

**CRATERS OF THE MOON NATIONAL MONUMENT
MULE DEER SURVEY
1996-1998**



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Executive Summary

Mule deer surveys were performed during the spring and fall of 1996-98. These included unstructured spring surveys as well as the systematic fall surveys in the north end of the monument. During May and June of 1998 systematic road surveys were done on the loop road in addition to the usual informal count.

The number of does and yearling observed in the spring counts continued a period of slow decline in 1996-97 before reaching a record high in 1998. Both the number of does and yearlings observed exhibited a 300 percent increase over 1997. Over winter survival of fawns was at average levels in 1996-97 but in 1998 was the third highest level since 1984.

The fall survey showed a very different trend with counts being the highest in 1996 and continuing to decline in 1997 and 98. The fawn to adult ratio has continue to show only minor changes from year to year indicating stable birth rates. The total population estimates continued to decline in 1998 even though spring counts were at a record high. This suggests that deer may be spreading out and a wider survey area may be necessary to obtain an accurate population estimate in the future.

When the data was averaged into three year intervals the deer population has generally declined since the mid 1980s. The numbers of all age/sex classes showed at least small increases in the period 1996-1998. This suggests that populations may be reversing the decline or stabilizing near the current levels.

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Introduction

Monitoring of the mule deer population began in 1980 when Griffith (Griffith, B. 1983. Ecological characteristics of mule deer: Craters of the Moon National Monument, Idaho. Report B-83 2. Coop. Park Studies Unit. Univ. of Idaho, Moscow 109 pp.) initiated a study on the population dynamics and habitat use of the monument's deer herd. As a result of this study Griffith developed site specific Standard Operating Procedures (SOP) for the continued monitoring of the deer population using an annual spring and late summer deer survey. These surveys were first performed in 1984 and have been conducted every year since that time.

Methods

In accordance with the monument's Standard Operating Procedures (SOP) informal spring surveys were conducted in 1996, 1997, and 1998. Between April and the first two weeks in June, monument staff recorded any mule deer sighted until at least 100 deer were documented. Most of these observations were made while in the field conducting other duties such as ranger patrols or other wildlife monitoring. Deer sighted were classified as adult males, adult females, yearlings and unknown. During the spring of 1998 in addition to the usual informal survey a systematic road survey was conducted. The spring road surveys were conducted on the loop road starting at the Visitor Center and ending at the end of the one way section of the loop road. The route used included the spur road to the tree molds parking area but did not include the road to Devil's Orchard trailhead. Five surveys were run on this route from 20 May to 5 June.

From 15 August to 15 September each year, there were eight early morning surveys conducted from a vehicle along the 3.9 mile section of secondary road that runs from the North End gate off Highway 26 to the old Martin Mine site in the north end of the monument. Observations began 10 minutes after sunrise and were made in one direction only. Attempts were made to spread the Survey days out evenly over the four week period, avoiding mornings with rain or winds greater than 10 mph. As with the spring surveys, all sightings were classified according to sex and general age (adult, yearling, fawn). Surrounding hillsides, lava flows, and valleys along the route were carefully observed with the use binoculars and a spotting scope. All surveys took 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.

Over-winter survival rates were determined using the spring and previous year's late summer survey data. In order to get more normally distributed data for analysis the highest and lowest counts were dropped leaving the 6 middle surveys for statistical analysis. Population means, ratios and percent change estimates were calculated for all age/sex classes. Population estimates and 95% confidence intervals were established using data from the six late summer surveys. Standard error estimates for each age and sex class in the late summer survey were calculated and 95% confidence intervals established.

Results

SPRING SURVEY

The numbers of adult does in the spring survey in 1996-97 were 50 and 42 respectively. In 1998 a record 120 does were observed (table 1). These included 87 in the usual informal survey and 33 in the formal road survey. The 87 recorded in the informal survey was the 3rd highest count since surveys began in 1984. The number of yearlings in 1998 was at the 2nd highest with 68 compared to the high of 109 in 1986. The yearling count in 1996-97 was 25 and 21 respectively. Overwinter fawn survival for the 3 years was 52%, 47%, and 70%. These were typical mid range values for the 15 years of surveys. During the 3 year period the yearlings per 100 doe ratio also showed midrange values of 50, 47, and 57 respectively. The total number of does recorded varied considerably with counts of 63, 52, and 154 over the 3 years.

