/18/12	07:58	LW4		
		10/18/12	08:08	LW4		
		10/18/12	08:50	LW4		
		10/18/12	07:43	LW5		
Linwood	Black dog with white on muzzle and front legs. White spots on chest. Short hair. Very thick dog with collar.	10/20/12	00:29	LW4	0	
Lake Como	Long, shaggy matted hair. Overall light color with dark spots. Bottom half seen as runs by. Looks skinny. NO collar.	10/8/12	15:39	LC1	0	





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Lake Como	Black dog with longer hair. Very shaggy tail that curls over back. NO collar.	10/8/12	01:36	LC4	1	
		10/8/12	02:53	LC4		
Lake Como	Longer haired light colored male dog. Smooth coat. Looks like a retriever mix. Seen with previous dog. NO collar.	10/8/12	01:36	LC4	0	
Lake Como	Mid-sized black/dark brown dog with short hair and smaller pointy ears. Maybe bobbed tail. NO collar.	10/8/12	02:53	LC4	2	(furthest dog) 
		10/12/12	17:52	LC4		
		10/11/12	03:59	LC5		
Lake Como	Another black/dark colored dog with shorter hair. Female. Seen with previous dog. NO collar.	10/8/12	02:53	LC4	1	
		10/11/12	03:59	LC5		





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Lake Como	Lighter colored dog with thick, matted longer hair. Solid color. Seen with previous 2 dogs. NO collar.	10/8/12	02:53	LC4	2	
		10/12/12	17:52	LC4		
		10/11/12	03:59	LC5		
Lake Como	Small black and lighter colored dog. Lighter chest and front legs. Looks like a mini pinscher. Less than 10 inches tall. Curly tail and pointy ears. Wearing spiked collar.	10/8/12	07:56	LC4	6	
		10/9/12	07:53	LC4		
		10/8/12	07:57	LC5		
		10/9/12	07:52	LC5		
		10/10/12	16:10	LC5		
		10/15/12	10:31	LC5		
Lake Como	Short white dog with fluffy, clumped hair. Solid color. Approx. 10 inches tall. NO collar.	10/8/12	07:56	LC4	2	
		10/12/12	17:49	LC5		
		10/15/12	10:31	LC5		
Lake Como	Short black dog with white on chest/belly. Short hair. Floppy ears. Seen with 3 larger dogs without collars. Wearing thin collar.	10/8/12	07:56	LC4	3	
		10/9/12	07:53	LC4		
		10/11/12	03:59	LC5		
		10/15/12	10:31	LC5		




Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Lake Como	Big, thick dog. Mostly white with one big dark spot on left side and dark face (except for muzzle). Legs on left have small dark patches mingled in. Bushy tail curls over back. Wearing thick dark collar.	10/8/12	15:34	LC4	3	
		10/12/12	14:30	LC4		
		10/8/12	15:30	LC5		
		10/19/12	13:25	LC5		
Lake Como	Short haired white dog. Has large dark patches (one on left shoulder, left hind end and right hind end). Face is dark on eyes and ears with white line between eyes and white muzzle. NO collar.	10/9/12	17:01	LC4	0	
Lake Como	Short black dog with curly tail. Solid color. No visible collar.	10/15/12	11:05	LC5	2	
		10/17/12	11:21	LC5		
		10/18/12	14:06	LC5		
SZ Boaz	Small black dog, about 8 inches tall. Thick body with fluffy hair, very short legs. Wearing collar.	10/7/12	14:03	SZ1	0	





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
SZ Boaz	Shaggy lighter colored dog. About 10 inches tall with long hair, solid color looks tan or light gray. Ears slightly darker. Wearing collar.	10/8/12	08:00	SZ1	2	
		10/8/12	10:03	SZ3		
		10/8/12	10:09	SZ4		
SZ Boaz	Stocky dog. Mostly black with white on hind end and around neck. Medium hair.	10/8/12	08:49	SZ1	0	
SZ Boaz	Lighter colored dog. Tan maybe, with lighter band around neck and between eyes. Looks like beagle/basset/pug (short muzzle) mix. Very stocky, long but short. Tail curls up. Wearing collar.	10/8/12	08:49	SZ1	8	
		10/8/12	08:49	SZ2		
		10/8/12	08:46	SZ3		
		10/8/12	08:46	SZ4		
		10/11/12	07:21	SZ4		
		10/15/12	09:05	SZ4		
		10/16/12	07:47	SZ4		
		10/19/12	08:00	SZ4		
		10/19/12	08:02	SZ5		




Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
SZ Boaz	Bigger dog with shorter hair. White with mingled in pale spots all over. One dark band at base of tail and dark around eyes and ears with one light patch on top of head. Wearing collar.	10/8/12	09:36	SZ1	2	
		10/15/12	07:35	SZ4		
		10/8/12	09:36	SZ2		
SZ Boaz	Shaggy haired light colored dog. Looks like a hound/retriever mix. About 18 inches tall. Wearing collar.	10/8/12	10:18	SZ1	7	
		10/10/12	11:08	SZ1		
		10/8/12	10:16	SZ2		
		10/8/12	10:21	SZ2		
		10/8/12	11:19	SZ2		
		10/8/12	10:50	SZ3		
		10/10/12	11:09	SZ4		
SZ Boaz	Shorter haired big dog. White with slightly darker spots mingled in all over. Tail has one dark band at base of tail. Ears and one spot on top of head are dark, but rest of face is white. Seen with previous dog. Wearing collar.	10/8/12	10:18	SZ1	4	
		10/8/12	10:05	SZ2		
		10/8/12	10:21	SZ2		
		10/10/12	11:09	SZ2		
		10/10/12	11:09	SZ4		





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
SZ Boaz	Larger black dog. Short hair. Ears pointy but flop over. Wearing collar with white cloth hanging from it.	10/10/12	18:57	SZ1	7	
		10/10/12	10:25	SZ2		
		10/16/12	09:03	SZ2		
		10/16/12	17:10	SZ2		
		10/16/12	11:17	SZ4		
		10/10/12	10:23	SZ3		
		10/18/12	09:13	SZ3		
		10/8/12	10:21	SZ2		
SZ Boaz	Dog about 15 inches tall at shoulders. Mostly light colored. Front feet are white on bottom, but tail is darker colored on top with white tip. Short hair on body, but tail has longer fringe. Wearing collar.	10/9/12	10:37	SZ2	1	
		10/12/12	10:18	SZ4		
SZ Boaz	Large short haired black dog. Has lighted mingled band on back of neck and bottom of front feet have lighter color mingle. Male dog, slender tail and ears. Wearing collar.	10/10/12	10:38	SZ2	0	
SZ Boaz	Shaggy haired dog. About 18 inches at shoulders. Very bushy tail. Coat mostly light colored with darker end on muzzle. Wearing collar.	10/12/12	08:58	SZ2	1	
		10/12/12	08:56	SZ3		





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
SZ Boaz	Shaggy darker colored dog. Seen with previous dog. Very bushy tail. Mingled coat with darker muzzle. Wearing collar.	10/12/12	08:58	SZ2	2	
		10/12/12	08:56	SZ3		
		10/14/12	09:16	SZ3		
SZ Boaz	Light colored, taller Chihuahua looking dog. Solid coat. Wearing collar.	10/13/12	02:48	SZ2	0	
SZ Boaz	Sheppard looking dog. Coat mostly solid medium color with black band on top of tail and darker color around ears. Wearing collar.	10/15/12	10:45	SZ2	1	
		10/10/12	09:26	SZ4		
SZ Boaz	Large black dog (Rottweiler build) with brown/dark gray back legs. Wearing large collar.	10/17/12	11:05	SZ2	0	




Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
SZ Boaz	Medium sized, skinny short haired dog. White fur with some mingled spots. Ears and around eyes are black/brown (makes a peak between eyes) but muzzle is white. Wearing collar.	10/18/12	01:41	SZ2	1	
		10/18/12	13:50	SZ3		
SZ Boaz	Black lab, very thick build. Coat solid except for very tip of tail, which looks white. Wearing darker collar.	10/18/12	13:41	SZ2	3	
		10/14/12	10:46	SZ4		
		10/18/12	14:03	SZ4		
		10/18/12	11:17	SZ5		
SZ Boaz	Very small black and brown Chihuahua. Legs and bottom jaw are brown, rest of body is black. Wearing collar.	10/18/12	18:28	SZ2	2	
		10/18/12	18:26	SZ5		
		10/19/12	18:08	SZ5		





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
SZ Boaz	Large black dog with floppy ears. Short hair with white on chest. Over 20 inches tall at shoulders. Cut off tail. Wearing white/light color collar.	10/20/12	08:35	SZ2	4	
		10/8/12	08:00	SZ4		
		10/10/12	07:56	SZ4		
		10/11/12	07:30	SZ4		
		10/18/12	07:54	SZ5		
SZ Boaz	Same as previous dog (seen with it). Solid black. Large/thick body. Cut off tail. Wearing collar.	10/20/12	08:35	SZ2	3	
		10/8/12	08:00	SZ4		
		10/10/12	07:56	SZ4		
		10/18/12	07:54	SZ5		
SZ Boaz	Tall short haired dog. Body and tail (except tip) are light color. Feet are white and neck is all white down to shoulder. Ears are darker color again. Wearing collar.	10/11/12	12:06	SZ3	1	
		10/11/12	12:05	SZ4		
SZ Boaz	Longer haired Chihuahua mix. Looks white or light creamy color. NO collar.	10/15/12	13:05	SZ3	1	
		10/15/12	13:01	SZ4		





