2005

The Use of Digital Motion-Sensor Cameras to Capture Coyote Presence in Western Georgia

Lauren Billodeaux
of Forestry and Wildlife Sciences, Auburn University, Auburn, AL, USA

Jim Armstrong
School of Forestry and Wildlife Sciences, Auburn University, AL, USA

THE USE OF DIGITAL MOTION-SENSOR CAMERAS TO CAPTURE COYOTE PRESENCE IN WESTERN GEORGIA

LAUREN BILLODEAUX, School of Forestry and Wildlife Sciences, Auburn University, Auburn, AL, USA
JIM ARMSTRONG, School of Forestry and Wildlife Sciences, Auburn University, AL, USA

Abstract: Because of their learned avoidance of humans and the dense cover provided by forested areas, observation of coyote activity is often very limited in the Southeast. In this study we used digital motion-sensor cameras to detect activity among coyote populations in various urban and rural habitats. Camera stations were placed adjacent to regenerating clear cuts, forest trails and roads, agriculture fields, residential areas, and within city parks to determine activity and presence of coyotes in these various areas. Cameras were successful in detecting coyotes in all study sites throughout the year. Coyotes appear to show no avoidance of camera stations. Cameras may be helpful in gathering general biological and activity information on coyote populations in an area.

Key words: Canis latrans, coyote, monitoring, motion sensor cameras, scent stations

Proceedings of the 11th Wildlife Damage Management Conference (D.L. Nolte, K.A. Fagerstone, Eds). 2005

INTRODUCTION

Like most predators, coyotes are elusive animals. This makes it all the more difficult for biologists to study their movements and behaviors. Most studies have monitored suburban/urban coyote populations through leg-hold trapped individuals and/or radio telemetry of captured animals (Person and Hirth 1991, Quinn 1997, Fedriani et al. 2001, Grinder and Krausman 2001, McClennen et al. 2001). These studies have provided valuable information about habitat selection and use, as well as activity times and diets of coyotes in urban areas. Trapping, however, in urban areas has some added complexity. There is an increased chance of capturing non-target species such as domestic dogs and cats from neighboring homes. In addition to safety concerns, the negative public perception of leg-hold traps would make it difficult to get public approval (Andelt et al. 1999). In Massachusetts box traps were attempted for coyote capture because of higher public acceptability. However, these proved to be very ineffective due to the cautiousness of coyotes (Way et al. 2002). The use of sirens and howling surveys has been done in rural areas to assess relative abundance of coyotes (Crawford et al. 1993). However, increased sound interference in a urban/suburban area would affect results of the survey.

Quinn (1995) compared the use of reported public coyote sightings to telemetry data of coyotes in Washington to measure the effectiveness of using the public as a source of information. Quinn found that public sightings however have a high level of bias because most sightings were during daytime hours, where people are more common, and in habitats with increased visibility. Public sightings did not account for all habitats shown in telemetry (Quinn

1995). Scent/track stations have been a popular way to look at predator presence in an area but this may not be the most effective tool for coyotes. Harris and Knowlton (2001) reported that coyotes in captivity were reluctant to step within one meter of novel stimuli. If coyotes do step within the track circle they are also prone to urination, scratching, and rolling behaviors which erase any track data (Bullard et al. 1983; Sumner and Hill 1980; Woelfl and Woelfl 1997). Scent/track stations also do not allow the differentiation between individuals or the number of individuals that visit a station at a time (Sargeant et al. 2003).

During the past few years, the use of infrared game cameras has become more popular in attempting to view animal behavior (Peterson and Thomas 1998, Koerth and Kroll 2000, Martorello et al. 2001, Wolf et al. 2003). The use of cameras to sight predators is less intrusive and less expensive than trapping (Martorello et al. 2001). Peterson and Thomas (1998) tested TrailMaster® cameras on a captive coyote population and found them effective for monitoring coyote movements, especially on active trails or at den sites.

In this study we used cameras at scent stations to eliminate or reduce some of the common biases of traditional scent/track stations. Cameras will allow us to know the number of visits by animals to the station, information on condition of the animal, possibly distinguish between individuals and age classes, the time of day the visit occurred, and will be independent of most weather conditions or disruptions by animal responses to the scent (i.e. rolling or scratching). This technique will also allow differentiation between coyotes and other canids.

STUDY AREA

This study took place in western Georgia in Muscogee, Harris, and Meriwether counties. All eight of the sites occur on public land and no trapping was done in any of these areas. Each site was greater than 3.2 km apart and can, thus, be considered independent sample units (Roughton and Sweeny 1982). The four rural sites were located in Harris and Meriwether counties. Two sites are on Blanton Creek Wildlife Management Area (WMA) and Joe Kurz WMA. Both WMAs are managed by the Georgia Department of Natural Resources (DNR). The other two rural sites were located on pine plantations owned by Mead Paper Company in Harris, County.

