

**ELK INVENTORY**  
**in the**  
**East Kootenay Trench**  
**MU 4-03, 1993**

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prepared for

B.C. Environment  
Cranbrook, B.C.

March 1993

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**SUMMARY**

An inventory of the elk population in part of the East Kootenay Trench which was surveyed in 1992 (MU 4-03) was repeated in 1993. Methods used were identical to those used in 1992. Small portions of MU's 4-20 and 4-04 which were surveyed in the 1992 census were also included in the 1993 survey area since the elk distribution was continuous across those areas. The survey area was expanded slightly to 580 km<sup>2</sup>. Accumulated snow was much deeper in open shrublands than in 1992 and elk were more widely dispersed, in smaller groups and in forested habitats more than in 1992.

A total of 33 surveys blocks were identified including 7 where expected numbers of elk were high, 10 moderate and 16 low. Helicopter time was sufficient to survey all of the high strata blocks, 7 mediums and 6 lows. The total population and composition was estimated using the Idaho elk aerial survey model. The total number was estimated at  $1755 \pm 365$  (mean  $\pm$  90% CI). An estimate for 1992 ( $2023 \pm 328$ ) was calculated based on the sample of 15/32 blocks within the same survey area.

The proportion of calves per 100 cows in 1993 ( $22.4 \pm 7.1$ ) appeared lower than in 1992 ( $30.7 \pm 4.2$ ) and may have been related to cold weather and deeper snow in core valley bottom habitats in 1993. The number of bulls per 100 cows ( $24.7 \pm 15.4$ ) was similar to 1992 ( $24.0 \pm 14.4$ ). Estimates and confidence limits calculated for 1992 are only approximate since sampling in MU 4-03 was allocated within 145 blocks identified in the whole East Kootenay Trench, not just within MU 4-03, as in 1993.

## INTRODUCTION

B.C. Environment (BCE) requested a second inventory of part of the Rocky Mountain Trench elk population within management unit 4-03. The survey area included lands west of the Kootenay River from the USA border to Cranbrook. The northern boundary was the St. Mary's River. Funding for the inventory was provided by the East Kootenay Trench Agriculture Wildlife Committee and BCE. The objective was to accurately estimate the number and sex/age composition of elk using management unit 4-03 in mid-winter.

## METHODS

The expected distribution of elk in MU 4-03 was estimated from the survey completed in 1992. All areas where elk were suspected to be wintering were over-flown using a fixed-wing aircraft 2 days after a fresh snowfall. Continuous snow cover allowed estimation of elk densities based on tracks. Elk were found within the same geographical area but most were using forested habitats and were much less visible than in 1992. Key habitats included low elevation Douglas fir forests where interception by tree canopies had reduced snow depths on the ground. The occupied range was subdivided into 33 blocks varying in size from 6.5 km<sup>2</sup> to 26.6 km<sup>2</sup>. Each block was assigned a rating based on the number of elk expected to be found in each. Ratings used were high (> 85), moderate (35-85) and low (< 35). Some areas where very few elk were expected (<1 / 10 km<sup>2</sup>) were assigned a nil rating. Areas classed as nil were confirmed by the absence of tracks or other signs of use by wildlife.

Census methods followed those developed in Idaho and documented in the Idaho Department of Fish and Game handbook titled Elk Sightability Surveys, A Practical Approach (Unsworth et al. 1991).

Survey methods used in 1993 were identical to those used in 1992 and the same observers and pilot were also used.

Each block was defined using easily recognizable boundaries in areas where the expected number of elk could be classed as high, moderate or low. Intensive searches of randomly selected blocks were completed by flying transects lines in flat areas and contours along slopes. Most blocks were subdivided into smaller subunits during searches to shorten transect lines and reduce the chance of double counting groups sighted on adjacent lines. Most searches were conducted at tree-top level although heights above ground up to 100 m were used in some open areas.

Each group of elk sighted was assigned a group number and plotted on the topographic maps used to identify the block boundaries. The total number in each group was counted by circling the area where an animal was seen and flushing all animals into the nearest opening. Any additional animals found while flushing a group were counted as members of the same group. Cover was estimated for the area where animals were first located prior to flushing. Snow cover and activity of elk prior to flushing were also recorded. Groups were classified by counting bulls and calves then assigning the remainder as cows. In some cases yearling females could be identified and were recorded in brackets after the total number of cows. For all estimates in this report, the number of cows includes both yearling and adult females.

