

CRATERS OF THE MOON NATIONAL MONUMENT
ANNUAL MULE DEER CENSUS
1995

Introduction

Formal studies of the Craters of the Moon (CRMO) mule deer population began in 1967 with a study conducted by Ritchie that was prompted by the concern of possible over-browsing by the herd. His results concluded that over-browsing was not occurring. Between 1980 and 1982, Griffith studied the population dynamics and habitat use of the monument's deer herd and established an annual deer population and vegetation transect monitoring program for the monument. Although the vegetation transect monitoring program has since been dropped from the deer program and incorporated into a vegetation trends monitoring program that began in 1992, annual spring and late summer deer censuses have continued.

Methods

All censuses were conducted as prescribed in the monument's Standard Operating Procedures (SOP's) developed by Griffith for Mule Deer Population Monitoring. Spring censuses (with the exclusion of 1992) were conducted informally. Between April and the first two weeks in June, monument staff recorded any mule deer sighted until at least 100 deer were documented. Some of these observations were made while in the field conducting the early morning spring bird census. Deer sightings were classified as adult males, adult females, yearlings and unknown.

In late summer of 1995, there were eight early morning censuses conducted by Natalene Cummings, CRMO Resource Management Specialist, from a vehicle along the 3.9 mile section of secondary road that runs from Highway 26 to the old Martin Mine site in the north end of the monument. Observations were made in one direction only. The census began 10 minutes after sunrise, between August 23 and September 21. Attempts were made to spread the Census days out evenly over the four week period, avoiding mornings with rain or winds greater than 10 mph. Again, all sightings were classified according to sex and general age (adult, yearling, fawn). Surrounding hillsides and lava flows and valleys along the route were carefully glassed with binoculars and a spotting scope, taking approximately two hours to complete.

All road killed deer were classified and recorded throughout the year by ranger division personnel and reported to resource management staff for inclusion in the annual deer report. Although the number of deer killed by hunters was recorded, age and sex classes were not specified.

Over-winter survival rates for 1995 were determined using the spring and previous year's (1994) late summer census data. Population means, ratios and percent change estimates were calculated for all age and sex classes and population estimates and 95% confidence intervals were established using data from six of the late summer census (after the highest and lowest censuses were eliminated). Standard error estimates for each age and sex class in the late summer census were calculated and 95% confidence intervals established.

Results

SPRING CENSUS

The number of adult does in the spring census of 1995 was 94. This is up by 24 from the previous year, making 1995 the highest since the 1986 total of 106. The number of yearlings was 16. This is down from 25 in 1994.

The yearling to 100 doe ratio in the spring of 1995 was at 24.6. This figure has been decreasing each year since a ratio of 96.5 was reached in 1993.

The Over-winter Fawn Survival Rate (OWFSR) for the spring 1995 census was 23%. This figure is down from

last year's rate of 44% and is the lowest OWFSR since the census began in 1984 (Table I).

FALL CENSUS

The mean number of deer in each of the age/sex classes was down this year. Exhibiting only a slight decrease were the adult male class, decreasing by 1.0, and the yearling males by 0.1; a percent change of -18.4% and -5.5% respectively. The fawn class decreased by 4.2 while the adult does demonstrated the greatest decrease of 5.6; a -24.7% and -30.6% change respectively. When the 95% Confidence Interval (CI) is applied to each age/sex class, significant change was indicated only for the adult females.

The number of fawns born to 100 does totalled 96.5. This is down from 1994's ratio of 108, but is greater than the 1993 ratio of 82.5 and 1992's ratio of 72.5.

The population for 1995 has been estimated at 250 individuals with a 95% CI range of 84 - 416. This is the second lowest population estimate since the census began in 1984, following the lowest estimate of 96 in 1993. Although this is a decrease over 1994's population estimate of 330, the change was determined to be NOT significant (Tables I and II).

Table I. Craters of the Moon National Monument Mule Deer Census Summaries for 1991-1995. (see appendix I for years prior to 1991).

