

**CRATERS OF THE MOON NATIONAL MONUMENT
AND PRESERVE MULE DEER SURVEY
2002-2004**

2004 Mule Deer 1



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December 2004

Executive Summary

Mule deer surveys were performed during the spring and fall of 2002 to 2004. These included unstructured spring surveys as well as the systematic fall surveys in the north end of the monument. Systematic road surveys were continued on the loop road in addition to the usual informal count during May and June.

The number of does continued to decline from the previous three year period. Numbers were about a third of the 15 year average. Yearlings were also down with numbers about half of the previous three year period and the 15 year average. Over-winter survival of fawns was not calculated and reported due a very small and statistically skewed sample size.

The fall survey recorded numbers that were half or less the of 15 year average for all age classes. The fawn to adult ratio continued a major decline that started in 2000. This indicates either a change in previously stable birth rates or a decline in early fawn survival. The total population estimate also showed a continued decline with estimates half to two thirds of the 15 year average. This is likely a result of drought conditions continuing through most of the period covered in this report.

When the data was averaged into three year intervals the deer population shows a general pattern of decline since the mid 1980s and reaching its lowest point in the current period. The numbers of all age/sex classes showed at least small increases in 1996-1998 over the previous three year period then showed a significant decline in the years since.

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Introduction

Monitoring of the mule deer population began in 1980 when Griffith initiated a study on the population dynamics and habitat use of the monument's deer herd (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.). 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 each year since. This document reports data collected from 2002 to 2004.

Methods

In accordance with the monument's Standard Operating Procedures (SOP) informal spring surveys were conducted from late April until 30 June. During this period the monument staff was requested to record any mule deer sighted. 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. Starting in the spring of 1998 systematic road surveys were conducted in addition to the usual informal survey. 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.

Late summer and early fall surveys were 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 (appendix 2). Observations began 10 minutes after sunrise and were made in one direction only. Survey days were evenly distributed 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 age (adult, yearling, fawn). Surrounding hillsides, lava flows, and valleys along the route were carefully observed with the use of binoculars and a spotting scope. All surveys took approximately two hours to complete. Eight surveys were completed each year during the period from August 16 to September 15.

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 calculated 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 using the student t-test.

Results

SPRING SURVEY

The number of adult does observed in the spring surveys ranged from 11 to 28 (table 1). The number of yearlings ranged from 1 to 23. Over-winter fawn survival is not reported. The protocol for this survey requires a minimum spring count of 100 animals and state that 200 or more animals is preferable. The three years of the survey reported here only 47, 50 and 12 animals were reported. 2002 was the first year since this survey began in 1984 that the population statistics were not calculated due to a too small sample size. Spring observations have continued to decline since that year.

FALL SURVEY

The mean number of deer in most sex/age classes showed significant decreases from 2000 and 2001 counts (Table 1). The only exception was yearling males which showed an increase in the three years 2002-04 and adult males which showed a significant increase in 2002 but decreased again in 2003 and 2004. Adult females showed an annual mean ranging from 9.5 to 12.3 in this period. This compares to a 15 year average of 22 and an average of 15.4 for the previous 5 years.

Fawns showed a less prominent decrease with annual means ranging from 6 to 9. This compared to an average of 11.4 for the previous 5 years and 15 year average of 21. The total number of deer observed also showed a similar trend with the annual means ranging from 18 to 25 the past 3 years. This compares to a mean of 30 for the previous years and 15 year average of 49.

These observed changes were rather varied in size between age groups and years. The changes in number of adult females, adult males, and the total number of animals observed were statistically significant at $p < 0.05$ for the drop in numbers from 2002 to 2003. The drop in fawn numbers from 2003 to 2004 was statistically significant at $p < 0.10$ ($p = 0.08$).

