

SMALL GRANT RESEARCH

UTILIZATION OF SCENT-STATION SURVEYS
TO DETERMINE PREDATOR ABUNDANCE AND SPATIAL USE
ON CARIBOU RANCH OPEN SPACE

(2nd Year of Baseline for Response to Recreation)



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ABSTRACT

Boulder County Parks and Open Space (BCPOS) management seeks a balance between recreation and the protection of wildlife habitats and other natural resources. Determining the response of predators to recreational activities is difficult due to the secretive nature and vast area used by most predators. The scent-station survey method has been widely used to detect predators and to estimate trends in carnivore abundance. During the 2002 and 2003 field seasons scent-station surveys were conducted throughout the Caribou Ranch Open Space (Given 2002). Abundance indices were developed for each species of predator in the area from the data collected and the resulting indices corresponded with expected densities of predators demonstrating that this detection method is effective. Spatial use for each species was also evident. Because the Caribou Ranch is not currently open to the public the site provides the perfect situation to establish predator use prior to recreation and thus determine a response to recreation once the property becomes open to the public. Comparison of the indices will demonstrate if there is a response by different species once the property opens for recreation. The development of abundance indices will also provide a useful measure to evaluate the effects of future management practices.

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INTRODUCTION

This study follows efforts implemented on the Caribou Ranch Open Space beginning in 2002 using a widely accepted and cost effective method for evaluating the abundance of predatory species and applying the results to a new and important function, use of habitat in relation to recreational use. The objectives of this study were to develop relative abundance indices for predatory species on the Caribou Ranch Open Space property and determine spatial use. Efforts in years prior to recreation will establish the baseline knowledge necessary to determine any response predators have to recreation on the Caribou Ranch when it becomes open to the public.

The development of abundance indices and determination of spatial use of predators will provide BCPOS managers with tools to track population trends for individual predatory species and a useful measure to evaluate the effects of future management practices upon predators. Further, by determining abundance indices while the property is not yet open for recreation creates a unique research opportunity to determine a response of predators to recreation when public use begins. The organization will be able to make more informed decisions for both current and future recreational activities in relation to desired management of predatory species.

Literature Review

Recreational activities are widespread, yet our understanding of their effects on wildlife is rudimentary. Although numerous studies of recreational impacts have been conducted, the knowledge gained is disparate and seldom definitive (Knight and Gutzwiller 1995). Numerous research papers have been published on the response of birds and ungulate species to recreation, however predators tend to be more difficult to study. Most available literature regarding predators and recreation focus on bears, as well as mountain lions and wolves to a lesser extent. Virtually all of these papers were comprised of anecdotal material or information derived through the use of radio-collared subjects. There was no published literature focused on the response of mesopredators to recreation. However, there is a large amount of literature that suggests that scent-stations can be utilized to detect carnivores and estimate relative abundances for many species, including all those known to occur in Boulder County. The attached references section lists the literature and papers reviewed to develop this study and will be appropriately referenced throughout the methods section.

METHODS

Scent-station surveys were conducted to record the presence of predators during the 2002 field season. Four scent-station survey sites were established (in consultation with Dave Hoerath) to provide the best spatial coverage of the property. Scent-station survey sites consist of one transect for each site. The goal was for each transect to contain ten stations, however, due to spacing and topographic limitations two transects contain eight stations while the other two contain ten. Each station consisted of

approximately one square meter of backyard sand that is raked smooth before being baited and each station is spaced approximately .32 km apart (Connor et al. 1983) (Nottingham et al. 1989). Stations were baited with one fatty acid scent (FAS) tablet, a commercially available predator scent attractant manufactured by the U.S. Department of Agriculture. One FAS tablet was placed in the center of the station during the day and checked for visitation the following day with a visit defined as one track or more of a species/station (Connor et al. 1983). Tracks were measured and identified using *Tracking Mammals* by James Halfpenny as a definitive reference. If weather rendered the survey line inoperative the procedure would be repeated. Each line was operated for one night/month from June through November (Brady 1981) (Roughton and Sweeny 1982). The study was conducted from June through November. The relative abundance index for each species is calculated as: total visits by a species divided by the total operative station nights times 1,000 (index = total visits by a species/total operative station nights X 1,000) as developed by Linhart and Knowlton (1975) and widely accepted as the standard for calculating scent-station abundance indices.