FALL SURVEY

The mean number of deer in each sex/age class was highest in 1996 and dropping in 1997 and 98 (tables 1 and 2). Adult males each year continued a general pattern of decline which started in 1994. Yearling males had a mean count of 3.6 in 1996 which was the highest count since 1988. Yearling males then declined in number in 1997 and 98. Adult females at a mean of 18.3 in 1996 were at the highest level since 1992. Females also declined in number in 1997 and 98. Fawns showed the same trend. The mean number of fawns of 18.5 in 1996 was the highest since 1991 but was followed by declines in 1997-98. The total number of deer observed continued to decline at a rate of 20 to 25% a year. Both the fawn to doe and fawn to adult doe ratios showed an approximately 20% decline in 1997 followed by about a 10% increase in 1998.

Vehicle kills on the highway ranged from the highest recorded number of 26 in 1996 and falling to 14 in 1997 and 11 in 1998. The population estimate was 345 ± 120 in 1996 and fell to 294 ± 123 in 1997 and 232 ± 177 in 1998. Based on a 95% CI these changes in the population estimates are not statistically significant.

Conclusions

During the 3 year period 1996-98 fall deer counts were at the highest in 1996 followed by declines in 1997 and 1998. This is true for all sex/age classes except adult males which were up slightly in the fall 1998 surveys. Even though most age classes were down in the fall of 1998 all age classes were up in the spring survey. Even before the addition of the formal road surveys on the loop road deer counts were up in all categories. This suggests that either deer mortality was up over the summer or more likely that deer were more spread out during the fall than is typical. Spring rains were much higher than normal with recorded precipitation in May and June more than twice the 40 year average. This produced better forage conditions that lasted longer into the summer than would be expected in an average precipitation year. These improved forage conditions are more likely to enable the deer to spread out than to cause high mortality. Improved forage would be expected to increase survival not decrease it. In the future it may be useful to try surveying the loop road in the fall if another high precipitation year results in lower counts in the north end.

Over-winter fawn survival was around 50% in 1996 and 97 before rising to 70% in 1998. Spring doe counts continued to decline in 1996 and 97 before jumping to a high of 120 in 1998. This was the highest number recorded in 15 years of spring surveys. The number of yearlings per 100 does and the percentage of does that were adults showed only minor changes in 1996-98 indicating survival among age classes was similar during these years.

Table 3 shows survey and population statistics in 3 year intervals since surveys began in 1984. The major trend observable in this data is the declining numbers of both does and fawns in the fall survey since the mid 1980s. These data show that recent counts of these 2 age classes are at levels about half of what they were in the mid 1980s. The decline may have ended since the population has stabilized in the late 1990s with at least slight increases in all sex/age classes during the period 1996-98. However, the modest increases of this period are due entirely to high counts in 1996. Only continued long term monitoring will determine if this year was an anomaly or the beginning of an upward trend in the population. Another trend from this data is the declining overwinter survival of fawns. Fawn survival has declined over 20 percentage points since the early 1990s. This was the case for both periods since 1992. Fawn survival was up in the spring of 1998 but one year does not make a trend and only continued monitoring will determine whether this year was an unusually good year or the beginning of a period of population growth.

Unlike females and fawns, male deer (both adults and yearlings) have always had comparatively very low counts and they have not showed any consistent trends in their year to year numbers. This lack of trends is true both for spring and fall counts.

One population statistic which has remained relatively constant has been the birth rate as measured by the ratio of fawns to adult does in the fall survey. This number has generally remained between 100 and 130 since 1988, except for unusually high years in 1990 and 91. Thus, population fluctuations during the last ten years are likely the result of survival rates rather than birth rates.