Conclusions

During all three years of data reported here the sample size in the spring surveys were the smallest yet recorded. The protocol for this survey requires a minimum spring count of 100 animals and states that 200 or more animals are preferable. Samples much smaller than this will have a lot of statistical variability and many normal statistical procedures are not valid. The yearling to doe ratio ranged from 9 to 96 compared to the 15 year average of 60. This number is skewed by the small sample size and it unlikely to be reliable for any of the three years. The percentage of does that were adults was also too small in these years to calculate. Over-winter survival of fawns was also affected by the small sample size. Also, when the normal calculations were tested the over-winter survival was calculated to be 172% in 2002. Since survival greater than 100% is not possible this test was able to verify the need for larger sample sizes to accurately calculate population parameters.

The fall deer counts showed a continued decrease in all age classes except yearling males. Yearling males, which usually have low counts, increased from 2000 and 2001 but still had mean count of less than two and were still only about half of the 15 year average (table 1). Increases in the fall counts were not statistically significant ($P < 0.05$) for yearling males.

This pattern may be related to weather conditions that predominated in the past few years. With the good snowpack and spring rains, 1999 experienced decent growing and browse conditions at least into midsummer. By contrast the dry conditions of fall continued through the winter of 1999-2000 and into spring and summer. The spring and summer season (May-August) of 2000 had only 1.49 inches of rain compared to an average of 4.63 (National Weather Service, Western Region Climate Center 2000). The drought conditions continued through July of 2004 with July through October of 2004 the first 4 consecutive months of average precipitation since 1996. The May through August season saw only 2.0" in 2002, 2.0" in 2003, and 5.45" in 2004. Although the total precipitation for the survey period in 2004 most of the rain came late in the period and it assumed that deer distribution was already determined for the much of the year.

Additionally, the peak growing season of May to June had a cumulative rainfall of 1.6" in 2002, 1.4" in 2003, and 2.7" in 2004 compared to 2.88 inch average for the period. Incidental observations indicate poor growth and early drying of vegetation in 2002 and 2003. The only surface water in the area is Little Cottonwood and Leech Creeks which dried up much earlier than normal and much higher up the stream channels than has been recorded in several years. This lack of water and forage likely had a negative influence on fawn survival. Dry conditions will

also cause deer to spread out over much larger areas in search of suitable browse and open water, then concentrating animals at locations that still have water. Although the last six months of 2004 saw a return to near normal precipitation levels it is unknown how long it may take deer populations to recover. Even if 2004 and 2005 see a return to normal precipitation levels it may take several years for deer populations to rebound.

Table 3 shows survey and population statistics in 3 year intervals since surveys began in 1984. Several trends are observable in this data. One is declining numbers of does and fawns in the fall survey since the mid 1980s. These data show that recent counts of these two age classes are about half of what they were in the mid 1980s for does and about 1/3 for fawns. The most recent period (2002 to 2004) showed the lowest average count of both fawns and adult females. These declines are likely a result of climate and other factors already discussed.

Unlike females and fawns, male deer (both adults and yearlings) have always had comparatively 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 (figure 2) and fall counts (figure 1). This accounts for large percentage fluctuations not having much significance. An increase of 213% from 2003 to 2004 was less than half an animal per survey.

One population statistic, which had previously 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 exception to this came in 2000. This year the fawn to adult doe ratio fell to an all time low of 74. This drop continued in 2001 with another new low of 64. This is a 52% drop from 1999 (132) and the 15 year average (131) (table 1). This number then rebounded in 2002 and 2003.

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 was followed by a steady decline starting in 2000 and continuing through 2004. This trend was likely influenced by the occurrence of frequent drought years from the mid 1980s through the early 1990s. Throughout shrub lands of southern Idaho many stand replacing fires occurred during this time period. This included the 1992 Little Prairie Fire in the monument. These environmental conditions produced poor forage conditions compared with the first few years of deer monitoring in the monument. In the years since the drought, vegetation has begun to recover. This weather pattern may explain the stabilizing numbers in the late 1990s.

Late summer 1999 through spring of 2004 had similar drought like conditions and the resulting poor forage. Which is likely related to the current decline in deer numbers starting in 2000.