RESULTS

As in 2002 seven species of predators were detected on the Caribou Ranch Open Space through this study. The relative abundance index for each species is calculated (labeled as Caribou Ranch Abundance) as: total visits by a species divided by the total operative station nights times 1,000 (index = total visits by a species/total operative station nights X 1,000). Further, the relative abundance index for each species at each of the sites is calculated in the same manner using only the data from that site to show spatial tendencies. The abundance results by species are as follows:

Coyote (*Canis latrans*)

Caribou Ranch Abundance = 55.56 (12 visits/216 operative stations X 1000)

Road Site Abundance = 100.00 (6 visits/60 operative stations X 1000)

Delonde Gulch Abundance = 62.50 (3 visits/48 operative stations X 1000)

House Loop Abundance = 41.67 (2 visits/48 operative stations X 1000)

Boulder Diversion Abundance = 16.67 (1 visit/60 operative stations X 1000)

Gray fox (*Urocyon cinereoargenteus*)

Caribou Ranch Abundance = 55.56 (12 visits/216 operative stations X 1000)

Road Site Abundance = 16.67 (1 visits/60 operative stations X 1000)

Delonde Gulch Abundance = 41.67 (2 visits/48 operative stations X 1000)

House Loop Abundance = 41.67 (2 visits/48 operative stations X 1000)

Boulder Diversion Abundance = 116.67 (7 visits/60 operative stations X 1000)

Black bear (*Ursus americanus*)

Caribou Ranch Abundance = 46.30 (10 visits/216 operative stations X 1000)

Road Site Abundance = 00.00 (0 visits/60 operative stations X 1000)

Delonde Gulch Abundance = 83.33 (4 visits/48 operative stations X 1000)

House Loop Abundance = 00.00 (0 visit/48 operative stations X 1000)

Boulder Diversion Abundance = 100.0 (6 visits/60 operative stations X 1000)

American marten or pine marten (*Martes americana*)

Caribou Ranch Abundance = 27.78 (6 visits/216 operative stations X 1000)

Road Site Abundance = 00.00 (0 visits/60 operative stations X 1000)

Delonde Gulch Abundance = 20.83 (1 visits/48 operative stations X 1000)

House Loop Abundance = 00.00 (0 visits/48 operative stations X 1000)

Boulder Diversion Abundance = 82.33 (5 visits/60 operative stations X 1000)

Long-tailed and Short-tailed weasel (*Mustela frenata or erminea*)

Caribou Ranch Abundance = 78.70 (17 visits/216 operative stations X 1000)

Road Site Abundance = 116.67 (7 visits/60 operative stations X 1000)

Delonde Gulch Abundance = 62.50 (3 visits/48 operative stations X 1000)

House Loop Abundance = 00.00 (0 visits/48 operative stations X 1000)

Boulder Diversion Abundance = 116.67 (7 visits/60 operative stations X 1000)

Mountain lion (*Felis concolor*)

Caribou Ranch Abundance = 4.63 (1 visits/216 operative stations X 1000)

Road Site Abundance = 00.00 (0 visits/60 operative stations X 1000)

Delonde Gulch Abundance = 20.83 (1 visits/48 operative stations X 1000)

House Loop Abundance = 00.00 (0 visits/48 operative stations X 1000)

Boulder Diversion Abundance = 00.00 (0 visits/60 operative stations X 1000)

Bobcat (*Lynx rufus*)

Caribou Ranch Abundance = 23.15 (5 visits/216 operative stations X 1000)

Road Site Abundance = 33.33 (2 visits/60 operative stations X 1000)

Delonde Gulch Abundance = 00.00 (0 visits/48 operative stations X 1000)

House Loop Abundance = 62.50 (3 visits/48 operative stations X 1000)

Boulder Diversion Abundance = 00.00 (0 visits/60 operative stations X 1000)

DISCUSSION OF RESULTS

Results of this study are discussed by species accounts and a review of how the results may apply to natural resource and future visitor management of the Caribou Ranch.