	1991	1992	1993	1994	1995
SPRING					
Adult Doe	52	MD	10	68	94
Yearlings	50	MD	7	25	16
Yearling:100 Doe	96.15	MD	70	36.8	24.6
Over-winter Survival	72.64%	MD	96.50%	44.0%	23.0%
Appr. Doe Total	77	MD	13.50	80.5	73
Adult Doe Ratio	0.68	MD	0.74	.84	.89
FALL					
Mean # Adult Males	7.83	2.30	0.17	5.5	4.5
Percent change	17.39%	-70.62%	-92.60%	3135%	-18.4%
Mean # Yearling Male	2.83	1.50	0	1.8	1.7
Percent change	0.00%	46.99%	-100.00%	0%	5.5%
Mean # Adult Females	37.67	20	5.70	18.3	12.7
Percent change	59.15%	-46.91%	-71.50%	221%	-30.6%
Mean # Fawns	41	14.50	4.70	17.0	12.8
Percent change	30.86%	-64.63%	-67.59	262%	-24.7%
MEAN TOTAL	89.33	38.30	10.50	42.6	31.7
Fawns:100 Does	108.80	72.50	82.50	108	96.5
Fawns:100 Adult Does	161.11	MD	111.50	128.6	108.4
VEHICLE KILLS					
Adult males	1	2	1	2	1
Yearling males	0	0	0	0	2
Adult females	4	3	2	6	3
Fawns	1	1	2	4	1
Unknown	0	3	1	0	0
TOTALS	5	9	6	12	7
HUNTER KILLS					
Adult males	7	17	7	9	0
Yearling males	3	0	0	0	0
Adult females	0	8	0	4	0
Fawns	0	0	0	0	0
Unknown	4	0	0	0	29
TOTALS	14	25	7	13	29
ILLEGAL KILLS					
Adult males	1	3	0	0	0
Yearling males	0	0	0	0	0
Adult females	0	0	0	0	0
Fawns	0	0	0	0	0
Unknown	1	0	0	0	0
TOTALS	2	3	0	0	0
FALL POP'N ESTIMATES	671	298*	96	330*	250
95% CI	490-852	157-439	0-357	204-456	84-416

MD = missing data

* = indicates significant change using the 95% Confidence Intervals

Table 2. Daily census totals, mean totals, standard error figures, and 95% confidence intervals for each class (age/sex) of deer in the 1995 Craters of the Moon National Monument Annual Mule Deer Census.

		08/23	08/28	09/12	09/13	09/22	09/23	mean	std error	95% CI
Adult Males	#	5	8	1	2	1	10	4.5	1.56	n.s.
	ratio	41.6	66.6	10	14.3	7.7	6.66	34.5		
Yrlg Males	#	1	1	3	2	1	2	1.7	.33	n.s.
	ratio	8.3	8.3	30	14.3	7.7	13.3	13.7		
Females	#	12	12	10	14	13	15	12.7	.71	*
	ratio	100	100	100	100	100	100	100		
Fawns	#	6	10	14	14	17	16	12.8	1.68	n.s.
	ratio	50.0	83.3	140	100	131	106	101.7		
Unknown	#	0	0	0	0	0	0	0		
TOTALS		24	31	28	32	32	43	31.7		

Conclusion

The mule deer population decreased from the 1994 to the 1995 censuses, although, the application of the 95% Confidence Interval formula demonstrates that the decrease was not significant overall. However, as a result of both the increased number of does counted in this spring's census and the adult female age/sex class exhibiting the greatest percent change (in negative numbers) in the fall census of any of the age/sex classes, it can be concluded that the decrease in the overall population resulted mostly from a loss of adult females, and that this decrease occurred between the spring census in June and the fall census ending in September. The cause of this overall decrease is unknown, as is an explanation to why the greatest loss was in the adult female class.