All four of the urban/suburban sites lie in Muscogee County around Columbus, Georgia. The first urban/suburban site is located on Standing Boy Creek Tract which is a 639 hectare property managed by Georgia DNR. The second site was located on the Columbus Metropolitan Airport. The remaining two urban/suburban sites lie on Columbus city parks: Cooper Creek Park and Flat Rock Park.

MATERIALS AND METHODS

Cameras chosen for this study were Leaf River® Outdoor Product's Digital Game Camera (Model DC-2BU). The unit contains a 2.1 mega-pixel digital camera with a 1.6" TFT LCD Viewing Screen. The camera chosen has an internal memory of 16 MB and can store up to 50 pictures. No additional memory card was used. Lures were used in conjunction with digital motion sensor cameras. A variety of baits and lures were tested through trial scent stations conducted prior to this study to determine highest canid response in the study area. A long range canid gland lure, Carmen's Canine Call (Windberg and Knowlton 1990) was placed with a food lure, Caven's

Hiawatha Valley, at each camera station as an attractant. Both scents were used throughout the study to maximize number of visits to the stations and to standardize the attractant throughout all seasons. In addition to increasing the number of visits, baits were used in an effort to cause the animal to hesitate so that an accurate picture could be taken by the digital camera.

Camera stations were set in both the rural (n = 4) and urban/suburban (n = 4) sites throughout the study area. Ten cameras were placed at each site for seven days within each biological season in order to accommodate different capture vulnerabilities throughout the year of different classes of individuals. We defined seasons as dispersal (September though 14 December), breeding (15 December through February), gestation (March through April), and pup rearing (May through August) (Grinder and Krausman 2001). Sampling started in October 2004 and extended through May 4, 2005. Sampling for the two Mead properties did not begin until March 2005. Camera stations were spaced an average distance of 0.02 kilometers apart. Each station was positioned near a game trail, field edge, or a roadside to maximize chance of visitation (Harris and Knowlton 2001, Sequin et al. 2003).

Setup of cameras was done wearing cotton gloves to reduce human scent at the camera station (Sequin et al. 2003). Sensitivity of motion detection on cameras were all standardized (Peterson and Thomas 1998). Time lapse between pictures alternated at each camera site. Odd numbered cameras had a one-minute time lapse. Even numbered cameras had a three-minute time lapse. Seven day camera sessions were done at one site at a time due to the limited number of cameras. Camera sessions were alternated between rural and urban sites to avoid temporal bias.

Separate cotton gloves with latex on the palms were worn during the application of the lures. A small hole in the soil was dug at each station and the recommended teaspoon amount of food lure was placed inside. The hole was partially covered with leaves and/or dirt. The gland lure was then rubbed on twigs, stump, log, or tree base at each station. When available, scat from the area was used with gland lure as an attractant.

RESULTS

Camera data included a total of 1,598 trap nights taking 2,932 pictures. Of those pictures approximately 36% had no data in picture. Stations had a 2.7% photo-trapping success rate for coyotes. Camera stations captured coyote activity at every site during the study period. A total of 78 pictures of coyotes were taken at camera stations; 38% (30) during dispersal season, 17% (13) during breeding season, and 45% (35) during gestation period. Pup rearing season data has not yet been collected so it will not be included in this paper. Most pictures included only one individual, however three pictures included two individuals. Figure one shows the distribution of coyote pictures taken throughout camera sessions. Coyotes were photo-captured mostly on the second and fourth days but pictures were collected throughout the session. Distribution of photo-captures appears random from this data set (see Figure 1).

A variety of canid behaviors were captured on camera including smelling scent (38), walking towards or from stations (28), standing over station (7), rolling (6), digging (1), and urination (1).

Of the pictures taken 1,778 were of non-target species. Most commonly photo-captured species included opossums, raccoons, gray squirrels, deer, gray foxes, red foxes, bobcats, domestic dogs, feral cats, chipmunks, armadillos, rabbits, and a variety of birds. Most mammal species showed interest in scents with the exception of squirrels and chipmunks.

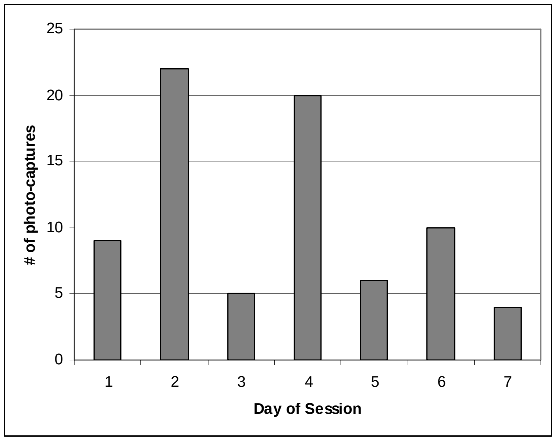

Figure 1. Distribution of coyote photo captures within camera sessions.