Tabulation of all count and classification data was done using the Idaho computer program. Three recorded variables, group size, % vegetation cover and % snow cover were used to estimate the number of animals missed in each block. Corrections were larger in 1993 since most elk occurred in small groups, often in dense tree cover. Few animals were seen in large groups (> 20) or in open habitats where snow depths were prohibitive.

Keith Hebert acted as primary observer and Bea Burlingham and Harry Leuenberger acted as secondary observers. Clay Wilson of Bighorn Helicopters, Cranbrook provided expert piloting services.

### **Prestratification Flights**

All of the proposed survey blocks were overflown by fixed-wing or helicopter and the number of elk present was estimated based on tracks and sightings of animals. The helicopter was used in densely forested units where low elevation flight was required to accurately estimate the number of animals present. Several of the high strata blocks used in 1992 were reduced in size to facilitate total coverage within 1 hour of helicopter search time. The boundaries of some low strata blocks were extended upslope into areas where the presence of elk was confirmed by tracks.

### **RESULTS**

Helicopter time budgeted (26 hrs) was sufficient to survey 20 of the 33 blocks identified in MU 4-03. Seven high strata blocks, 7 moderates and 6 lows were sampled. Blocks varied in size from 6.5 to 30.8 km<sup>2</sup> and searches required 29 minutes to 88 minutes each to complete (Table 1). Search intensity varied from 1.1 to 9.3 minutes per km<sup>2</sup> depending on the numbers of elk encountered and the density of cover. Herding and classifying animals required considerable time in some blocks. The largest number seen in a single block was 157 in block #26 near lower Gold Creek (Figure 2). The largest number estimated, after correction for sightability, was 238 in the same block (# 26).

