

*Original*

MICHIGAN DEPARTMENT OF NATURAL RESOURCES  
Wildlife Division Report No. 3085  
June 1988

THE 1987 ELK HUNT  
DATA SUMMARY<sup>1</sup>

Richard J. Moran  
Wildlife Research Biologist  
Houghton Lake Wildlife Research Station  
Box 158, Houghton Lake Heights, MI 48630

Stephen M. Schmitt  
Wildlife Veterinarian  
Rose Lake Wildlife Research Center  
8562 E. Stoll, East Lansing, MI 48823

<sup>1</sup>Contribution of Federal Aid to Wildlife Restoration,  
Michigan Pittman-Robertson Project W-127-R.

## INTRODUCTION

The 1987 elk hunting season was a 6-day hunt held December 8-13. The 130 successful permittees, who appeared for the required pre-hunt Orientation Program in Atlanta on December 7, were drawn from 38,546 applications. Applicants were drawn from each of Regions I, II, and III according to the respective proportion of applications received from that geographic area. This resulted in 3 permits for Region I, 36 for Region II, and 91 for Region III.

The legal hunting area contained 5 hunting zones totaling 686 sq. mi. A synopsis of elk hunting in Michigan appears in Table 1. Hunters in 1987 were required to stay within their assigned zones through the first 4 days of hunting. The weather was exceptionally mild for December (35-40°F daytime) and snowcover absent to a light dusting. The 130 permits were distributed among 49 Hunter Choice (bull, cow, or calf) and 81 Antlerless (cow or calf). The permits were allocated among Zones A, B, C, and D according to desired removals (Fig. 1). Zone X was a "free" zone where any elk could be taken at any time on an unfilled tag to alleviate agricultural damage.

## HUNTING SUCCESS

One hundred twenty-nine of the 130 hunters bagged a legal elk for a 99% success rate (Table 1). The lone "unsuccessful" hunter shot a spike bull on his Antlerless Permit.

The legal kill of 129 included 48 bulls, 73 cows, and 8 calves. The legal harvest of bulls was 1 short of the bull quota because

Table 1. Synopsis of Michigan controlled elk hunting, 1964-1987.

Year	Hunting Period December	Applications	Area mi	Zones	Permits	Harvest			% Success	
						Bulls	Cows	Calves Tot.		
1964	5-12	23,000	577	5	300	126	103	40	269	90
1965	8-16	35,000	577	5	300	56	94	33	183	61
1984	11-16	45,908	222	1	50	10	35	4	49	98
1985	10-15	52,658	295	2	120	29	80	10	119	99
1986	9-14	36,348	453	4	95	39	50	4	93	98
1987	8-13	38,546	686	5	130	48	73	8	129	99





**MICHIGAN ELK RANGE**



1 hunter took a cow on his Hunter Choice tag. The antlerless quota was met with the kill of 81 cows and calves.

#### DAILY KILL AND VALIDATION

With the exception of the first day, validation (bringing the elk to the check station) and kill were about equal again this year. By the end of the third day, hunters had taken 81% of the season's kill (Table 2). On the first day hunters took 52% of the bull harvest but only 38% of the antlerless (Table 3). The final legal kill of 48 bulls and 81 antlerless was 98% and 100%, respectively, of the quotas.

#### KILL DISTRIBUTION

The size, permit allocations, and elk harvest for the 5 hunting zones are shown in Table 4. Zones C and D were much enlarged over 1986, while in Zone A, the Johannesburg sector was split off to form a special 105-sq.-mi. Zone X (Fig. 1). This area was open to taking of any elk (bulls, cows, or calves) at any time by an unfilled tag during the hunt. Total hunting area increased to 686 sq. mi. for a possible hunter density of 1/5.3 sq. mi.

In Zone B (the "club" zone), both Hunter Choice and Antlerless quotas were exceeded by a total of 11 elk. The harvest was again facilitated by the cooperation of Canada Creek and Black River ranches which contributed a combined total of 37 elk--14 bulls, 21 cows, and 2 calves. Thirty-four percent of the total elk kill came from Zone B. Both Zones C and D fell short of the quotas as expected. The problem in D was complicated by deer feeding operations on private lands which tend to concentrate elk on areas not accessible to hunters. Zone X



Table 2. Daily validation of elk and accumulated harvest, Michigan elk season, 1987.