DISCUSSION

Setup of Stations and Equipment

Use of camera stations has different challenges compared to other monitoring methods. In this study we targeted areas with increased probability of activity like intersections of roads and trails. There were some constraints, however, in where the camera could be placed. First, there must be a tree to fasten the camera to that is close to the road. Debris and plants in front of the camera also need to be removed otherwise the motion sensor could be activated by the wind blowing leaves or debris in front of the sensor. We also had to face the camera out of the direct path of the sun. Cameras that were placed facing the rising or setting sun were likely to be triggered by the sun repeatedly.

Safety of cameras also became a factor in setting up the stations. Though we wanted to focus on high traffic areas, there was an increased risk of theft in areas of high human traffic. Each camera was fastened with a cable padlock, however locks were not 100% effective. In November 2004 we had one camera stolen from a tree. In some areas we set cameras on side trails to avoid detection.

Limitations of camera are also an important consideration in station setup. The cameras that we used had a limited flash distance. If cameras are set at field edge, motion sensor could be set off by an animal that was beyond flash distance. This would result in an empty picture. Stations set along trails where there was a more narrow travel path were most successful in capturing individuals.

One of our goals with the camera stations was to develop a monitoring method that could be used regardless of weather conditions. Though severe flooding would affect the potency of the bait, normal rain showers did not prevent visitation. Bait repeatedly lasted throughout the entire week regardless of rain showers. Photo-capture distribution (Figure 1) shows data collection until the final trap night.

Unlike previous camera studies (Peterson and Thomas 1998, Sequin et al. 2003), this study used digital cameras. The digital storage allowed the cameras to remain in the field for six days without disturbance. This reduced the human scent at station as well as reduced maintenance needed for each station. If memory cards were used with cameras we could have waited longer to download data, however reapplication of scents would probably be required. Digital cameras were also able to take photos without any additional noise. The silent action may reduce the alarm in individuals at camera station. The one negative in using a digital camera was the lapse time between the motion trigger and the picture being taken. In many examples, pictures included only the tail or back foot of an animal that had walked by. We attempted to reduce this problem by using baits to increase the time period that the animal was within the camera's range;

however it was not always successful. This delay in the camera is the probable cause of many of the empty pictures in our data.

Coyote Capture Data

Sequin et al. (2003) used cameras to monitor a coyote population that was also being tracked with radio telemetry. They had only a slightly lower trapping success rate than our study with 1.6% (Sequin et al. 2003). Two factors that differ between our study and the Sequin et al. 2003 study are trapping and the use of baits. Trapping was done intermittently throughout their study to collar individuals. Coyotes have been reported to have an increased wariness of humans and traps in areas where there has been previous trapping due to learned social behavior (Harris and Knowlton 2001, Sacks et al. 1999). Secondly no bait was set at the stations in their study to draw coyotes to the location and often coyotes were recorded traveling within close proximity of the station without being photo-captured (Sequin et al. 2003).

Sequin et al. (2003) never photo-captured the same individual at the same station more than once within the same hour and only once did they capture the same coyote at a station twice in 24 hours. Animals in our study were not marked so positive identification of individuals is not certain. However individuals with very distinct coloring could be identified between pictures. In at least seven cases, cameras captured more than one picture of coyotes within an hour. In two additional cases, individuals investigated stations long enough for four pictures to be captured. In at least two other cases coyotes returned again to the same station within a few days.

Cameras did prove to be accurate in differentiating between coyotes and other canids as well as some identification between numbers of individuals visiting a site. Though camera data did not allow for accurate age classification, juvenile coyotes could often be distinguished from adults because of size and “puppy-like” features. In pictures taken at good angles, sex and even breeding condition of some females was identified.

MANAGEMENT IMPLICATIONS

Throughout the eastern U.S. there is a lack of data on the movements and habitat use of the coyote as it has adapted to new environments. Information on areas of coyote use will be especially important in urban areas where there are potential conflicts with human populations. Motion-sensor cameras provide an alternative method of collecting information on coyotes in an area without trapping. Because of repeated pictures of individuals, we conclude that coyotes are showing no avoidance of camera stations. Data from cameras allow for more accurate identification of coyotes and collection of biological information than traditional scent stations. In addition, cameras provided data on other mammal populations in the area. Placement of cameras is an important variable in determining capture success, but this is a factor in other monitoring methods as well. We recommend testing cameras to become familiar with the unit and its sensitivity and flash limitations. Digital camera units are more costly but the reduction in maintenance and film development may make it more affordable in the long run.