MANAGEMENT UNIT 4-03  
 ELK INVENTORY 1993  
 - STRATIFIED SURVEY BLOCKS

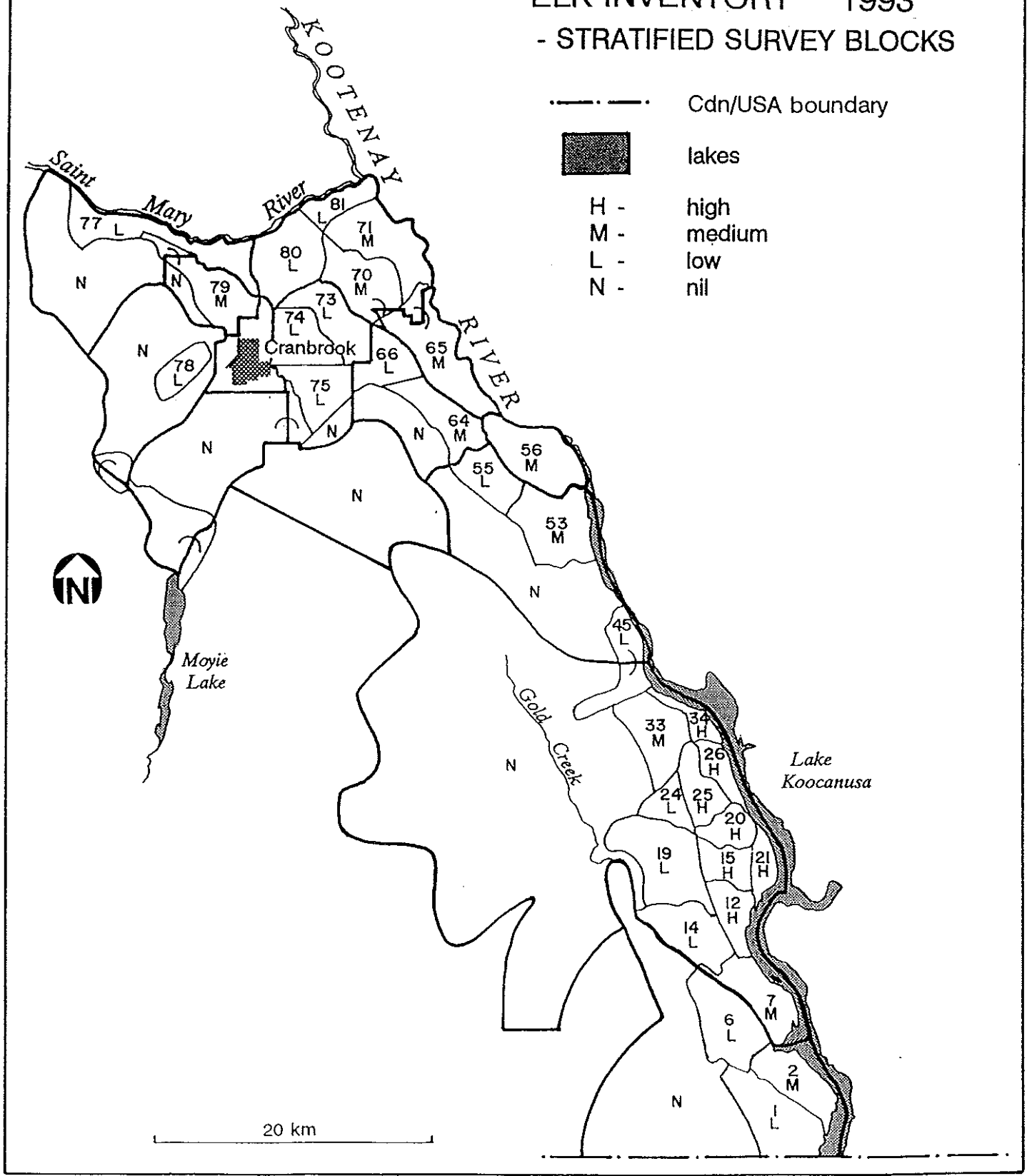


Figure 1. Survey blocks and strata in Management Unit 4-03, 1993.

Scattered small groups and single animals in dense cover generated larger corrections than in 1992. In total 733 elk were seen in the 20 blocks counted in MU 4-03 in 1993 (Table 1). In 1992, 1270 elk were counted in the 15 blocks surveyed (Simpson 1992). The corrected estimates for blocks surveyed in 1993 were 1251 (70% increase, Table 1) compared to 1519 (20% increase, Simpson 1992) in 1992.

In general the stratification was more difficult than in 1992 and variability, particularly in the low strata was higher in 1993. Elk were more dispersed and in dense cover so accurate estimation of numbers based on a single overflight was difficult. Estimates for high blocks averaged 120 elk, moderates 21 elk and lows 44 elk. Moderate strata were judged based on tracks in openings and presence of agricultural feed, which elk were using in several locations. Obvious trails were seen radiating from cattle feed yards in several locations and some elk were seen eating hay. Those sites and the surrounding forests were rated moderate however, many elk must have moved further away into low units during the day when the surveys were done. Hence many of the moderate units had lower numbers than expected and low units were higher. Fortunately the relationship proved very consistent so variation within each stratum remained low even though the expected numbers were reversed.



Table 1. Search times and number of elk counted in blocks sampled in MU 4-03, Gold Creek, East Kootenay Trench, 1993.

Block No.	Name	Search (min)	Km <sup>2</sup>	No. Elk		
				Strata	Count	Estimate
1	S Newgate		20.3	L		
2	N Newgate	49	18.9	M	6	6
6	SW Gold	62	24.1	L	36	99
7	SE Gold		18.4	M		
12	Englishman	60	11.4	H	29	78
14	Mid Gold		19.1	L		
15	SW Flat	78	13.8	H	49	83
19	Up Gold	35	30.8	L	12	25
20	Mid Flat	75	11.1	H	98	112
21	SE Flat	59	6.5	H	113	124
24	Twin Lake		8.3	L		
25	NW Flat	50	9.9	H	40	98
26	NE Flat	88	9.5	H	157	238
33	Plumbob	57	18.1	M	5	28
34	E Plumbob	66	7.9	H	77	108
45	N Plumbob		15.7	L		
53	Wardner	29	26.2	M	15	15
55	S Haha		14.1	L		
56	Tokay	50	23.4	M	1	3
64	N Haha		19.2	M		
65	E Mayook	62	24.6	M	24	47
66	Mayook Cr	79	16.4	L	18	50
70	W City Field	49	24.0	M	4	8
71	Farentino		22.6	M		
73	E Blk I		18.3	L		
74	W Blk I	74	16.9	L	7	11
75	N Baker		14.8	L		
76	Moyie		26.6	L		
77	W Mission		22.8	L		
78	W Cranbrook	29	8.7	L	7	43
79	Hospital Cr	56	23.7	M	15	40
80	E Mission	59	24.4	L	20	35
81	Ft Steele		9.5	L		
Totals		19.4 hr	580.0		733	1,251