Recommendations

Migration especially in the spring tends to be spread out over a several weeks. To further quantify spring use of the monument and increase the sample size to a level sufficient for analysis it may be necessary to expand the survey area to include walking surveys on the wilderness trail or other areas of deer use. Increasing the length of the count is not practical for two reasons. An earlier start would not likely be effective as very few deer are observed in April. Extending the survey into July is not feasible either as yearling become increasingly difficult to distinguish from adults by July.

Since annual weather patterns are a factor in the movement of deer in the region the data collected under these conditions is best looked at over periods of several years and for analysis of long term trends rather than year to year fluctuations. For example, in good precipitation years like 1998, which produce excellent forage conditions, deer may be more spread out rather than actually experiencing an apparent decline. In other years like 1999, which are unusually dry in spring and summer, deer may be more concentrated in areas of better forage or available water. In even more dry years like 2000 to 2003 when water sources dry up the deer likely suffer higher mortality, lower reproduction, and spread out even more in search of water then concentrate when water is located. These factors will be difficult to determine without much more widespread surveys and great caution should be taken when looking at single year data.

The Preserve was transferred from the BLM in November of 2000 and brought both new lands and new deer and elk herds under NPS management. The Idaho Fish and Game commission and other parties have expressed concern with potential depredation and other issues with deer and elk. In response to these concerns congress passed legislation designating the Preserve in 2002 and opening the area to hunting. To address hunting effects or issues with wild ungulates it may become necessary to expand monitoring of deer, elk, or pronghorn in other areas of the monument or preserve.

Table 1. Summaries for 2000-2004 Craters of the Moon National Monument Mule Deer Survey.

	2000	2001	2002	2003	2004	15 year Average
SPRING						
Adult Doe	87	74	24	28	11	55
Yearlings	45	22	23	22	1	34
Yearling:100 Doe	51	30	*	*	*	60
Over-winter Survival	55%	50%	*	*	*	63%
Total Does	110	85	36	39	12	85
Adult Doe Ratio	80	87	68	72	96	74
FALL						
Mean # Adult Males	1.0	0.8	1.8	0.16	0.5	3.0
Percent change	-73%	-20%	125%	-91%	213%	
Mean # Yearling Male	0.5	0.5	1.7	1.5	1.7	3.0
Percent change	0.0	0.0	240%	-13%	13%	
Mean # Adult Females	13.8	17.6	12.3	9.5	10.2	19.5
Percent change	-7.8%	27.5%	-30.1%	-10.5%	7.3%	
Mean # Fawns	8.2	9.8	9.3	9.2	6.0	18.4
Percent change	-41.7%	19.5%	-4.0%%	-1.1%	-34.8	
MEAN TOTAL	23.5	28.7	25.1	20.4	18.4	43.4
Fawns:100 Does	59	56	76	97	59	93.7
Fawns:100 Adult Does	74	64	112	135	62	125
FALL POP'N ESTIMATES	191	231	216	168	155	329
95% CI	164-217	177-285	198-234	145-191	106-204	

* The sample sizes were too small to calculate valid estimates for these parameters. The 15 year average excludes these numbers.