Day	Dec.	Bulls		Antlerless				Total					
		Val.	Kill	Cows		Calves		Val.	Accum. Val.	% Tot.	Kill	Accum. Kill	% Tot.
1	8	23	25	26	29	1	2	50	50	(39)	56	56	(43)
2	9	9	8	18	15	5	4	32	82	(64)	27	83	(64)
3	10	5	5	15	16	1	1	21	103	(80)	22	105	(81)
4	11	1	0	5	4	0	0	6	109	(85)	4	109	(85)
5	12	8	8	6	6	1	1	15	124	(96)	15	124	(96)
6	13	2	2	3	3	0	0	5	129	(100)	5	129	(100)
Total		48	48	73	73	8	8	129	129	(100)	129	129	(100)

Table 3. Daily legal kill of elk and percent harvest attained, Michigan elk season, 1987.

Day	Dec.	Bulls		Antlerless		Combined			% Total Kill	
		Adult	Yrlg. <sup>c</sup> Tot.	Adult	Yrlg. <sup>c</sup> Calves Tot.	Adult	Yrlg. <sup>c</sup> Calves Tot.	Accum. Kill	Bulls Antl. Tot.	
1	8	24	1 25	27	2 2 31	51	3 2 56	56	52 38	43
2	9	8	0 8	15	0 4 19	23	0 4 27	83	69 62	64
3	10	4	1 5	10	6 1 17	14	7 1 22	105	79 83	81
4	11	0	0 0	3	1 0 4	3	1 0 4	109	79 88	85
5	12	7	1 8	4	2 1 7	11	3 1 15	124	96 96	96
6	13	2	0 2	3	0 0 3	5	0 0 5	129	100 100	100
Total		45	3 48 <sup>a</sup>	62	11 8 81	107	14 8 129	129	98 <sup>b</sup> 100 <sup>b</sup>	99 <sup>b</sup>

<sup>a</sup>hunter choice permit filled w/cow

<sup>b</sup>% harvest quota

<sup>c</sup>yearlings are 1-1/2-years-of-age

Table 4. Elk license allocations and validated harvest from hunting zones, Michigan elk season, 1987.

Hunting Area		Permit Allocations						Elk Harvest							
Zone	Size mi. <sup>2</sup> (%)	Hunter Choice		Antlerless		Total		Bulls		Cows/calves		Total Kill		Net Dif.	
		No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)		
A	96 (14)	13	(26)	22	(27)	35	(27)	12	(25)	17/2	(23)	31	(24)	(89)	-4
B	111 (16)	14	(29)	19	(24)	33	(25)	16	(31)	25/3	(35)	44	(34)	(133)	+11
C	220 (32)	7	(14)	10	(12)	17	(13)	3	(6)	6/1	(9)	10	(8)	(59)	-7
D	154 (23)	15	(31)	30	(37)	45	(35)	7	(15)	21/1	(27)	29	(22)	(64)	-16
X	105 (15)	--	--	--	--	--	--	10	(21)	4/1	(6)	15	(12)	--	+15
Tot.	686 (100)	49	(100)	81	(100)	130	(100)	48	(100)	73/8	(100)	129	(100)	--	-1



("free" zone), designed to ease crop damage by elk, produced 15 elk including 10 bulls, 4 cows, and 1 calf.

Hunters who elected to switch zones for the last 2 days of the hunt totaled 31--15 Hunter Choice and 16 Antlerless. They included 5 from A, 4 from B, 7 from C, and 15 from D. Those successful in their new zone included 15 in Zone X, 1 in Zone A, and 15 in Zone B. Clearly, Zones B and X were highly utilized as alternate destinations. The proportion of hunters switching zones this year was 24%, the same as in 1986.

Public land made up 45% of the hunting area and yielded 50% of the kill (Table 5). In Zone B 86% of the kill came from private lands, which comprised 54% of the land area.

The kill by counties was Montmorency (66), Otsego (50), Cheboygan (12), and Presque Isle (1) (Table 6).

#### KILL DENSITY

The kill density for the 686-sq. mi. hunting area was 0.2 elk/mi<sup>2</sup> (Table 7), the same as in 1986. Seventy-seven sections (11%) produced an elk kill--also a repeat of 1986. Overall kill density for sections with an elk kill was 1.7 elk/mi<sup>2</sup>. Zones A and B had the highest percentage of successful sections, 22 and 20%, respectively. Zone B again had the highest average kill density (2.0/mi<sup>2</sup>), but Zone X was a close second.

#### HUNTING EFFORT

The 129 successful hunters expended 279 hunter-days during the 6-day season for an average of 2.2 days/hunter. Hunters expended

Table 5. Representation of public and private lands in elk hunting zones with kill contribution from each, Michigan elk season, 1987.