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
SZ Boaz	Very fluffy dog. Fur several inches long. Tail fluffy but short. Darker fur on back, tail, and face. Lighter on legs, belly, neck. Wearing collar.	10/8/12	08:35	SZ4	1	
		10/19/12	08:36	SZ4		
SZ Boaz	Light colored medium sized dog with hound face. End of muzzle and tip of tail are white. Top of tail has black stripe down it. Wearing collar.	10/8/12	11:19	SZ4	0	
SZ Boaz	Pit bull looking dog. Dark on most of body. Front legs and neck are white. Face is white on right half except circle around eye and spot on ear. Left side is brown from ear to eye. Wearing collar.	10/10/12	15:09	SZ4	5	
		10/14/12	09:58	SZ4		
		10/17/12	10:05	SZ4		
		10/18/12	08:54	SZ4		
		10/19/12	08:59	SZ5		
		10/11/12	10:06	SZ4		




Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
SZ Boaz	Lighter colored dog with mingled, medium length fur. Very skinny. Tail has long fluffy hair. Ears and around eyes is darker than neck/legs. Wearing collar.	10/10/12	19:02	SZ4	0	
SZ Boaz	Male dog about 15 inches tall at shoulder. Very slender build like a young whippet. Tail cut off. Mostly white with two large slightly darker patches. Around ears and eyes and tip of nose are darker too. Wearing dark collar.	10/11/12	07:21	SZ4	1	
		10/19/12	08:02	SZ5		
SZ Boaz	Resembles a border collie. Longer hair. Lower half and neck is white. Back is mingle of colors, and around ears looks black. Wearing collar.	10/11/12	09:38	SZ4	0	
SZ Boaz	Small light colored dog. Resembles a Yorkie. Only about 8 inches high at shoulder. With 2 others. Wearing collar.	10/15/12	07:48	SZ4	0	





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
SZ Boaz	Very similar to previous dog. Small Yorkie-like dog. Color medium range. Wearing collar.	10/15/12	07:48	SZ4	0	(furthest dog) 
SZ Boaz	Small shaggy dog. Only about 10 inches tall. Fur is medium colored. Wearing collar.	10/15/12	07:48	SZ4	0	
SZ Boaz	Black dog with short hair. Slender build and only about 18 inches tall at shoulders. Pointy, floppy ears. Some lighter markings on chest. Wearing white collar.	10/16/12	10:16	SZ4	2	
		10/16/12	11:00	SZ5		
		10/18/12	09:16	SZ4		
SZ Boaz	Dog about 18 inches tall. Medium length light hair, solid color all over. No other distinguishing features. Wearing collar.	10/16/12	11:17	SZ4	2	
		10/18/12	11:19	SZ4		
		10/19/12	17:15	SZ5		




Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
SZ Boaz	Dog about 18 inches tall with medium length hair that looks light brown. Ears are darker color than body. Only front half is seen. Wearing collar.	10/16/12	11:17	SZ4	0	
SZ Boaz	Dog about 15 inches tall. Mostly white with dark band around base of tail and dark ears. Hair medium length. Seen with previous 2 dogs. Wearing collar.	10/16/12	11:17	SZ4	1	
		10/19/12	17:15	SZ5		
SZ Boaz	Black lab. Smaller build than previous lab. Solid colored coat. Wearing light colored collar with round tag.	10/18/12	13:42	SZ4	1	
		10/18/12	13:39	SZ5		





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
SZ Boaz	Taller, skinny male dog with mostly white coat. Darker spots mingled all over. Ears, around eyes, and half of muzzle is black. Tip of muzzle around nose is darker as well. Wearing dark collar.	10/18/12	13:49	SZ4		
		10/18/12	14:06	SZ4		
		10/18/12	13:38	SZ5	2	
SZ Boaz	Small light colored dog. Resembles a Chihuahua in body and tail, but face has more terrier features. NO collar.	10/19/12	09:34	SZ4	0	
SZ Boaz	Mostly black dog. White patch on neck/belly and all feet are white. Wearing collar.	10/19/12	10:26	SZ4	0	
SZ Boaz	German Sheppard. Black saddle pattern with lighter legs and ears/eyes. Muzzle is black as well. Wearing collar and chain.	10/19/12	11:18	SZ4	0	




Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
SZ Boaz	Medium sized (about 18 inches tall) light colored dog. Solid color coat. Short muzzle like a pug mix. Short, cut-off tail. Wearing collar and bandana.	10/19/12	11:58	SZ4	1	
		10/14/12	14:04	SZ5		
SZ Boaz	Solid black dog. Perhaps a lab mix. Looks very young. Large floppy ears. Wearing collar with triangle pattern.	10/21/12	07:39	SZ4	0	
SZ Boaz	Black Scottie dog about 15 inches high at shoulder. Wearing light colored collar.	10/15/12	09:16	SZ5	2	
		10/16/12	13:06	SZ5		
		10/18/12	08:54	SZ5		
SZ Boaz	Small tan colored dog. Has lighter band around neck, on bottom of legs, and on tip of nose. Tail is darker except for light tip. About 15 inches high at shoulders. Wearing collar.	10/17/12	11:04	SZ5	0	




Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Lincoln	White dog with wolf-like face (longer narrow muzzle with pointy ears). Bushier tail curls up. NO collar.	10/26/12	09:47	LN1	5	
		10/26/12	9:43 AM	LN5		
		10/27/12	12:25 AM	LN5		
		10/27/12	12:45 AM	LN5		
		10/27/12	2:42 AM	LN5		
		10/27/12	7:18 PM	LN5		
Lincoln	Tall, lean dog. Mostly black short hair with some lighter patches on underside of neck and muzzle, lower chest, and lower half of each leg. Wearing collar with dangling charm.	10/21/12	12:37	LN5	4	
		10/21/12	13:19	LN5		
		10/21/12	13:25	LN5		
		10/27/12	11:12	LN5		
		11/3/12	09:28	LN5		
Lincoln	Golden retriever. Bushy tail, solid light colored longer fur. NO collar.	10/24/12	20:32	LN5	1	
		10/28/12	23:59	LN5		





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Lincoln	Solid black dog. Rather tall with square jaw build. Wearing collar.	10/25/12	08:49	LN5	3	
		10/25/12	12:41	LN5		
		10/25/12	13:07	LN5		
		10/26/12	15:03	LN5		
Lincoln	Dog with Sheppard build but solid light color. Looks thin around ribs. Medium length hair with shaggier tail. NO collar.	10/26/12	09:43	LN5	0	(Left dog) 
Lincoln	Looks very similar to previous dog. Sheppard build. Mostly light colored with darker tint on shoulders and on top of tail. Thicker build. Medium length hair. NO collar.	10/26/12	09:43	LN5	1	(Right dog) 
	10/26/12	15:26	SZ5			
Buck Sansom	Taller, leaner solid black dog. Seen from a distance but seems to have lighter color on muzzle. Wearing collar.	10/24/12	13:43	BS1	8	(Left dog) 
		10/27/12	10:16	BS1		
		10/27/12	10:15	BS3		
		11/3/12	09:29	BS4		
		10/24/12	14:09	BS5		
		10/26/12	15:36	BS5		
		10/26/12	15:57	BS5		
		10/28/12	22:06	BS5		
	10/31/12	14:13	BS5			




Park	Description	Captures (initial in bold)				Total Recap.	Photograph
		Date	Time	Loc.			
Buck Sansom	Very thick black dog. Built like a heavy lab. Small white patch on chest. Wearing collar.	10/24/12	13:43	BS1	18		
		10/26/12	15:37	BS1			
		10/27/12	10:16	BS1			
		10/31/12	02:24	BS1			
		10/31/12	02:35	BS1			
		10/31/12	04:01	BS1			
		10/31/12	00:07	BS3			
		10/31/12	02:32	BS3			
		10/28/12	22:07	BS4			
		10/24/12	13:42	BS5			
		10/24/12	14:09	BS5			
		10/26/12	15:36	BS5			
		10/26/12	15:57	BS5			
		10/28/12	22:06	BS5			
		10/30/12	18:06	BS5			
		10/30/12	18:20	BS5			
		10/31/12	00:11	BS5			
10/31/12	02:34	BS5					
10/31/12	14:13	BS5					
Buck Sansom	Tall dog. Mostly a medium color with dark, square muzzle. Short ears. Wearing collar.	10/27/12	10:16	BS1	3		
		10/27/12	10:15	BS3			
		10/28/12	09:32	BS3			
		10/28/12	09:37	BS5			
Buck Sansom	Looks like a Boston terrier mix. About 15 inches tall at shoulders. Back and back legs are black. Tail cut off. Front legs, chest and neck are white. Face and ears are black except for short muzzle. Wearing collar.	10/28/12	16:29	BS1	3		
		10/28/12	17:01	BS1			
		10/28/12	16:34	BS4			
		10/28/12	16:33	BS5			