Species Accounts

Seven naturally occurring predator species were detected utilizing the scent-station method. As expected weasels and canids were the most numerous by detection, while the felids that normally require much larger ranges were found to be present but

with much less frequency. Black bears and martens fell somewhere in the middle for frequency. Results for 2003 were very similar to 2002 with all species detected at the same level or with one additional detection except for the mountain lion which was detected only once versus twice in 2002. A brief synopsis for each species detected will follow, including population estimates based on research of home ranges. It should be noted that the entire acreage of the Caribou Ranch may not provide appropriate habitat and there are many other variable factors so such estimates should be considered loose guidelines, with very detailed research required to refine such population estimates.

Coyote (*Canis latrans*)

Coyotes were observed on the Caribou Ranch two times and both tracks and scat were frequently sighted. Home ranges are known to vary widely for coyotes from as little as 4 to 5 square kilometers to as large as 143 square kilometers (Voigt and Berg 1987). Mean annual home range in southeastern Colorado was 11.3 square kilometers for residents (Gese et al. 1988). Based on the Colorado data, and depending on ranges falling partially on adjacent lands the Caribou Ranch probably supports one to two pairs of coyotes, their associated offspring until dispersal and occasional transient individuals. Coyotes were detected in all four sites although 50% of the coyotes detected in the study were along the road loop site which has extensive meadows in vicinity of many of the stations. One more detection occurred in 2003 than 2002. This road loop area is likely to be greatly impacted when the property is opened for recreation so it will be interesting to see how the coyotes respond. Coyotes, along with gray foxes, were the second most commonly detected species behind weasels.

Gray fox (*Urocyon cinereoargenteus*)

The gray fox, along with coyotes, was the second most abundant predator in the study to the weasels. The gray fox was detected the same number of times in 2003 as 2002. Home ranges averaged 30 to 200 ha in Utah (Trapp 1978). Exclusive areas of occupancy are established and dens are thought to often be in the vicinity of water. Based on the Utah home range data the Caribou Ranch could likely carry twenty or more gray foxes and their associated young. Over 58% of the detections occurred in the Boulder Diversion area and the Road Loop (which has the least access to water) had only one detection. It is somewhat surprising that the gray fox was so prevalent in the area as it is not known to be a resident of higher elevations in the mountains and Caribou is probably near the upper edge of its range, however, the open drainage areas provide the necessary habitat.

Black bear (*Ursus americanus*)

Black bears were detected in every month except for November. As in 2002 there appeared to be at least two different bears, one in the Delonde Gulch area and the other on the north of the property around the Boulder Creek diversion. All the tracks would appear to be from boars and it is likely that there are two boars that have ranges on the Caribou. The annual home range of a male in Colorado varied from 31 to 145 square kilometers (Beck 1991) and thus it is likely that the ranges are either only partially on Caribou or have some overlap but it is unlikely that the Caribou Ranch supports more than two boars and possibly two sows with their young.

American marten or pine marten (*Martes americana*)

Martens are generally associated with older growth and mixed-age stands of spruce-fir and lodgepole pine (Fitzgerald, Meaney, and Armstrong, 1994). Six martens were detected, same as 2002, and all occurred in either Delonde Gulch or the Boulder Diversion site. The other two sites generally lack appropriate habitat. Home ranges for this species can vary greatly. A study in Wyoming found average home ranges for males of 2.0 to 3.2 square kilometers and females to be 0.8 sq. km (T. Clark et al. 1989). However, as the species is quite transient and also frequently shares territories it is too difficult to extrapolate a population estimate. Considering the more specialized habitat requirements it is not surprising that the species had the lowest overall abundance index other than the felids, but in the appropriate habitat areas the abundance was much closer to the more abundant canids.

Long-tailed and Short-tailed weasel (*Mustela frenata* or *erminea*)

Utilizing more sophisticated tracking methods, such as stride and straddle measurements these two species can be differentiated, however, reliable measurements require good trails rather than just the random tracks often found at scent-stations so tracks were simply recorded as weasel although most are likely to be the long-tailed variety. For the second year weasels were the most common species recorded in the study and they visited stations frequently in both the Road Loop and Boulder Diversion sites as well as a couple on the Delonde Gulch site. Home ranges for both weasels range anywhere from 10 to 25 ha (Fitzgerald, Meaney, and Armstrong, 1994). Based on those range estimates there could be anywhere from 350 to 875 individual weasels on the

Caribou Ranch if suitable habitat was uniformly distributed. As expected the weasel was found to be the most abundant predator.