Zone	Hunting Area		Harvest			
	Size (mi <sup>2</sup> )	%	Bulls	Cows	Calves	Tot. (%)
A	Public	67	8	14	2	24
	Private	33	4	3	0	7
	Tot.	100	12	17	2	31
B	Public	46	1	4	1	6
	Private	54	15	21	2	38
	Tot.	100	16	25	3	44
C	Public	50	2	6	1	9
	Private	50	1	0	0	1
	Tot.	100	3	6	1	10
D	Public	40	4	16	1	21
	Private	60	3	5	0	8
	Tot.	100	7	21	1	29
X	Public	21	5	0	0	5
	Private	79	5	4	1	10
	Tot.	100	10	4	1	15
Comb. Gr. Tot.	Public	45	20	40	5	65
	Private	55	28	33	3	64
	Tot.	100	48	73	8	129

Table 6. Legal elk kill by zone and county, Michigan elk season, 1987.

County	Zone				Total
	A	B	C	D	
Presque Isle			1		1
Cheboygan		9		3	12
Otsego	10	5		26	50
Montmorency	21	30	9		66
Total	31	44	10	29	129



Table 7. Kill density of legal elk for total hunting area and sections with a kill, Michigan elk season, 1987.

Zone	All Sections				Sections w/Kill			Range (Kill/mi <sup>2</sup> )
	Kill	Mi <sup>2</sup>	%	Kill/mi <sup>2</sup>	Mi <sup>2</sup>	(%) <sup>a</sup>	Kill/mi <sup>2</sup>	
A	31	96	14	0.3	21	(22)	1.4	1-4
B	44	111	16	0.4	22	(20)	2.0	1-4
C	10	220	32	0.1	8	(4)	1.3	1-3
D	29	154	23	0.2	18	(12)	1.6	1-4
X	15	105	15	0.1	8	(8)	1.9	1-5
Tot./Avg.	129	686	100	0.2	77	(11) <sup>b</sup>	1.7	---

<sup>a</sup> % sections in zone

<sup>b</sup> % Total hunting sections

about 85% of the total effort in the first 3 days as in 1986 (Table 8). Hunting statistics, based on the nearest full day's effort, are remarkably similar from year to year.

#### ELK SEEN

Hunters reported seeing a total of 2,436 elk for an average of 10.5 elk/hunter-day. The sighting rate was 12.4 in 1986 and 10.3 in 1985. Hunters recorded 803 bulls containing 18.7% spikes, the same ratio as in 1986. This year almost 60% of the elk seen were unidentified as to sex and age, making a bull:cow:calf ratio impossible.

#### SEX AND AGE COMPOSITION

A 1:1.7 ratio of Hunter Choice to Antlerless Permits resulted in a harvest of 63% antlerless elk (Table 4). Fig. 2. illustrates the sex structure, by age group, of the legal kill. Females made up 60% of the harvest.

Among females, the PRIME age group (3-7 yrs.) comprised 49%, YOUNG (1/2-2 yrs.) 35%, and OLD (8-16 yrs.) was 16%. Among the males, YOUNG made up 45%, PRIME 46%, and OLD 9%.

Two and 5-year-olds were strong age classes among bulls, comprising 56% of the group. For cows, the age-class representation was more balanced from 1-5 years.

Fig. 3 shows that the overall age distribution of the legal kill was very similar between 1986 and 1987. Representation of YOUNG, PRIME, and OLD groups is similar, as well as relative size of individual age classes.

Table 8. Distribution of hunting effort by day, Michigan elk season, 1987.

Day	Dec.	Day of Week	Hunter-days		Days in Hunt by Group					
					Hunters		Hunter-days			
			No.	%	No.	%	Days	No.	%	No.
1	8	Tue.	125	45	58	45	1	58	21	21
2	9	Wed.	68	24	28	22	2	28	20	20
3	10	Thur.	41	15	25	20	3	25	27	27
4	11	Fri.	20	7	3	2	4	3	4	4
5	12	Sat.	21	8	12	9	5	12	22	22
6	13	Sun.	4	1	3	2	6	3	6	6
Total			279	100	129	100		129	279	100



