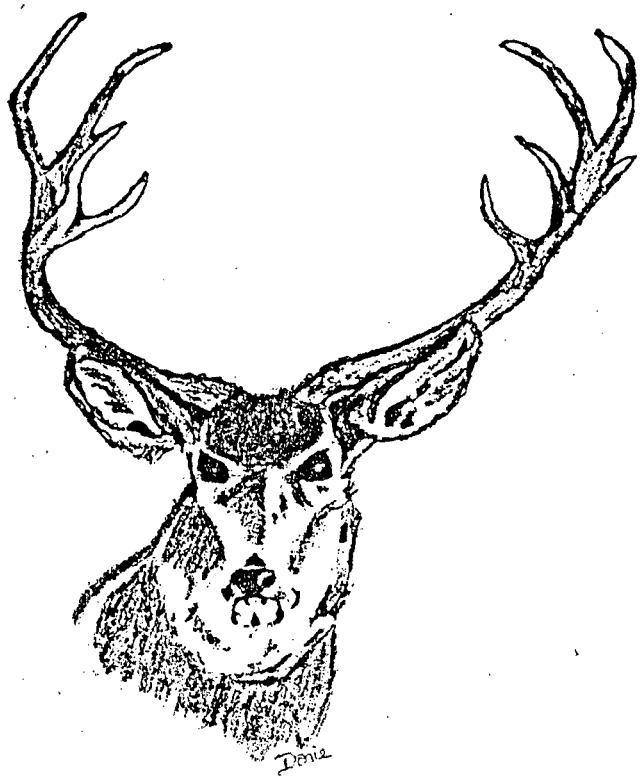
Ron / Mike

MULE DEER STUDY SUPPLEMENT

JANUARY 1988 - APRIL 1988



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Introduction:

The purpose of this report is to provide a supplement to the 1987-1988 City of Boulder Mule Deer Study update. It is designed to gain a better insight on the present deer population in and around the Boulder City limits. The study was conducted from January 1988 to April 1988 by a staff of three University of Colorado interns and one volunteer citizen from the Boulder Open Space division. The information gathered in this report includes a deer population estimate, the percentage of deer observed both within and outside Boulder residential areas, and winter home ranges. Concluding this supplement are suggestions and recommendations for future study procedures.

Population Estimate:

During the first week of April, four previously designated transects were surveyed by staff members from the City of Boulder Open Space, Boulder Mountain Parks, and the three interns from the University of Colorado. The four transects covered a 17 sq.mi. study area and were divided up into the north district, the north-central district, the south-central district, and the south district. All four transects have been outlined according to previous deer study surveys. The total area was surveyed over a four day period from April 4,1988 to April 7,1988 in order to establish a population estimate.

The estimated mean population of 1,117 deer was derived with a 95% confidence interval of 1,117 +/- 80, or 1,037 to 1,197 deer with a standard error of 40.7 .

The following formulas were used to calculate the deer population estimate based on the four day survey.

Daily Population Estimate:

$$N = \frac{(n_1+1)(n_2+1)}{(m_2+1)} - 1$$

Where:

n_1 = total number of marked deer in the population on count day = 113 .

n_2 = total number of deer seen on a given sampling day = 450,422 437, & 475 .

m_2 = total number of marked deer seen on a given sampling day = 41, 46,44, & 48 .

Count Day:	Population Estimate:
Monday(4/4)	1,223
Tuesday(4/5)	1,025
Wednesday(4/6)	1,109
Thursday(4/7)	1,106

$\hat{\bar{N}}$ = mean population estimate = 1,117 .

Standard Error Estimate:

$$SE(\hat{N}) = \sqrt{\frac{1}{k(k-1)} \Sigma (\hat{N} - \hat{\bar{N}})^2}$$

Where:

$\hat{N}$ = population estimate on a given day.
Σ = sum of the samples from 1 through k.
k = total number of samples = 4 .

$$SE(\hat{\bar{N}}) = 40.7 .$$

Final Population Figure:

$N = \hat{\bar{N}} \pm 1.96(SE)$.

Where:

1.96 = Z score for a 95% confidence interval.
SE = standard error = 40.7 .
$\hat{\bar{N}}$ = mean population estimate = 1,117 .