The total population estimates follow similar trends as the doe counts. That is declining numbers throughout the 1980s and mid 1990s with stabilizing numbers in the late 1990s. This is likely in part due to the period from the mid 1980s through the early 1990s consisting of many drought years. This time period had many stand replacing fires throughout brush lands of southern Idaho. This included the Little Prairie Fire in the monument. These environmental conditions produced poor forage conditions all times of year compared with the first few years of deer monitoring in the monument. The significant increase in deer of all age/sex classes in 1998 is probably a result of the increase in rain followed by warm dry conditions favorable to plant growth. Will this be the beginning of a new trend of population growth or simply a bump in a continuing period of decline? Only continued monitoring will be able to answer this question.

Recommendations

Spring surveys have always been informal with monument staff recording deer sightings as they have occurred. The problem with this approach is there is no way to measure the sampling effort in any year or combination of years. Known sampling effort is necessary to compare results between years. The current procedure makes any comparison numbers very difficult and highly questionable. The current methods can only provide a very general look at broad scale trends in the population. In order to get more comparable numbers from year to year in the spring survey, structures as begun in 1998 should be continued. These surveys should be increased in number to 6 or 8 visits as in the fall

survey. To further quantify spring use of the monument by mule deer it may be useful to expand the survey area to include walking surveys on the wilderness trail or other areas of deer use.

Table I. Craters of the Moon National Monument Mule Deer Survey Summaries for 1995-1998.

	1995	1996	1997	1998
SPRING				
Adult Doe	94	50	42	120
Yearlings	16	25	21	68
Yearling:100 Doe	25	50	47	57
Over-winter Survival	23.0%	51.8%	47%	70%
Total Does	73	63	52	154
Adult Doe Ratio	0.89	0.8	0.81	.78
FALL				
Mean # Adult Males	4.5	4.2	3.5	3.7
Percent change	-18.4%	-6.7%	-16.7%	5.7%
Mean # Yearling Male	1.7	3.67	1.5	1.2
Percent change	5.5%	118%	-59.1%	-20%
Mean # Adult Females	12.7	18.3	17.0	13.5
Percent change	-30.6%	44.0%	-7.1%	-20.6%
Mean # Fawns	12.8	18.5	14.0	10.8
Percent change	-24.7%	44.7%	-24.3%	-22.9%
MEAN TOTAL	31.7	44.7	37.7	27.5
Fawns:100 Does	96.5	101	82.1	92
Fawns:100 Adult Does	108.4	126.3	101	117
VEHICLE KILLS				
Adult males	1	1	0	0
Yearling males	2	0	0	1
Adult females	3	15	7	4
Fawns	1	9	6	7
Unknown	0	1	1	0
TOTALS	7	26	14	11
FALL POP'N ESTIMATES	250	345	294	232
95% CI	84-416	225-465	170-417	55-409

Table 2A. Daily survey totals, mean totals, standard error figures, and 95% confidence intervals for each class (age/sex) of deer in the 1996 Craters of the Moon National Monument Annual Mule Deer Survey.

		8/29	9/3	9/6	9/13	9/14	9/18	mean	std error	Sig. Chan.
Adult Males	#	1	5	2	10	1	6	4.2	.51	n
	ratio	6	23	11	48	6	43	22.8		
Yrlg Males	#	1	5	4	7	3	2	3.6	.88	n
	ratio	7	23	28	33	17	14	19.3		
Females	#	17	22	18	21	18	14	18.3	1.17	+
	ratio	100	100	100	100	100	100	100		
Fawns	#	19	19	21	15	21	16	18.5	1.02	+
	ratio	112	86	117	71	117	114	102.8		
Unknown	#	0	0	0	0	0	0	0		
TOTALS		38	51	45	53	43	38	44.7		

Significant Change from previous year: n = change not statistically significant, + = significant increase over previous year, -- = significant decrease from previous year
ratio = the age/sex class to adult doe ratio for a survey

Table 2B. Daily survey totals, mean totals, standard error figures, and 95% confidence intervals for each class (age/sex) of deer in the 1997 Craters of the Moon National Monument Annual Mule Deer Survey.