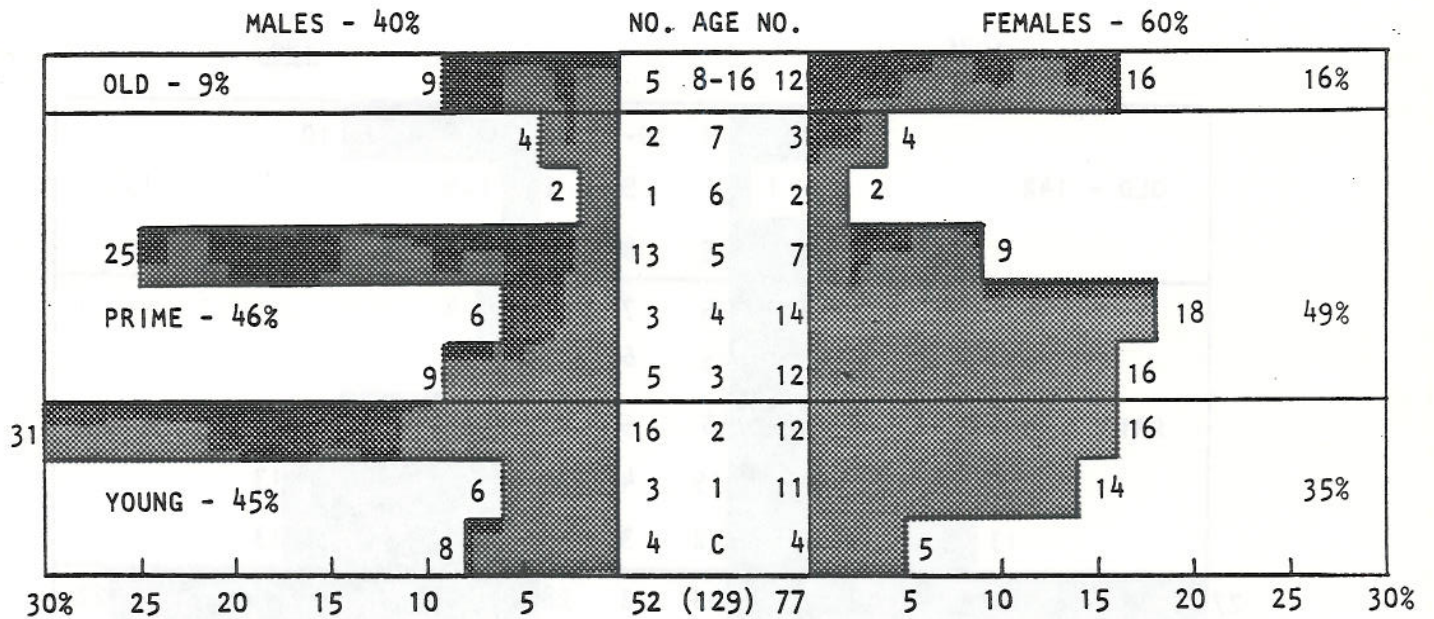


Fig. 2. Sex structure, by age groups, of legal elk harvested during Michigan elk season, 1987.