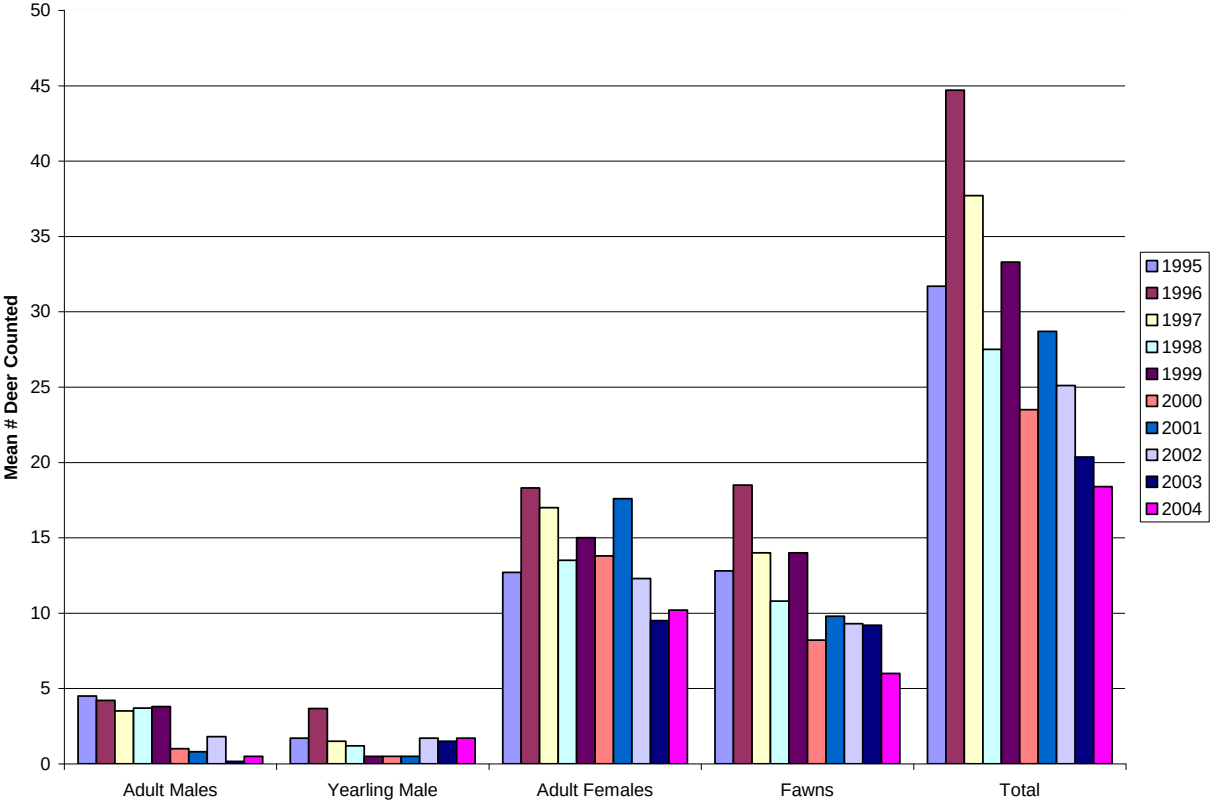


Figure 1. Mean number of mule deer counted in fall surveys 1995-2004.

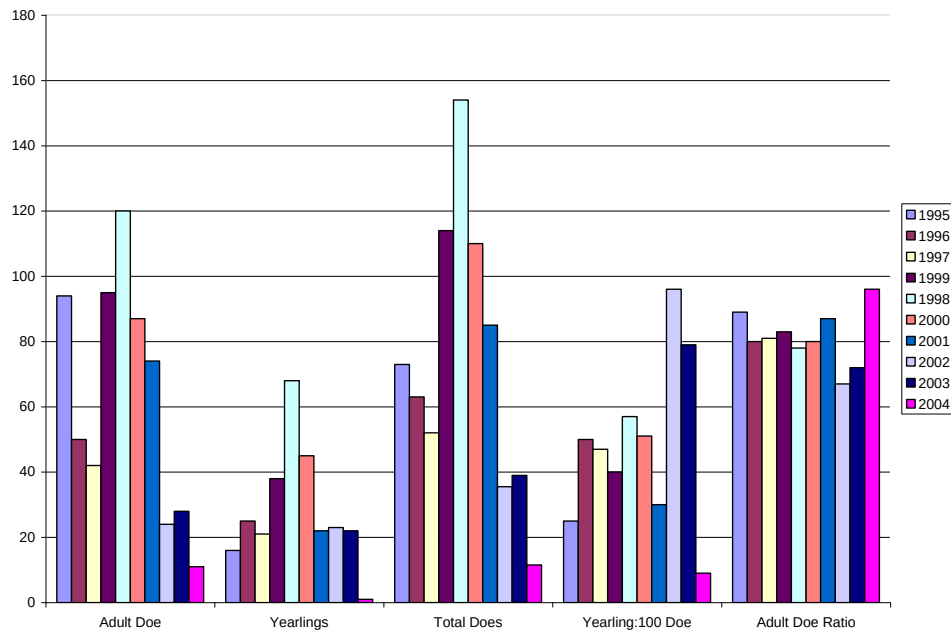


Figure 2. Number of deer counted in spring surveys 1995-2004.