The number of yearlings to 100 does in the spring census has been decreasing each year, exhibiting an increasing loss of fawns each winter season. Also confirming this loss was the overwinter survival rate of fawns during the winter of 1994-1995 of 23%; the lowest since the census started in 1984. Due to the dry summers and resulting decrease in vegetative mass, fawns are going into winter underweight, according to Idaho State Wildlife Game and Research Manager, Lonnie Kick in his Winter 1994 issue of Idaho Wildlife article titled, "Oh, deer!" In addition, although the early months of the 1994 - 1995 winter were normal in temperatures and precipitation compared to the 37 year averages, March through June of 1995 saw record amounts of precipitation, mainly in the form of snow (Appendix 2). Deeper snow levels in the latter half of winter when fat reserves on deer are at their lowest, may have attributed to a higher fatality rate in yearlings by making travel more difficult and energy consumptive and by burying forage.

Furthermore, the number of fawns born to 100 does was down in the fall census, meaning that either there are fewer productive females in the population, or fewer twin and triplet births; as are common to this herd (See Brad Griffith's 1982 report on the Craters of the Moon NM's mule deer herd). Because the number of yearlings and the overwinter success rate in the spring census were down, there would have been fewer non-productive females in the adult doe population, resulting in a higher fawn to 100 doe ratio. Because this did not occur, one might assume that there were fewer twin/triplet births (CRMO Annual Mule Deer Census Standard Operating Procedures (SOP's), section F - Interpretive Guidelines, pg 15). In a population where such births are common, it is possible to assume that there was some factor present that affected the health of the productive female population. Such factors could be stress and/or malnutrition caused by the deep spring snow. Other factors include possible disease and/or increased predation.

It will be necessary to continue to monitor the population and establish research projects that are aimed at determining specific causes to the decrease fawn production and overwinter success, if this decreasing trend continues.

Appendix 1. Summaries for the Craters of the Moon National Monument Annual Mule Deer Census from 1984-1994.

	1984	1985	1986	1987	1988	1989
SPRING						
Adult Doe	55	51	106	71	58	49
Yearlings	47	31	109	47	60	13
Yearling:100 Doe	85.5	60.80	68.10	66.20	103.05	26.05
Over-winter Survival	84.0%	55.00%	65.90%	64.20	100.00%	34.50%
Appr. Doe Total	78.05	66.50	214.50	94.50	88.00	56
Adult Doe Ratio	0.70	0.77	0.75	0.75	0.66	0.88
FALL						
Mean # Adult Males	4.10	1.33	1.83	2.5	3.7	3.33
Percent change	-2.40%	-67.60%	37.60%	36.60%	48.00%	-10.00%
Mean # Yearling Male	6.60	5.67	2.00	4.00	6.30	1.83
Percent change	37.50%	-14.15	-64.70%	100.00%	57.50%	-70.00%
Mean # Adult Females	30.00	30.00	26.00	25.50	26.70	28.83
Percent change	-17.80%	0.0%	-13.30%	-1.90%	4.70%	-10.75%
Mean # Fawns	33.10	31.00	26.83	25.33	20.50	20.33
Percent change	-11.00%	-6.40%	-13.50%	-5.60%	-19.00%	-0.83%
MEAN TOTAL	74.00	68.00	56.67	57.30	57.20	49.33
Fawns:100 Does	110.50	103.30	103.20	116.3	77.0	85.30
Fawns:100 Adult Does	157.90	134.70	138.30	154.80	116.80	96.50
VEHICLE KILLS						
Adult males	1	1	2	2	3	0
Yearling males	1	4	4	3	3	0
Adult females	4	8	9	5	2	3
Fawns	8	11	8	7	6	2
Unknown	1	0	2	1	0	0
TOTALS	15	24	25	18	14	5
HUNTER KILLS						
Adult males	1	11	14	4	14	9
Yearling males	1	23	21	19	27	13
Adult females	3	29	17	11	18	18
Fawns	8	5	5	7	6	1
Unknown	1	0	0	0	0	0
TOTALS	14	68	57	41	65	41
ILLEGAL KILLS						
Adult males	3	1	1	MD	MD	4
Yearling males	0	1	1	MD	MD	0
Adult females	0	6	5	MD	MD	1
Fawns	0	1	1	MD	MD	0
Unknown	0	0	1	MD	MD	0
TOTALS	3	9	9	MD	MD	5
FALL POP'N ESTIMATES	559	515	432	437	436	379
95% CI	436-682	408-622	335-529	340-534	339-533	272-486

continued.....