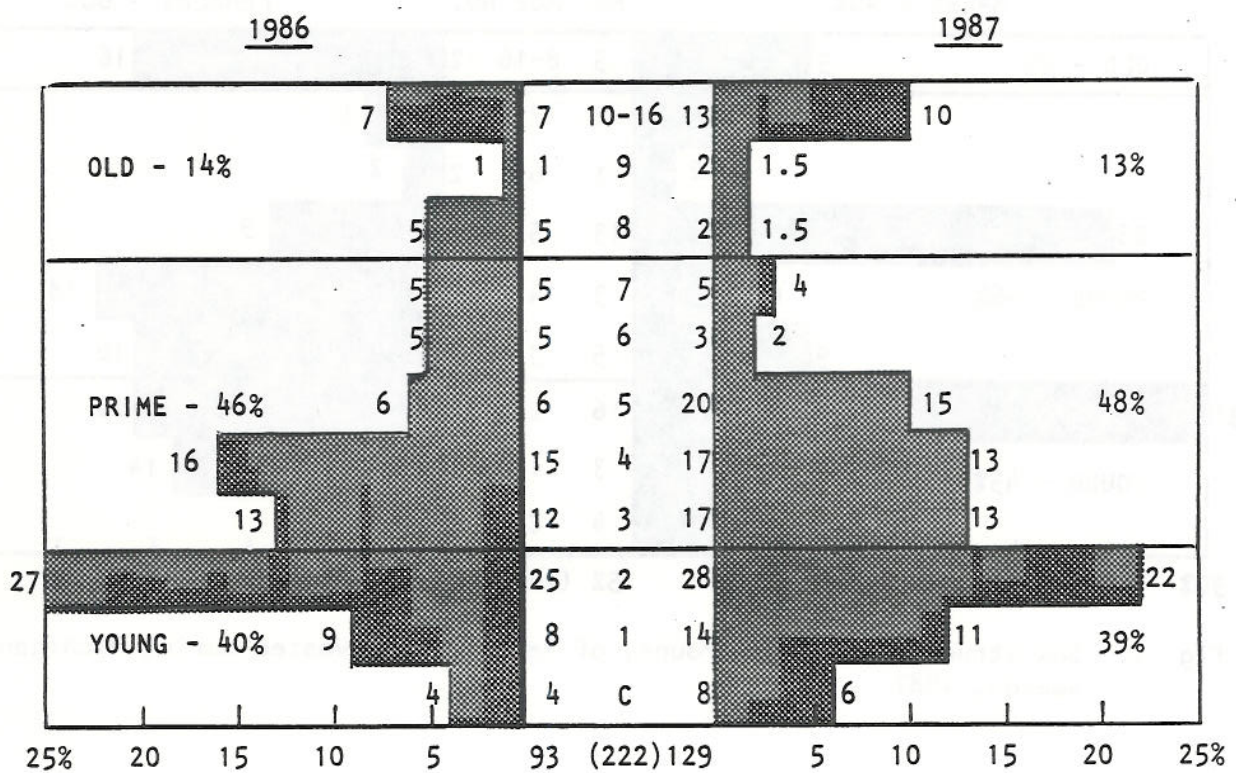


Fig. 3. Age structure of legal elk harvested during Michigan elk seasons, 1986 and 1987.

#### REPRODUCTIVE DATA

Reproductive status of cow elk was determined by serum progesterone levels. A serum progesterone level of 0.8 ng or higher was used as an indication of pregnancy. The pregnancy rate for all cows was 81% (Table 9) compared to 82% in 1986. The rate among mature cows (2 plus years) was 89% in both 1986 and 1987. The 11 yearlings showed a 36% rate compared to 20% last year. The pregnancy rate of yearlings is much more variable than that of the mature cows, and depends on physical condition, range, and winter severity.

#### CALF SURVIVAL DATA

The presence of milk in the udders of cows was used to estimate calf survival. It was assumed that a cow with milk in her udder was still accompanied by her calf.

A comparison was made between 1986 cow pregnancy rates (Moran et al. 1986) and 1987 cow lactation frequencies (Table 10). The reason for the discrepancy in years was because the cows that were pregnant in December of 1986 gave birth to calves in May and June of 1987 and would be lactating in December of 1987. In other words, the previous year's pregnancy rate was compared with the current year's lactation rate to determine the calf survival rate for the 1987 cohort. The percentage of 1987 cows lactating divided by the 1986 pregnancy rates provides a rough estimate of calf survival for the first 6 months of life.

The calf survival rate for calves born to 3 plus-year-old cows was 85%. Until more data are accumulated for younger cows, it would be best to use calf survival rates only for 3 plus-year-old lactating



Table 9. Pregnancy of cow elk, by age class, according to serum progesterone levels (>0.8 ng/ml), Michigan elk season, 1987.

Age Class	N	Preg.	%
1	11	4	36
2	12	8	67
3	14	12	86
4	7	7	100
5	9	9	100
6	4	4	100
7	4	4	100
8	1	1	100
9	2	2	100
11	3	3	100
13	1	1	100
14	3	2	67
16	2	2	100
All cows	73	59	81
Adults >2	62	55	89
Yearlings	11	4	36

Table 10. Calf survival estimates based on comparison of 1986 pregnancy rates and 1987 lactation frequencies. Michigan elk season, 1986 and 1987.

Age Class	1986			1987			Calf Survival <sup>1</sup> Est. (%)
	N	Preg.	%	Age Class	N.	Lact.	
1	5	1	20	2	11	0	0 <sup>2</sup>
2+	45	40	89	3+	49	37	85
Tot.	50	41	82	Tot.	60	37	76

<sup>1</sup>Lactation frequency divided by pregnancy rate. Calf survival determined by calculating percentage of cows lactating which would have been pregnant based on 1986 pregnancy rates.

<sup>2</sup>Small sample

cows, due to the low numbers of 1-year-old pregnant cows and 2-year-old lactating cows.

#### FIELD-DRESSED WEIGHTS

A new dressed weight record for bulls was established at 688 pounds for a 7-year-old specimen. The heaviest cow was a 435 pound, 16-year-old, well under the 453 10-year-old handled in 1985. Weights were normal for most sex and age classes (Table 11).