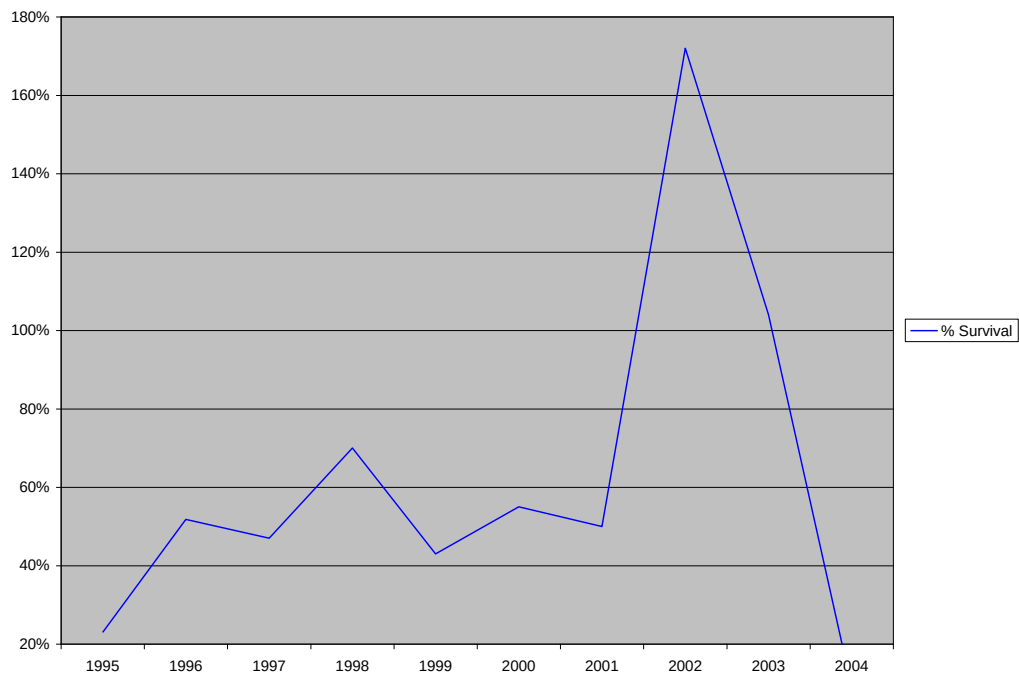


Figure 3. Percent over winter survival of fawns 1995-2004

Table 2a. Daily survey totals, mean totals, and standard error figures for each class (age/sex) of deer in the 2004 Craters of the Moon National Monument Mule Deer Fall Survey.

		1st	2nd	3rd	4th	5th	6th	total	mean	SE	t-test P
Ault males	#	1.0	1.0	1.0	0.0	0.0	0.0	3.0	0.5	0.2	0.260
	ratio	0.1	0.1	0.1	0.0	0.0	0.0		0.0		
Yrlg males	#	3.0	2.0	2.0	0.0	2.0	3.0	12.0	2.0	0.4	0.503
	ratio	0.3	0.1	0.2	0.0	0.2	0.8		0.3		
Females	#	10.0	19.0	9.0	9.0	10.0	4.0	61.0	10.2	2.0	0.767
	ratio	100.0	100.0	100.0	100.0	100.0	100.0		100.0		
Fawns	#	7.0	12.0	5.0	3.0	5.0	4.0	36.0	6.0	1.3	0.086
	ratio	70.0	63.2	55.6	33.3	50.0	100.0		62.0		
Unknown		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total		21.0	34.0	17.0	12.0	17.0	11.0	112.0	18.7	3.4	0.646

Significant change is the P value from a student t-test between means for 2004 and 2003 counts

ratio = the age/sex class to adult doe ratio for a survey

Table 2b. Daily survey totals, mean totals, and standard error figures for each class (age/sex) of deer in the 2003 Craters of the Moon National Monument Mule Deer Fall Survey.