Appendix I continued....

	1990	1991	1992	1993	1994
SPRING					
Adult Doe	42	52	MD	10	68
Yearlings	31	50	MD	7	25
Yearling:100 Doe	73.80	96.15	MD	70	36.8
Over-winter Survival	86.00%	72.64%	MD	96.50%	44.0%
Appr. Doe Total	57	77	MD	13.50	80.5
Adult Doe Ratio	0.74	0.68	MD	0.74	.84
FALL					
Mean # Adult Males	6.67	7.83	2.30	0.17	5.5
Percent change	100.00%	17.39%	-70.62%	-92.60%	3135%
Mean # Yearling Male	2.83	2.83	1.50	0	1.8
Percent change	54.64%	0.00%	46.99%	-100.00%	0%
Mean # Adult Females	23.67	37.67	20	5.70	18.3
Percent change	-0.67%	59.15%	-46.91%	-71.50%	221%
Mean # Fawns	31.33	41	14.50	4.70	17.0
Percent change	54.11%	30.86%	-64.63%	-67.59	262%
MEAN TOTAL	64.50	89.33	38.30	10.50	42.6
Fawns:100 Does	132.40	108.80	72.50	82.50	108
Fawns:100 Adult Does	178.90	161.11	MD	111.50	128.6
VEHICLE KILLS					
Adult males	1	1	2	1	2
Yearling males	0	0	0	0	0
Adult females	3	4	3	2	6
Fawns	1	1	1	2	4
Unknown	0	0	3	1	0
TOTALS	5	5	9	6	12
HUNTER KILLS					
Adult males	20	7	17	7	9
Yearling males	6	3	0	0	0
Adult females	9	0	8	0	4
Fawns	4	0	0	0	0
Unknown	0	4	0	0	0
TOTALS	39	14	25	7	13
ILLEGAL KILLS					
Adult males	0	1	3	0	0
Yearling males	0	0	0	0	0
Adult females	3	0	0	0	0
Fawns	3	0	0	0	0
Unknown	0	1	0	0	0
TOTALS	6	2	3	0	0
FALL POP'N ESTIMATES	490	671	298*	96	330*
95% CI	389-591	490-852	157-439	0-357	204-456

MD = missing data

* = indicates significant change using the 95% Confidence Intervals

Appendix 2. The monthly average maximum, average minimum, average and range of temperatures and precipitation records for Craters of the Moon National Monument from 1998 to 1993.