#### ANTLER DEVELOPMENT

Antler measurements, including total points (both antlers), beam circumference, beam length, and widest point of spread were collected for 48 bulls (Table 12). Antler development of yearlings (small sample) was down this year compared to 1985 and 1986. Older age classes showed normal development.

Commemorative Bucks of Michigan records now include 23 entries for elk (minimums are 260 points typical and 270 non-typical): 1 from 1964, 2 from 1984, 3 from 1985, 7 from 1986, and 10 from 1987.

#### FIELD VS LABORATORY AGING

Comparison of elk aged at the check station (using tooth replacement and wear) with laboratory incisor cementum annuli was again analyzed (Table 13). Overall accuracy was 57%, similar to previous years experience. Field aging error was consistent with earlier years where moderate-aged elk (2-4 years) are over-aged, 5-year-olds are thrown both ways, and older elk (6+) are under-aged.



Table 11. Field-dressed weights, in pounds, of elk examined during the Michigan elk season, 1987.

Age Class	Males			Females		
	N	X	Range	N	X	Range
1/2	4	208	152-234	4	178	144-202
1	3	273	262-283	11	289	234-345
2	16	401	333-508	12	307	233-368
3	5	490	418-630	14	363	316-408
4	8	562	466-650	7	374	315-416
5	6	576	468-650	9	369	329-420
6	2	556	540-572	4	350	315-394
7	3	629	594-688	4	348	334-376
8	1	516	---	1	380	---
9	0	---	---	2	363	335-390
10	1	658	---	0	---	---
11	1	568	---	3	377	368-382
12	2	535	---	0	---	---
13	0	---	---	1	350	---
14	0	---	---	3	362	344-388
16	0	---	---	2	413	390-435
Tot./Avg.	52	467	152-688	77	336	144-435

Table 12. Antler development of bulls examined during Michigan elk season, 1987.

Age	Total Points			Beam Circ. (in.)	Beam Length (in.)	Max. Spread (in.)
	N	X	Range			
1	3	2.0	2	2.6	12.0	11.9
2	16	8.4	7-11	4.3	29.3	24.4
3	5	10.0	8-11	4.8	31.5	27.3
4	8	11.4	10-14	5.6	39.2	32.6
5	6	12.0	10-14	5.8	40.9	35.0
6	2	13.5	12-15	6.3	45.1	30.9
7	3	13.0	12-14	6.5	45.0	32.5
8	1	14.0	14	6.4	44.5	36.5
10	1	15.0	15	7.2	44.1	45.5
11	1	13.0	13	7.9	53.1	37.0
12	2	10.5	9-12	6.9	44.1	38.4
Total	48	10.0	2-15	5.1	35.5	31.0

Table 13. Comparison of elk ages using field tooth eruption-wear technique and laboratory analysis of incisor cementum annuli, Michigan elk season, 1987.

Lab Age (by incisor cementum annuli)	Agree		% Agreement	Performance
	Total	Sample		
1/2	8/8		100	No problem
1	14/14		100	No problem
2	24/28		86	Over-aged as 3-year-olds
3	13/19		68	Over-aged as 4-year-olds
4	5/15		33	Over-aged as 5 and 6-year-olds
5	4/15		27	Aged as 4, 6, and 7-year-olds
6	3/6		50	Under-aged as 4 and 5-year-olds
7	1/7		14	Under-aged as 4, 5, and 6-year-olds
8	1/2		50	Under-aged as 6-year-old
9	0/2		0	Under-aged as 6 and 7-year-olds
10	0/1		0	Under-aged as 9-year-old
11	0/4		0	Under-aged as 7, 8, and 10-year-old
12	0/2		0	Under-aged as 7 and 10-year-old
13	0/1		0	Under-aged as 12-year-old
14	0/3		0	Under-aged as 9 and 13-year-old
16	0/2		0	Under-aged as 10 and 14-year-old
Total	73/129		57	

## LABORATORY ANALYSES

Serum was analyzed for several trace minerals (Selenium-Se, Copper-Cu, and Zinc-Zn) and vitamins (A and E) in Dr. Duane Ullrey's laboratory at Michigan State University. Table 14 gives the results of these tests. The values for Zn, Cu, Vitamin A, and Vitamin E were within normal ranges for domestic stock; the Se values were low. Minimum recommended values for domestic ruminants are 0.05 ug/ml. The values for the elk ranged from 0.012 ug/ml to 0.082 ug/ml minimum level.