ACKNOWLEDGEMENTS

We would like acknowledge Center of Forest Sustainability and the William R. and Fay Ireland Fund of the School of Forestry and Wildlife Science, Auburn University for their support of this research. We also appreciate the cooperation of the Georgia Department of Natural Resources,

Columbus Metropolitan Airport, and Columbus Parks and Recreation.

LITERATURE CITED

ANDELT, W.F., R.L. PHILLIPS, R.H. SCHMIDT, AND R.B. GILL. 1999. Trapping furbearers: An overview of the biological and social issues surrounding a public policy controversy. Wildlife Society Bulletin 27:53-64.

BULLARD, R.W., F.J. TURKOWSKI, AND S.R. KILBURN. 1983. Responses of free-ranging coyotes to lures and their modifications. Journal of Chemical Ecology 9:877-888.

CRAWFORD, B.A., M.R. PELTON, AND K.G. JOHNSON. 1993. Techniques to monitor relative abundance of coyotes in east Tennessee. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 47:62-70.

FEDRIANI, J.M., T.K. FULLER, AND R.M. SAUVAJOT. 2001. Does availability of anthropogenic food enhance densities of omnivorous mammals? An example with coyotes in southern California. Ecography 24(3):325-331.

GRINDER, M., AND P.R. KRAUSMAN. 2001. Morbidity-mortality factors and survival of an urban coyote population in Arizona. Journal of Wildlife Diseases 37:312-317.

HARRIS, C.E., AND F.F. KNOWLTON. 2001. Differential responses of coyotes to novel stimuli in familiar and unfamiliar settings. Canadian Journal of Zoology 79:2005.

KOERTH, B.H., AND J.C. KROLL. 2000. Bait type and timing for deer counts using cameras triggered by infrared monitors. Wildlife Society Bulletin 28:630-635.

MARTORELLO, D.A., T.H. EASON, AND M.R. PELTON. 2001. A sighting technique using cameras to estimate population size of black bears. Wildlife Society Bulletin 29:560-567.

MCCLENNEN, N., R.R. WIGGLESWORTH, S.H. ANDERSON, AND D.G. WACHOB. 2001. The effect of suburban and agricultural development on the activity patterns of coyotes (*Canis latrans*). American Midland Naturalist 146:27-36.

PERSON, D.K., AND D.H. HIRTH. 1991. Home range and habitat use of coyotes in a farm region of Vermont. Journal of Wildlife Management 55:433-441.

PETERSON, L.M., AND J.A. THOMAS. 1998. Performance of trail master infrared sensors in monitoring captive coyotes. Wildlife Society Bulletin 26:592-596.

QUINN, T. 1995. Using public sighting information to investigate coyote use of urban habitat. Journal of Wildlife Management 59:238-245.

_____. 1997. Coyote (*Canis latrans*) habitat selection in urban areas of western Washington via analysis of routine movements. Northwest Science 71:289-297.

ROUGHTON, R.D., AND M.W. SWEENY. 1982. Refinements in scent-station methodology for assessing trends in carnivore populations. Journal of Wildlife Management 46:217-229.

SACKS, B.N., K.M. BLEJWAS, AND M.M. JAEGER. 1999. Relative vulnerability of coyotes to removal methods on a northern California ranch. Journal of Wildlife Management 63:939-949.

SARGEANT, G.A., D.H. JOHNSON, AND W.E. BERG. 2003. Sampling designs for carnivore scent-station surveys. Journal of Wildlife Management 67:289-298.

SEQUIN, E.S., M.M. JAEGER, P.F. BRUSSARD, AND R.H. BARRETT. 2003. Wariness of coyotes to camera traps relative to social status and territory boundaries. Canadian Journal of Zoology 81:2015-2025.

SUMNER, P.W., AND E.P. HILL. 1980. Scent-stations as indices of abundance in some furbearers of Alabama. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 34:572-583.

WAY, J.G., I.M. ORTEGA, P.J. AUGER, AND E.G. STRAUSS. 2002. Box-trapping eastern coyotes in southeastern Massachusetts. Wildlife Society Bulletin 30:695.

WINDBERG, L.A., AND F.F. KNOWLTON. 1990. Relative vulnerability of coyotes to some capture procedures. Wildlife Society Bulletin 18:282-290.

WOELFL, S., AND M. WOELFL. 1997. Coyote, *Canis latrans*, visitations to scent stations in southeastern Alberta. Canadian Field-Naturalist 111:200-203.

WOLF, K.N., F. ELVINGER, AND J.L. PILCICKI. 2003. Infrared-triggered photography and tracking plates to monitor oral rabies vaccine bait contact by raccoons in culverts. Wildlife Society Bulletin 31:387-391.