	1988	1989	1990	1991	1992	1993
JANUARY						
Aver. Max	28.4	23.9	31.3	28.8	31.7	26.8
Aver. Min.	7.7	2.5	15.9	7.8	13.9	6.1
Average 36.1	13.2	23.6	18.3	22.8	16.45	
Range	38./-7	38./-12	48./0	39./-22	43./4	37./-22
Precip/snow	1.33 snow	3.46 snow	1.87 snow	.08 snow	.26 snow	3.24 snow
% recovery	.70	.55	.94	.90	.71	.97
FEBRUARY						
Aver. Max	38.5	26.0	33.0	48.1	43.5	29.2
Aver. Min.	13.8	5.9	8.7	22.9	22.9	11.6
Average 26.1	15.9	20.8	35.5	33.2	20.4	
Range	51./-5	43./-17	46./-7	56./12	57./10	39./-16
Precip/snow	T. snow	2.12 snow	1.52 snow	T. snow	1.81 snow	3.58 snow
% recovery	.86	.93	.61	.96	.79	1.00
MARCH						
Aver. Max	44.9	42.1	48.0	43.3	55.3	40.0
Aver. Min.	17.9	22.9	23.6	23.3	29.8	21.3
Average 31.4	32.5	35.8	33.3	42.5	30.7	
Range	62./-1	53./0	62./9	60./6	62./22	53./3
Precip/snow	.035 snow	2.65 snow	.78 snow	2.17 snow	.45 snow	1.83
% recovery	.83	.90	.74	.97	.84	1.00
APRIL						
Aver. Max	59.8	63.6	60.9	53.4	66.0	50.6
Aver. Min.	32.0	32.2	35.5	30.2	36.1	28.0
Average 45.9	47.9	48.2	41.8	51.1	39.3	
Range	73./20	75./16	75./19	63./18	81./21	62./18
Precip/snow	.59	.13 snow	1.64	2.14 snow	.29	1.14
% recovery	.66	.63	.70	.73	.70	1.00
MAY						
Aver. Max	71.8	66.0	61.7	60.1	74.3	69.4
Aver. Min.	35.0	34.5	34.0	35.4	43.9	40.7
Average 53.4	50.2	47.8	47.8	59.1	55.1	
Range	85./21	80./24	70./22	45./26	83./34	81./25
Precip/snow	.38 snow	.83	3.14	2.21	.24	1.34
% recovery	.54	.35	.81	.87	.87	1.00
JUNE						
Aver. Max	85.8	79.3	75.5	73.9	77.9	68.7
Aver. Min.	51.7	44.2	44.3	43.6	48.7	41.6
Average 68.8	61.7	59.9	58.8	63.3	55.1	
Range	98./38	85./33	92./26	81./33	93./36	85./28
Precip/snow	.06	.47	1.75	1.28	1.31	3.70
% recovery	.60	.36	.70	.80	1.00	1.00

continued....

Appendix 2 continued....

JULY

Aver. Max	89.3	89.7	82.8	87.1	82.6	74.1
Aver. Min.	50.3	57.6	57.5	54.2	51.3	45.7
Average 69.8	73.6	70.2	70.6	66.9	59.9	
Range	94./38	95./47	98./40	93./43	94./37	86./37
Precip/snow	.21	.48	.14	1.15	.29	.92
% recovery	.77	.74	1.00	.71	1.00	.80

AUGUST

Aver. Max	82.2	81.7	86.3	86.7	86.3	78.7
Aver. Min.	50.9	51.5	56.4	53.7	54.2	47.5
Average 66.6	66.6	71.4	70.2	70.2	63.1	
Range	93./35	93./36	98./42	93./44	97./32	86./36
Precip/snow	.81	.43	.59	1.14	.09	1.06
% recovery	.61	.87	.90	.58	1.00	1.00

SEPTEMBER

Aver. Max	73.3	72.0	79.5	77.2	74.3	73.2
Aver. Min.	40.5	39.3	48.8	44.5	42.3	42.4
Average 56.9	55.7	64.2	60.8	58.3	57.8	
Range	89./26	80./34	88./40	86./30	83./31	85./30
Precip/snow	.33	.54	.21	.63	.48	.78
% recovery	.90	.80	.77	.57	1.00	1.00

OCTOBER

Aver. Max	72.4	60.3	61.5	59.7	64.4	59.6
Aver. Min.	38.1	34.5	30.1	30.2	35.6	32.8
Average 55.3	77.5	45.8	44.9	50.0	46.2	
Range	82./28	70./17	78./18	80./3	85./20	79./12
Precip/snow	0.0	1.04	T	2.56 snow	1.07	1.18 snow
% recovery	.61	.61	.55	.81	1.00	1.00

NOVEMBER

Aver. Max	34.3	44.5	44.7	36.8	34.9	38.3
Aver. Min.	18.4	18.9	23.3	18.3	18.0	14.4
Average 26.4	31.7	34.0	27.5	26.5	26.4	
Range	66./4	60./4	55./8	52./-1	52./0	55./-9
Precip/snow	4.34 snow	.88 snow	.57 snow	1.09 snow	.78 snow	.18 snow
% recovery	.63	.66	.83	.97	1.00	.93