Selenium deficiency is related to geography, and it occurs in many parts of the world where the soil contains inadequate amounts of this essential trace mineral. Michigan soils are deficient in Se, therefore, plants grown in those soils are also deficient. Domestic ruminants in Michigan are given supplemental selenium in their diets to prevent a deficiency. Adequate levels of Se are necessary in ruminants to prevent nutritional muscular dystrophy (white muscle disease) and reproductive failures.

No lesions due to a Se deficiency have been observed in hunter-killed elk during the past 4 years. Vitamin E, whose function is inextricably involved with that of Se, can prevent some Se deficiency problems. The elk vitamin E levels were in the normal range for ruminants and possibly prevented muscle myopathies in adults. The low Se levels may cause problems more difficult to observe, such as early post-natal mortality, difficulty in cows calving, difficulty with calves nursing, or difficulty with calves standing. However, the high survival rate of calves suggests that this is not a problem at this time.



Table 14. Serum analysis for trace minerals and vitamins E and A, Michigan elk season, 1987. (Lab work by Michigan State University).

Tag #	Vit.E ug/ml	Vit.A ug/ml	Se ug/ml	Tag #	Zn* ug/ml	Cu* ug/ml
1	5.2	0.34	0.020			
2	3.3	0.68	0.062			
3	3.3	0.50	0.038	3	1.02	0.98
4	4.4	0.55	0.042			
5	3.2	0.47	0.046	1,2,4,5	1.20	0.97
6	2.3	0.36	0.020			
7	2.3	0.32	0.034			
8	2.9	0.45	0.052	8	1.03	0.87
9	3.3	0.34	0.016			
10	3.2	0.49	0.028	6,7,9,10	0.94	0.66
11	4.5	0.59	0.066			
12	3.3	0.34	0.028	12	1.06	0.86
13	3.5	0.51	0.066			
14	3.7	0.47	0.036	14	1.25	1.03
15	3.7	0.37	0.046	11,13,15	1.29	1.16
16	2.1	NA	0.012			
17	1.9	0.57	0.032			
18	3.3	0.27	0.038	16,17,18	0.91	0.90
19	2.2	0.54	0.040			
20	2.9	0.72	0.070	19,20	1.05	0.82
21	2.3	0.50	0.028	21	1.08	0.95
22	2.9	0.66	0.038			
23	3.6	0.66	0.068	22,23	1.23	1.04
24	5.9	0.39	0.020	24	1.29	0.45
25	3.3	0.70	0.050			
26	3.1	0.67	0.066			
27	3.5	0.55	0.046	25,26,27	1.04	0.90
28	3.2	0.56	0.044	28	0.69	0.75
29	3.0	0.60	0.066			
30	11.4	0.38	0.020			
31	2.7	0.64	0.052	29,30,31	1.15	0.91
32	1.9	0.62	0.052			
33	1.7	0.53	0.050	33	1.22	1.18
34	2.5	0.63	0.040	34	0.85	1.00
35	3.5	0.61	0.062			
36	3.0	0.85	0.046	32,35,36	1.01	1.05
37	3.0	0.46	0.036			
38	2.7	0.36	0.040			
39	2.8	0.42	0.028	37,38,39	0.91	0.85
40	2.8	0.41	0.040	40	0.88	0.77
41	2.4	0.37	0.044			
42	2.3	0.34	0.022			

\*POOLED SAMPLES; NA = NOT AVAILABLE

Tag #	Vit.E ug/ml	Vit.A ug/ml	Se ug/ml	Tag #	Zn* ug/ml	Cu* ug/ml
43	4.5	0.21	0.032	41,42,43	0.95	0.84
44	2.2	0.31	0.022	44	1.29	0.88
45	3.6	0.42	0.022			
46	3.5	0.59	0.044			
47	2.0	0.31	0.026	47	0.59	0.64
48	2.0	0.32	0.042	45,46,48	0.92	0.75
49	2.2	0.31	0.032			
50	3.2	0.41	0.046			
51	2.4	0.37	0.038			
52	2.8	0.30	0.024	49,50,51,52	0.82	0.60
53	4.0	0.46	0.050			
54	3.0	0.38	0.028			
55	3.3	0.42	0.026	53,54,55	0.82	0.56
56	7.0	0.39	0.024			
57	2.8	0.37	0.028	57	0.81	0.60
58	2.3	0.30	0.019			
59	2.7	0.37	0.037			
60	4.2	0.52	0.028	56,58,59,60	0.81	0.60
61	4.4	0.46	0.020			
62	3.9	0.54	0.042	62	0.95	0.80
63	3.1	0.62	0.025			
64	3.1	0.39	0.025			
65	3.1	0.69	0.047	61,63,64,65	1.02	0.78
66	3.6	0.36	0.025	66	1.02	0.51
67	4.5	0.24	0.017	67	0.99	0.44
68	4.2	0.54	0.023			
69	3.1	0.37	0.025			
70	2.7	0.37	0.020	68,69,70	0.95	0.63
71	2.5	0.33	0.028	71	1.00	0.66
72	2.5	0.18	0.012			
73	2.8	0.43	0.027			
74	3.3	0.36	0.032			
75	2.9	0.53	NA	72,73,74,75	1.06	0.63
76	NA	NA	NA	76	NA	NA
77	3.2	0.59	0.039			
78	4.8	0.69	0.044	78	NA	NA
79	2.3	0.45	0.028	79	0.99	0.47
80	2.7	0.46	0.023			
81	3.6	0.37	0.017	77,80,81	0.93	0.74
82	4.2	0.51	0.033	82	NA	NA
83	2.9	0.41	0.037			
84	4.4	0.49	0.037	83,84	0.92	0.86
85	3.5	0.39	0.017	85	1.08	0.76