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Buck Sansom	Small Chihuahua looking dog. Mostly black on back and upper legs as well as ears and eyes. Lighter colored muzzle, tail, and lower legs. NO collar.	10/23/12	17:30	BS3	5	
		10/24/12	02:56	BS3		
		10/25/12	03:19	BS3		
		10/25/12	08:16	BS3		
		10/21/12	15:55	BS5		
		10/25/12	15:10	BS5		
Buck Sansom	Medium sized dog, about 18 inches at shoulders. Mostly medium brown color on back with slightly lighter coloring on feet and muzzle. Short floppy ears and curled tail. Wearing collar.	10/27/12	18:24	BS3	5	
		10/27/12	18:53	BS3		
		10/27/12	18:30	BS4		
		10/27/12	18:55	BS4		
		10/27/12	18:28	BS5		
		10/27/12	18:52	BS5		
Mosque Point	Light solid colored dog. Over 20 inches tall at shoulders. Has short floppy ears. Wearing darker collar.	10/28/12	08:01	MP1	2	
		10/25/12	06:56	MP5		
		10/27/12	08:21	MP5		
Mosque Point	German Sheppard. Black saddle pattern with thick fur. Lighter neck and legs with darker ears, muzzle (very dark), and tail. Wearing collar.	10/23/12	10:14	MP2	4	
		10/26/12	08:41	MP2		
		11/3/12	09:19	MP2		
		10/28/12	08:56	MP4		
		10/26/12	08:20	MP5		





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Fairfax	Black and white dog resembling a border collie. Back, top of legs, and ears are black. White neck, legs, between eyes, and on muzzle. NO collar.	11/8/12	21:18	FF1	0	
Fairfax	Mingled pattern, white around shoulders with slightly darker color mixed onto back, tail, and legs. Ears are darker as well as around the right eye. Rest of face is white. Wearing collar.	11/7/12	17:01	FF2	1	
		11/7/12	17:12	FF4		
Fairfax	Bigger dog, about 20 inches tall at shoulders. Black and either gray or brown mingled. Black is dominant color on back and sides with spots on neck, face, and legs. Under neck is white. NO collar.	11/10/12	02:44	FF2	0	





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Fairfax	Large dog with square muzzle/head. Very mingled pattern with white around neck/shoulders. Back, legs, and tail are mingle of darker colors. Head is solid dark color around ears and eyes. Muzzle has some white on top. Wearing color with metal buttons/spikes.	11/7/12	17:18	FF3	2	
		11/7/12	17:12	FF4		
		11/7/12	17:20	FF5		
Fairfax	Solid medium colored dog. Around 18 inches at shoulders with short ears. Wearing harness but no collar.	11/7/12	17:18	FF3	1	
		11/7/12	17:25	FF3		
Fairfax	German Sheppard build with solid light colored body. Muzzle and ears are black. Wearing collar.	11/6/12	14:58	FF4	1	
		11/6/12	14:57	FF5		





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Fairfax	Small Chihuahua mix. Mostly black with lighter color on legs, one stripe over each leg on right side, end of tail, and muzzle. NO collar.	11/8/12	10:40	FF4	1	
		11/11/12	10:35	FF4		
Fairfax	German Sheppard with traditional saddle pattern. Lighter legs and face (except for dark muzzle). NO collar.	11/11/12	20:09	FF4	1	
		11/17/12	4:05 PM	FF4		
Fairfax	Black dog. Thick build. NO collar.	11/16/12	01:33	FF4	0	
Fairfax	German Sheppard with solid black back, tail, and upper legs. Lower legs, jaws, and top of muzzle are lighter. NO collar.	11/6/12	14:57	FF5	0	

Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Prairie Dog	Larger dog with short hair. Back and sides are almost black but legs, tail, and face (expect for edges of muzzle) are lighter color. Short ears. NO collar.	11/11/12	06:52	PD1	2	
		11/17/12	06:51	PD2		
		11/10/12	07:17	PD4		
Prairie Dog	Slender build. Solid black on back and head. White belly and bottom of front legs. One white patch on very top of head. Short floppy ears. NO collar.	11/17/12	06:51	PD2	4	
		11/17/12	15:48	PD2		
		11/17/12	15:45	PD3		
		11/17/12	15:59	PD4		
		11/17/12	06:50	PD5		
Tandy Hills	Shaggy haired black dog. Solid color except for front legs and bottom of back legs, which are white/gray. Wearing collar.	11/8/12	12:39	TH1	0	




Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Tandy Hills	Solid black dog. Medium length hair. NO collar.	11/18/12	01:04	TH1	0	
Tandy Hills	Medium sized dog with mingled pattern. Mostly white but with large dark spot on shoulders and other smaller spots. Head is all dark color as is hind end. NO collar.	11/18/12	01:04	TH1	0	
Tandy Hills	Dog with very fluffy light colored hair. Thick build. Wearing dark collar.	11/13/12	08:32	TH2	0	
Tandy Hills	Large black lab. Solid color and thick build. Wearing collar.	11/4/12	10:33	TH4	5	
		11/4/12	10:34	TH4		
		11/4/12	10:56	TH4		
		11/17/12	10:19	TH4		
		11/17/12	14:25	TH4		
		11/10/12	10:07	TH5		




Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Tandy Hills	Medium colored dog (gray or brown) with short hair. Face resembles pit bull. Wearing white collar.	11/4/12	17:13	TH4	0	
Tandy Hills	Black and white dog. Body is black except for chest and stomach. Short muzzle and legs like a bull dog build. Wearing white collar.	11/4/12	17:13	TH4	0	
Tandy Hills	Black dog with short hair. White on very top of head and lower legs. Pointed ears. Wearing regular collar and shock collar.	11/5/12	07:27	TH4	2	
		11/8/12	07:58	TH4		
		11/13/12	08:02	TH4		
Tandy Hills	Black and white short haired dog. Body is black, but chest, legs, tip of tail, and half of neck are white. Wearing black collar.	11/5/12	07:27	TH4	3	
		11/5/12	13:14	TH5		
		11/8/12	07:23	TH5		
		11/8/12	07:58	TH4		





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Tandy Hills	Short haired dog with very mingled coat. Looks shades of gray or brown. Skinny dog under 18 inches high at shoulder. Wearing collar.	11/5/12	07:27	TH4	2	
		11/8/12	07:58	TH4		
		11/8/12	07:23	TH5		
Tandy Hills	Border collie. Black on back and sides as well as around ears. Legs are mostly white as well as tip of tail, neck, and muzzle. Wearing light colored collar.	11/6/12	10:46	TH4	4	
		11/7/12	11:55	TH4		
		11/8/12	11:37	TH4		
		11/11/12	16:29	TH4		
		11/5/12	13:14	TH5		
Tandy Hills	Black dog. Skinny with short hair. Looks solid colored. Wearing light colored collar.	11/8/12	07:58	TH4	0	
Tandy Hills	Sheppard looking dog. Black on back and sides but lighter legs, chest and face. Wearing collar.	11/13/12	09:44	TH4	0	




Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Tandy Hills	Looks like white lab. Solid color with medium length hair. Wearing chain.	11/13/12	16:09	TH4	0	
Tandy Hills	Large Chihuahua looking dog. Dark colored, some mingle. NO collar.	11/17/12	09:51	TH4	0	
Tandy Hills	Dog with a Sheppard looking face. Mingled medium color that fade from darker color on back to lighter shade on legs, neck, and tail. Face and ears are darker. Wearing collar.	11/4/12	10:34	TH5	0	
Tandy Hills	Dog is solid black. Pointy ears and shorter muzzle. No other colors apparent. Wearing collar.	11/9/12	08:01	TH5	0	




Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Tandy Hills	Solid medium colored dog with short hair. Wearing collar almost same shade as fur.	11/9/12	08:01	TH5	0	
Carter	Black dog. Shorter hair. Skinny tail with some lighter tint on bottom. At least 20 inches high at shoulders. Male. NO collar.	11/22/12	20:26	CR1	1	
		11/23/12	19:10	CR1		
Carter	Black dog with white markings on chest. Short floppy ears. Wide stance/stocky build. Less than 18 inches at shoulders. NO collar.	11/22/12	20:26	CR1	2	
		11/23/12	19:10	CR1		
		11/24/12	17:23	CR5		
Carter	Light-Medium colored dog with short hair. Darker around nose and end of ears. Short pointy ears. NO collar.	11/22/12	20:26	CR1	2	
		11/24/12	17:21	CR3		
		11/24/12	17:23	CR5		





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Carter	Looks like young lab. Solid light color. Longer ears. Wearing darker collar.	11/23/12	14:40	CR1	0	
Carter	Tall solid light colored dog. Short hair. Long skinny tail. Face resembles pit bull. Slender build. NO collar.	11/25/12	19:57	CR1	10	
		11/27/12	11:55	CR1		
		11/28/12	08:54	CR1		
		11/28/12	09:16	CR1		
		11/29/12	09:38	CR1		
		11/24/12	13:06	CR2		
		11/25/12	07:53	CR2		
		11/28/12	08:54	CR2		
		11/22/12	10:14	CR3		
		11/28/12	08:57	CR4		
	11/29/12	09:33	CR5			
Carter	Short dog about 15 inches tall. Stocky hound features. Mostly light colored on legs and neck but darker on back, sides, around ears and eyes, and bottom half of tail. NO collar.	11/25/12	07:57	CR1	8	
		11/28/12	08:54	CR1		
		11/28/12	09:16	CR1		
		11/29/12	09:38	CR1		
		11/24/12	13:06	CR2		
		11/25/12	07:53	CR2		
		11/28/12	08:54	CR2		
		11/28/12	08:57	CR4		
			11/29/12	09:33		





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Carter	Larger dog with slender build. Mostly white short fur with dark ears and dark band at base of tail. Male. NO collar.	11/27/12	10:11	CR1	0	
Carter	Black dog with Sheppard build. Small lighter patches on muzzle and lighter color on bottom of legs. NO color.	11/27/12	11:55	CR1	7	
		11/28/12	08:54	CR1		
		11/28/12	09:16	CR1		
		11/29/12	09:38	CR1		
		11/28/12	08:54	CR2		
		11/28/12	08:55	CR3		
		11/19/12	00:08	CR4		
		11/28/12	08:57	CR4		
Carter	Solid black short haired dog. Female. Looks very pregnant. NO collar.	11/19/12	00:08	CR4	1	
		11/19/12	00:11	CR5		





Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Carter	Looks like border collie in face. Mostly black with lighter legs, lightener fur around neck, and lighter muzzle. End of tail has lighter tip. NO collar.	11/19/12	00:08	CR4	1	
		11/19/12	00:11	CR5		
Carter	Longer haired light colored dog. Bushy tail and large floppy ears. NO collar.	11/18/12	18:08	CR5	0	
Carter	Larger solid medium colored dog. Squared face with shorter ears. Wearing chain.	11/23/12	07:06	CR5	1	
		11/29/12	09:33	CR5		
Kellis	Short haired black and white dog. Back, sides, all but the tip of the tail, and face are black. Lower back legs, most of right front, and all of left front leg are white as is neck and end of muzzle. NO collar.	11/21/12	16:12	KL1	1	
		11/21/12	16:06	KL5		




Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Kellis	Longer haired dog. Mostly black on black, sides, neck, and tail. Legs are lighter color, as is lower jaw. NO collar.	11/27/12	00:17	KL1	0	
Kellis	Almost solid black male dog. Longer hair. Inner legs are lighter. Middle of back right leg is lighter and bottom of front right leg is lighter. One light spot on right jaw. NO collar.	12/1/12	01:22	KL1	1	
		12/1/12	1:21 AM	KL4		
Kellis	Very long haired, bushy dog. Solid darker color. Seen only as it runs away from camera. NO collar.	11/25/12	20:40	KL2	0	



Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Kellis	Shorter dog (less than 18 inches at shoulders). Face looks like a pug mix. Body is mostly white with one dark patch from middle of back ot halfway up tail. Darker color around ears as well. Wearing collar.	11/19/12	11:43	KL4	1	
		11/19/12	11:36	KL5		
Kellis	Light colored dog with tall pointy ears. Body has two shades of light color with slightly darker patches above legs and on ears. Legs and middle of back are lighter. Bushy curly tail. Darker streak along back. Wearing collar.	11/19/12	13:55	KL4	4	
		11/21/12	2:08 PM	KL4		
		11/19/12	1:55 PM	KL5		
		11/21/12	2:08 PM	KL5		
		11/30/12	4:08 PM	KL5		
Kellis	Thick, bushy haired white dog. Solid color with husky build. Wearing collar.	11/19/12	06:21	KL5	1	
		11/20/12	5:15 AM	KL5		

Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Kellis	Small dog. Less than 12 inches tall. Mostly darker color with short hair. With bushy tail. Looks like daschund mix.	11/19/12	13:55	KL5	2	
		11/19/12	14:08	KL5		
		11/26/12	14:16	KL5		
Kellis	Medium colored, short haired daschund. Wearing collar.	11/26/12	14:16	KL5	0	
Kellis	Short haired, brown dog with white markings on neck. Wearing harness.	11/30/12	16:55	KL5	0	
Foster	Short haired light colored dog. Long slender tail. Only back end is seen.	11/19/12	17:53	FO3	0	

Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Foster	Dog with thicker medium length hair. Mostly solid lighter color with bushy tail. Ears and end of muzzle are darker. NO collar.	11/23/12	11:38	FO3	0	
Foster	Looks like golden retriever. Very thick build. Shaggy ears and tail. NO collar.	11/25/12	18:24	FO4	0	
Foster	Very similar to above dog. Scraggly, shaggy looking retriever. Slightly darker color all over. NO collar.	11/25/12	18:24	FO4	0	
Quail Ridge	Solid dark colored dog with short hair. Top of head is all that is seen.	12/4/12	10:42	QR1	0	

Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Quail Ridge	Solid black. Short hair. Over 20 inches at shoulders. White spots on chest. Cut off tail. Wearing white collar.	12/13/12	16:35	QR3	1	<p>Left dog.</p> 
		12/13/12	16:35	QR5		
Quail Ridge	Solid black short haired dog. Cut off tail. Same breed as above dog. Collar a light gray shade.	12/13/12	16:35	QR3	1	<p>Right dog.</p> 
		12/13/12	4:35 PM	QR5		
Quail Ridge	Light colored retriever looking dog. Very shaggy tail. Wearing chain.	12/14/12	17:59	QR3	3	
		12/13/12	09:46	QR4		
		12/13/12	17:12	QR5		
		12/14/12	18:01	QR5		
Quail Ridge	Looks like a lab. Solid light color. Short hair. Wearing collar.	12/16/12	07:29	QR3	1	
		12/16/12	07:27	QR4		

Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Quail Ridge	Light colored Chihuahua. Solid colored short hair. Wearing harness.	12/7/12	14:29	QR4	0	
Quail Ridge	Very tall mingled colored dog. Body is medium color. Darker mingle on hind legs and tail as well as around ears and muzzle. Bottom of legs are lighter. Wearing collar.	12/12/12	14:23	QR4	1	
		12/12/12	14:10	QR5		
Quail Ridge	Looks like a collie face. Black around ears and eyes with white band in between extending to muzzle. Body is mostly white with large black patch along middle and black at base of shortened tail. Mingled spots all over. Wearing harness/collar.	12/15/12	11:08	QR4	2	
		12/15/12	16:45	QR4		
		12/15/12	16:32	QR5		

Park	Description	Captures (initial in bold)				Photograph
		Date	Time	Loc.	Total Recap.	
Oakmont	Black dog with thick shaggy fur. Tail very bushy, long hair. Wearing collar with something white hanging from it.	12/13/12	06:56	OM5	1	
		12/14/12	10:48	OM5		
Overton	Solid black dog. Thick build Looks like a lab. Wearing shiny collar with 2 tags.	12/4/12	04:07	OV1	0	

Appendix V: Cost-Effectiveness Information

The term “cost-effective” is used to describe this study because it could easily be replicated in other urban areas with fairly low upfront costs and low maintenance costs throughout the duration of the study. The following table details materials and labor cost estimates for a city wishing to replicate this study as a special project for interns.

Item	Description	Source	Unit Cost	Total Cost
Material Costs				
Cameras	15 (5 per park) Moultrie Game Spy M-880 models	Amazon.com	~ \$159.00	\$2385.00
Security Cases	Angle iron, iron rods, padlocks, and steel cable all included	Local suppliers	--	\$250
SD Memory Cards	1 2-GB card per camera	Amazon.com	\$11.44	\$171.60
External Hard Drive	1-TB Seagate storage device for photos	Amazon.com	\$69.00	\$69.99
AA Batteries	8 per camera, changed monthly	Local suppliers	\$20.00 for 48	\$60.00 (monthly)
Hawbaker’s synthetic lure	Available in 1 oz. bottles. 1 oz. can equip 3 lures.	Amazon.com	\$4.50 (weekly)	\$18.00 (monthly)
Honeycomb Pure Catnip Extract	Available in 1 oz. bottles. Each bottle can equip 3 lures. Cheaper alternative brands also available.	Amazon.com	\$19.95 (weekly)	\$79.80 (monthly)
Sardines	Bought in cans with 3-4 items per can, which will equip 3 lures.	Local Grocery Store	\$2.95 (weekly)	\$11.80 (monthly)
Used Cat Litter	Obtained from local pet owner or animal shelter.	Local suppliers	Free	\$0.00 (monthly)
Specimen Cups	Dynarex sold in boxes of 100	Amazon.com	\$27.68	\$27.68
Wooden Stakes	12-inch untreated pine	Home Depot	\$2.47 for 12	\$4.94
Total Initial Investment:				\$3078.81
Total Monthly Replenishment Costs:				< \$169.60
Labor Costs				
Field Work	Avg. 10 hrs/week for set up and removal. Avg. 1-2 hrs/week checking sites. Initial work of at least 8 hrs building security boxes.	Special Project Intern(s)	\$10.00 (hourly wage)	--
Cataloging Photos	Approx. 3 hrs needed to catalog species, date, time, and actions in 2-3 thousand pictures from 1 camera.	Special Project Intern(s)	\$10.00 (hourly wage)	--
Total Monthly Cost if 1-2 Interns Work Full Time:				\$400.00 - \$800.00

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VITA

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ABSTRACT

USING SCENT LURES AND CAMERA TRAPS TO DETECT THE PRESENCE AND SCENT PREFERENCES OF MESOCARNIVORES IN URBAN PARKS

by Hayley Ann Sebourn Zagurski
Bachelor of Science, 2011
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Mark Wallace, Professor of Natural Resource Management and Chair of the Department,
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This study assessed the presence of free-ranging cats (*Felis catus*) and other mesocarnivores in city parks using motion-activated cameras and determined which scent lures were more attractive to each species. Five cameras were used at each park to monitor four scent lures (used cat litter, catnip extract, commercial wildcat lure, and sardines) and a control (water). Cameras ran for 14 trap nights at each of the 24 surveyed parks (n=336 trap nights). Photographs were cataloged to determine the total sightings of each species per park and how many times each species investigated the lures. 14 species were detected with *Sciurus niger*, *Procyon lotor*, *Canis lupus familiaris*, and *Didelphis virginiana* being most common. Free-ranging cats were most attracted to used litter and sardines (t=0.034 and t=0.026, p<0.05, respectively). The strongest scent preferences were found for raccoons and wildcat lure (t=0.004, p<0.01), opossums and sardines (t=0.008, p<0.01), and squirrels and used litter (t=0.009, p<0.01).