DECEMBER

Aver. Max	27.2	34.7	24.0	33.9	25.7	29.9
Aver. Min.	15.1	13.6	3.0	12.8	8.1	12.2
Average 21.2	24.2	14.0	23.3	16.9	21.1	
Range	40./-13	46./0	50./-29	43./0	35./-15	43./0
Precip/snow	2.2 snow	.15 snow	.56 snow	.37 snow	2.24 snow	.72 snow
% recovery	.77		.94	.45	1.00	1.00

ANNL PRCP.	9.85	13.18	12.77	14.82	9.31	19.67
ANNL % RCVRY	.71	.68	.79	.77	.91	.96

	1994	1995	37 yr. avg.	
JANUARY				
Aver. Max	35.6	28.1	28.8	
Aver. Min.	16.5	14.8	9.9	
Average 26.1	21.4	19.3		
Range	43./-2	41./-5	58./-24	
Precip/snow	.57 snow	2.84 snow	2.02 snow	
% recovery				
FEBRUARY				
Aver. Max	33.0	40.0	34.0	
Aver. Min	14.0	21.3	13.9	
Average 23.5	30.7	23.9		
Range	44./0	50./5	60./-19	
Precip/snow	1.57 snow	.66 snow	1.60 snow	
% recovery				
MARCH				
Aver. Max	51.7	41.5	41.4	
Aver. Min.	24.6	23.2	20.3	
Average 38.2	32.3	30.8		
Range	64./12	55./5	67./-18	
Precip/snow	0.0	3.44*snow	1.38	(*= wettest)
% recovery				
APRIL				
Aver. Max	59.4	54.3	50.9	
Aver. Min.	32.4	29.4	32.2	
Average 45.9	41.9	41.0		
Range	79./18	64./20	83./7	
Precip/snow	.93 snow	1.16 snow	1.05 snow	
% recovery				
MAY				
Aver. Max	70.0	60.7	64.5	
Aver. Min.	42.4	36.7	36.7	
Average 56.2	48.7	50.5		
Range	83./33	73./27	88./15	
Precip/snow	1.29	4.46 snow	1.72 snow	
% recovery				
JUNE				
Aver. Max	70.0	60.7	64.5	
Aver. Min.	47.4	43.2	44.5	
Average 64.0	56.2	59.3		
Range	92./30	85./29	90./25	
Precip/snow	.10	3.85 snow**	.1 snow	(**= most snow)
% recovery				

continued....

Appendix 2 continued....

JULY

Aver. Max	88.6	82.8	84.0
Aver. Min.	55.0	51.5	51.7
Average 71.8	67.2	67.7	
Range	97./37	92./42	99./30
Precip/snow	.14	.66	.74
% recovery			

AUGUST

Aver. Max	88.3	84.9	82.4
Aver. Min.	54.6	50.0	51.0
Average 71.4	67.4	66.2	
Range	95./45	92./39	97./30
Precip/snow	1.31	.28	.93
% recovery			

SEPTEMBER

Aver. Max	79.9	76.8	71.6
Aver. Min.	46.2	43.0	40.7
Average 63.1	59.9	56.2	
Range	87./38	92./24	92./16
Precip/snow	.37	.22	.6 snow
% recovery			

OCTOBER

Aver. Max	56.4	61.0	59.1
Aver. Min.	32.6	30.8	31.3
Average 44.5	45.9	45.2	
Range	67./17	72./22	85./2
Precip/snow	1.64 snow	.19 snow	.92 snow
% recovery			

NOVEMBER

Aver. Max	31.4	49.3	40.1
Aver. Min.	14.5	27.8	20.1
Average 23.0	38.5	30.1	
Range	50./-2	60./11	66./-11
Precip/snow	1.98 snow	.99 snow	1.44 snow
% recovery			

DECEMBER

Aver. Max	28.4	35.5	30.1
Aver. Min.	15.0	16.3	11.3
Average 21.7	25.9	20.7	
Range	40./-4	47./-7	52./-37
Precip/snow	1.67 snow	2.8 snow	1.87 snow
% recovery			

ANNL PRCP.	11.57	21.55	15.51 annual mean
ANNL % RCVRY			