		8/15	8/28	8/29	9/4	9/8	9/9	mean	std error	Sig. Chan.
Adult Males	#	3	5	5	0	1	7	3.5	1.1	n
	ratio	20	21	31	0	4	47	20.5		
Yrlg Males	#	1	2	0	2	1	3	1.5	.4	--
	ratio	7	8	0	20	4	20	8.8		
Females	#	15	24	16	10	22	15	17	2.1	n
	ratio	100	100	100	100	100	100	100		
Fawns	#	19	11	11	10	18	15	14	1.6	n
	ratio	127	46	69	100	82	100	82.4		
Unknown	#	0	0	0	10	0	0	1.7	1.7	
				100			9.8			
TOTALS		38	42	32	32	42	40	37.6		

Significant Change from previous year: n = change not statistically significant, + = significant increase over previous year, -- = significant decrease from previous year
ratio = the age/sex class to adult doe ratio for a survey

Table 2C. Daily survey totals, mean totals, standard error figures, and 95% confidence intervals for each class (age/sex) of deer in the 1998 Craters of the Moon National Monument Annual Mule Deer Survey.

		8/17	8/19	8/24	8/26	8/31	9/9	mean	std error	Sig. Chan.
Adult Males	#	2	5	4	3	6	2	3.7	0.67	n
	ratio	13	50	44	15	38	18	31.3		
Yrlg Males	#	0	2	1	2	1	1	1.2	0.31	n
	ratio	0	20	11	10	6	9	10.2		
Females	#	15	10	9	20	16	11	11.8	1.72	n
	ratio	100	100	100	100	100	100	100		
Fawns	#	16	5	13	7	17	7	10.8	2.10	n
	ratio	107	50	144	35	106	64	91.5		
Unknown	#	1	0	0	0	0	0	0.2	1.67	n
		6.7					1.7			
TOTALS		34	22	27	32	40	21	37.6	3.07	

Significant Change from previous year: n = change not statistically significant, + = significant increase over previous year, -- = significant decrease from previous year
ratio = the age/sex class to adult doe ratio for a survey

Table 3. Craters of the Moon National Monument Mule Deer Survey Summaries in 3 year intervals for the period 1984-1998.

	1984-86	1987-89	1990-92	1993-95	1996-98
SPRING					
Adult Doe	71	59	47	48	71
Yearlings	62	40	41	16	38
Yearling:100 Doe	71	65	85	44	51
Over-winter Survival	68%	66%	79%	55%	56%
Total Does	120	79.5	67	56	90
Adult Doe Ratio	0.74	0.76	0.71	0.82	0.80
FALL					
Mean # Adult Males	2.4	3.2	5.6	3.4	3.8
Percent change		33%	75%	-39%	12%
Mean # Yearling Male	4.8	4.0	2.4	1.2	2.2
Percent change		-17%	-40%	-50%	83%
Mean # Adult Females	29	27	27	12.2	16
Percent change		-7%	0%	-55%	27%
Mean # Fawns	30	22	29	12	14
Percent change		-26%	32%	-60%	17%
MEAN TOTAL	66	55	64	28	37
Fawns:100 Does	106	93	105	96	92
Fawns:100 Adult Does	144	123	170	116	115
VEHICLE KILLS					
Adult males	1.3	1.7	1.3	1.3	0.3
Yearling males	3.0	2.0	0.0	0.7	0.3
Adult females	7.0	3.3	5.6	3.7	8.7
Fawns	9.0	5.0	1.0	2.3	7.3
Unknown	1.0	0.3	1.0	0.3	0.7
TOTALS	21.3	12.3	8.9	8.3	17.3
FALL POP'N ESTIMATES	502	417	486	228	290
95% CI					

Appendix 1. Summaries for the Craters of the Moon National Monument Annual Mule Deer Survey 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%
Total Does	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%
Total Does	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