Mountain lion (*Felis concolor*)

Mountain lions have a behavioral intolerance of their own and require large home ranges with maximum density estimated to be one lion per 25 to 50 square kilometers (Currier 1976). Depending on how territories fall within adjacent lands the Caribou Ranch probably falls within the home range of one to two males perhaps overlapping with one to two females and there may be an occasional transient on the move through. The only detection occurred in the rugged and varied habitat of the Delonde Gulch, which was also the case in 2002 although there were two detection that year.

Bobcat (*Lynx rufus*)

Home ranges in the West vary from 22 to over 80 square kilometers for males and 8 to 27 square kilometers for females (McCord and Cardoza 1982, Rolley 1987). Based on these ranges the Caribou Ranch probably supports one to two males and one to two females and their associated young. Bobcats registered five times (vs. 4 in 2002) with all detections at two scent-stations. As both of these stations are in areas that will likely be impacted by future recreation there is an opportunity to determine a response of this secretive cat.

Application to Natural Resource and Visitor Management

Results of the second year of surveys correlated very closely to the 2002 results having documented seven species of predators and detected all of the expected target species. The two years of data is an excellent foundation for a baseline of abundance indices on a property that is currently closed to the public. Based on this initial data there also appear to be spatial patterns that are valuable for management decision making. Two survey sites, the Road Loop and the House Loop are the most disturbed areas currently with roads, trails, and historical buildings already in place. Additionally, hay harvesting is still taking place in this vicinity. This is also the area that is most likely to be open for recreation. Currently, coyotes, weasels and bobcats are favoring this area and will most likely have to adapt the most to future recreation. These are all adaptable species with broad, general habitat requirements. The other two areas harbor the most diversity with six species detected in the Delonde Gulch and five species on the northern section of the property, the Boulder Diversion. Delonde Gulch is the least disturbed area of the property and would seem to have the most diversity of habitat and predators. It was the only location for mountain lion and frequently has signs of bears. The Boulder Diversion area is more disturbed with maintenance activities and the Rainbow Lakes road, however, the water source as well as the more dense spruce-fir and lodgepole forest makes this area the stronghold for both the pine marten and the gray fox.

Based on the initial spatial distribution a couple of management recommendations are possible (keep in mind this is based on only two years of data):

- 1) If recreation is to occur the loop utilizing the current roads and trail system would impact the fewest predator species and the species impacted would be the ones that are best equipped to adapt successfully.
- 2) Protecting the Delonde Gulch from recreation and other impacts will conserve the greatest diversity of predators.
- 3) The Boulder Diversion area is key for conservation of pine marten and gray fox on the Caribou property and is also very diverse (5 of 7 predators were detected).

It is important to emphasize that this study is developed to compare population trends and spatial use across years, and in particular will be applicable as recreation begins at the Caribou Ranch in the future. It is difficult to make conclusive recommendations based on only two years of data and therefore all such recommendations are made cautiously using the best data available with an emphasis that further research is necessary to make more meaningful determinations.

CONCLUSION

Utilizing the scent-station methodology to detect predators during the 2003 field season appears to have been very successful, in fact predators were detected at a much higher rate than during our 2000 Survey of the Heil Ranch (29% vs. 16%), as well as slightly higher than the 2002 Caribou surveys (29% vs. 28%) yet the consistency between years is confirming of the method. Species were detected in frequencies that are

consistent with their expected abundances, such as based on population density research weasels should have been the most common species followed by gray foxes and then coyotes while black bears and mountain lions should be considerably less abundant. The relative abundance indices developed in this study found that species did in fact occur in the abundance order that would have been expected based on known research thus lending validity to this method as a measure of predator abundance.

Two years of data have provided insight into spatial distribution throughout the property for each species. This is the type of baseline establishment that is necessary to determine a response to future recreation as we will be able to see both population trends and movement patterns.

It is clear that two years of data at the Caribou Ranch does not provide the statistical power to suggest any definitive results as to predator abundances and spatial use. It is important to have additional surveys to firmly establish a baseline and then to examine how predators respond to recreation in the future. The results of this initial study years though do confirm the success demonstrated at the Heil Ranch that the methodology is properly designed to establish predator abundance indices, spatial use patterns and to determine a response of predators to recreation. Continued data collection over a prolonged time period is recommended to refine relative abundance indices and to more fully determine spatial use of predators, especially as the disturbance of trail building has now begun.

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