\* POOLED SAMPLES; NA = NOT AVAILABLE

Tag #	Vit.E ug/ml	Vit.A ug/ml	Se ug/ml	Tag #	Zn* ug/ml	Cu* ug/ml
86	3.6	0.43	0.040	86	NA	NA
87	3.4	0.28	0.017			
88	2.9	0.48	0.033			
89	2.1	0.43	0.023	87,88,89	0.96	0.96
90	2.6	0.50	0.023	90	0.76	0.59
91	6.0	0.52	0.020			
92	3.7	0.44	0.032			
93	3.2	0.44	0.054	91,92,93	0.96	0.69
94	3.3	0.42	0.017			
95	3.5	0.70	0.033			
96	3.7	0.49	0.019	94,95,96	1.12	0.79
97	8.1	0.67	0.032	97	NA	NA
98	3.7	0.27	0.017	98	NA	NA
99	2.8	0.67	0.030			
100	3.2	0.77	0.037	99,100	0.98	0.66
101	2.7	0.44	NA	101	NA	NA
102	3.0	0.43	0.032			
103	2.9	0.41	0.037			
104	2.3	0.33	0.028	102,103,104	0.70	0.54
105	2.9	0.53	0.033			
106	2.2	0.37	0.014			
107	2.9	0.58	0.019	105,106,107	0.78	0.50
108	2.2	0.43	0.037	108	NA	NA
109	2.6	0.51	0.020	109	1.04	0.78
110	5.0	0.76	0.051			
111	NA	NA	NA	111	NA	NA
112	4.3	0.71	0.065			
113	4.1	0.68	0.035	110,112,113	1.01	0.72
114	3.3	0.68	0.028	114	0.68	0.53
115	3.1	0.67	0.065			
116	3.2	0.57	0.073			
117	5.4	0.78	0.073	115,116,117	1.13	0.68
118	4.3	0.75	0.073			
119	3.5	0.79	0.069			
120	4.0	0.65	0.082			
121	4.7	0.59	0.073	121	NA	NA
122	3.5	0.49	0.069			
123	3.0	0.59	0.069	118,119,120,122,123	1.15	0.70
124	3.1	0.52	NA	124	NA	NA
125	2.6	0.46	0.061			
126	2.8	0.43	0.057			
127	3.1	0.54	0.069			
128	3.8	0.60	0.073	125,126,127,128	0.95	0.64
129	2.2	0.42	0.053			
130	2.7	0.44	0.078	129,130	0.86	0.62

\* POOLED SAMPLES; NA = NOT AVAILABLE

## SUMMARY

The management goal for the elk herd is being met through closely controlled hunts. The goal is to maintain a visible herd that is in harmony with its range. The 4 recent hunts, 1984-1987, have achieved the desired removal of elk to meet the above goal. The hunts have also allowed Michigan residents an opportunity to apply for an elk permit and for the fortunate ones drawn to participate in a high quality hunting experience.

## ACKNOWLEDGEMENTS

We thank the elk hunters for their voluntary cooperation, and DNR biologists and technicians and Michigan State University personnel for gathering and handling elk samples. Tom Cooley and Paul Friedrich were helpful in analyzing samples and data. Thanks are also extended to Karen Douglas and Jan Miller for assisting in the preparation of this report.



## LITERATURE CITED

Moran, R. J., J. R. Terry, and S. M. Schmitt. 1987. The 1986 Elk Hunt. Mich. Dept. Nat. Resour. Wildl. Div. Rep. 3057. 34pp.