		1st	2nd	3rd	4th	5th	6th	total	mean	SE	t-test P
Ault males	#	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.2	0.0	0.0
	ratio	0.0	0.0	0.0	0.1	0.0	0.0		0.0		
Yrlg males	#	1.0	0.0	4.0	2.0	1.0	1.0	9.0	1.5	0.0	0.9
	ratio	0.2	0.0	0.3	0.2	0.1	0.1		0.2		
Females	#	6.0	12.0	12.0	9.0	9.0	9.0	57.0	9.5	0.0	0.1
	ratio	100.0	100.0	100.0	100.0	100.0	100.0		100.0		
Fawns	#	9.0	8.0	9.0	14.0	8.0	7.0	55.0	9.2	0.0	1.0
	ratio	150.0	66.7	75.0	155.6	88.9	77.8		102.3		
Unknown		0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.2		
Total		16.0	20.0	25.0	27.0	18.0	17.0	123.0	20.5		0.0

Significant change is the P value from a student t-test between means for 2003 and 2002 counts
 ratio = the age/sex class to adult doe ratio for a survey

Table 2c. Daily survey totals, mean totals, and standard error figures for each class (age/sex) of deer in the 2002 Craters of the Moon National Monument Mule Deer Fall Survey.

		1st	2nd	3rd	4th	5th	6th	total	mean	SE	t-test P
Ault males	#	2.0	1.0	2.0	1.0	5.0	0.0	11.0	1.8	0.7	0.267
	ratio	0.2	0.1	0.2	0.1	0.5	0.0		0.2		
Yrlg males	#	1.0	4.0	0.0	0.0	1.0	4.0	10.0	1.7	0.8	0.172
	ratio	0.1	0.3	0.0	0.0	0.1	0.3		0.1		
Females	#	10.0	12.0	12.0	16.0	10.0	15.0	75.0	12.5	1.0	0.116
	ratio	100.0	100.0	100.0	100.0	100.0	100.0		100.0		
Fawns	#	7.0	8.0	9.0	7.0	14.0	10.0	55.0	9.2	1.1	0.751
	ratio	70.0	66.7	75.0	43.8	140.0	66.7		77.0		
Unknown		3.0	3.0	4.0	0.0	1.0	0.0	11.0	1.8		
Total		23.0	28.0	27.0	24.0	31.0	29.0	162.0	27.0	1.2	0.624

Significant change is the P value from a student t-test between means for 2002 and 2001 counts