N = 1,117 +/- 80 or 1,037 - 1,197

Percent of Deer Within and Outside Residential Areas:

From the total number of tagged deer reported since October 1987, the percentage of deer sighted within and outside residential areas was calculated according to the following criteria:

1. The percent and number of deer never seen in residential areas.
2. The percent and number of deer seen 100% of the time.
3. The percent and number of deer seen at least once in residential areas.
4. The percent and number of deer seen in at least 50% of the total sightings in residential areas.

Results were recorded in Table A located in the appendex section.

Winter Home Ranges:

Winter home ranges were defined by estimating the total number of acres an individual deer occupied during the months of October 1987 to April 1988. A minimum of five sightings were required during these months in order to establish home ranges. Sightings recorded in each of the four transect books were transferred onto a Boulder City map with a scale of 1:50,000. Lines were drawn connecting the plotted site areas and a transparent 10×10/in. grid was overlayed on the outlined areas in order to determine acerage. Each square on the 10×10/in. grid was equal to 2 acres. Total acreage for each individual deer was determined and recorded (see Table B). From this data, a mean total acreage was calculated for each of the four transects in order to determine the average acreage inhabited by mule deer during the winter season. The average winter home range for mule deer in the 17 sq.mi. study area was approximately 78.3 acres.

Potential Problems and Suggested Improvements:

After careful consideration, the following problems and improvements were analyzed in order to improve future study procedures.

Potential Problems:

1. Difficulty in determining an accurate population estimate.
2. Uncertainty in determining if an actual population increase or decrease exists.
3. Difficulty in accurately calculating home ranges due to incomplete data gathered during previous study years.

Suggested Improvements:

1. Recording of untagged as well as tagged deer seen on transects.
2. More clarified reports on deer sightings.
3. More precise documentation of trapsites and locations of sighted deer.
4. Increased consistentcy and thoroughness in surveying.
5. Increased citizen participation on deer sightings.
6. Expand transects located in residential areas.
7. Consistent scales on all maps used for surveying.

Interpretation and Conclusion:

Compared to the 1986 population estimate of 1,073 +/- 170 and the 1983 and 1984 means of 783 and 888 respectively, this years population estimate of 1,117 +/- 80 seems to indicate a continued trend of an increasing mule deer population.

The percentage of mule deer sighted within residential areas during the 1987-1988 season was 27.5% and indicates a decrease with respect to the 1986 figure of 33% and the 1983-1984 figure of 37%.

In closing, it should be stated that surveys such as the one performed, may not be totally accurate and room for error does exist. However, with the recommendations documented and more in depth surveying, the possibilty of error and the probability of inaccuraces could be minimized.

With the mule deer population in Boulder being influenced heavily by both human and environmental factors, it may become critical that population estimates be more precise in order that the most effective management techniques be used to protect the mule deer population in Boulder.

Appendex:

Table A: Deer Sightings in Boulder Residential Areas from October 1987 to April 1988 .

	% of Deer:	# of Deer:
1.Never Seen:	72.5	74.0
2.Seen 100% of Time:	5.0	5.0
3.Seen at Least Once:	27.5	28.0
4.Seen 50% or More:	17.5	18.0

Table B: Winter Home Ranges of Marked Deer Between October 1987 and April 1988. Based on a minimum of Five Sightings and Calculated in Acres.

North District:

Ø 185 — 16
Ø 192 — 6
Ø 198 — 12
Ø 150 — 150
Ø 200 — 160
Ø 289 — 42

TOTAL: 386
AVG. 64.33

North-Central District:

Ø 152 — 24
Ø 161 — 138
Ø 166 — 130
Ø 171 — 86
Ø 173 — 24
Ø 176 — 34
Ø 255 — 5
Ø 283 — 11

TOTAL: 452
AVG. 56.5

South District:

Y 105 — 538
Y 115 — 176
Y 116 — 132
Y 122 — 48
Y 123 — 108
Y 238 — 32
Y 241 — 72
Y 244 — 200
Y 246 — 14
Y 288 — 36

TOTAL: 1,356
AVG. 135.6

AVG. WINTER HOME RANGE = 78.3 ACRES.

South-Central District:

Y 133 — 60
Y 135 — 162
Y 138 — 26
Y 140 — 42
Y 146 — 82
Y 149 — 10
Y 150 — 91
Y 204 — 78
Y 205 — 66
Y 207 — 13
Y 208 — 33
Y 210 — 60
Y 212 — 14

TOTAL: 737
AVG. 56.7