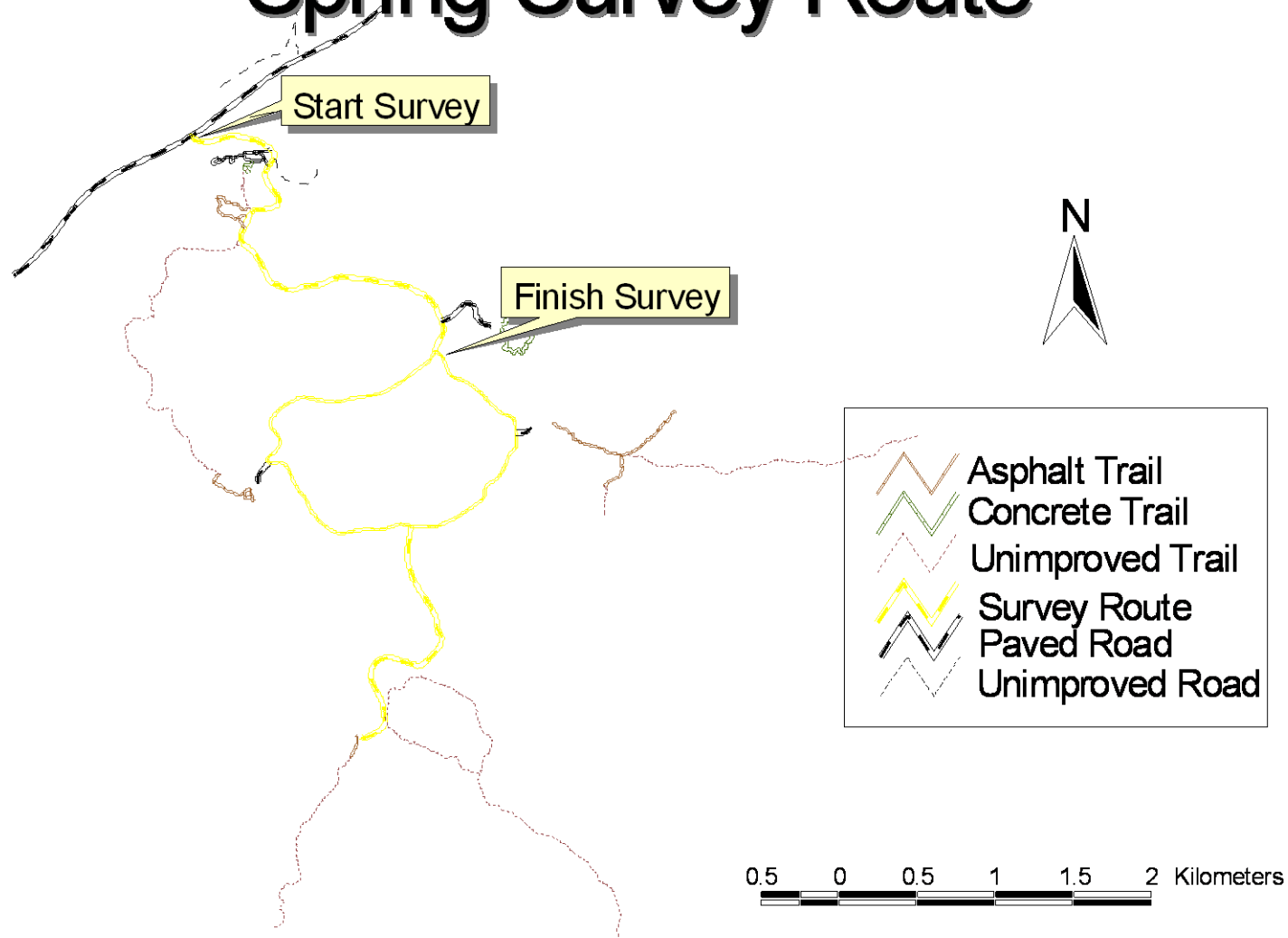
ratio = the age/sex class to adult doe ratio for a survey

Table 3. Craters of the Moon National Monument Mule Deer Survey Summaries in 3 year intervals for the period 1984-2004.

	1984-86	1987-89	1990-92	1993-95	1996-98	1999-2001	2002-2004
SPRING							
Adult Doe	71	59	47	48	71	85	21
Yearling	62	40	41	16	38	35	18
Yearling:100 Doe	71	65	85	44	51	40	*
Over-winter Survival	68%	66%	79%	55%	56%	49%	*
Total Does	120	80	67	56	90	103	29
Adult Doe Ratio	0.74	0.76	0.71	0.82	0.80	0.83	0.78
FALL							
Mean # Adult Males	2.4	3.2	5.6	3.4	3.8	1.9	0.8
Percent Change		33%	75%	-39%	12%	-50%	-58%
Mean # Yearling Males	4.8	4.0	2.4	1.2	2.2	0.5	1.6
Percent Change		-17%	-40%	-50%	83%	-77%	220%
Mean # Adult Females	29	27	27	12	16	12.1	10.6
Percent Change		-7%	0%	-55%	27%	-25%	-12.4%
Mean # Fawns	30	22	29	12	14	10.6	8.1
Percent Change		-26%	32%	-60%	17%	-24%	-23.6%
MEAN TOTAL	66	55	64	28	37	28.5	21.3
Fawns:100 Does	106	93	105	96	92	69	77
Fawns:100 Adult Does	144	123	170	116	115	90	103
FALL POPULATION ESTIMATES	502	417	486	228	290	179	180

* Statistic not calculated due to very small sample size in all three.

Spring Survey Route



Fall Survey Route