MANAGEMENT UNIT 4-03  
 ELK INVENTORY 1993  
 - ELK ESTIMATES/BLOCK

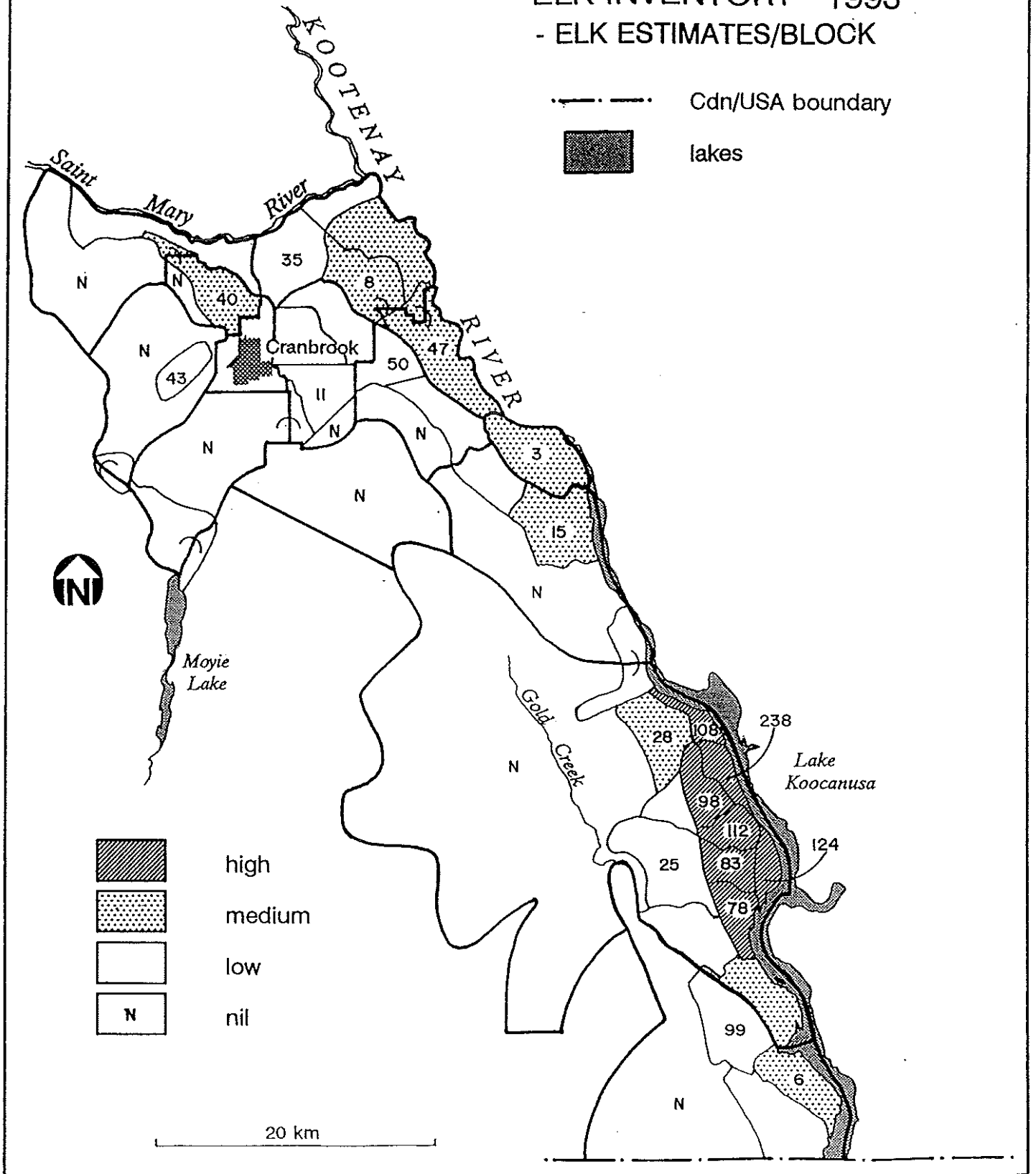


Figure 2. Estimated numbers of elk and strata of blocks surveyed in 1993.

Table 2. Elk counts and estimates in each stratum and the estimated population within Management Unit 4-03 in 1993.

Summary of Raw Counts									
Stratum	Units		-----Number of Each Class Counted-----						
	Sampled	Total	Cows	Bulls	Calves	Spikes	Raghrn	Ad.Bul	Unclass
1	7	563	431	31	99	23	7	1	2
2	7	70	50	7	13	7	0	0	0
3	6	100	60	27	13	12	13	2	0
	20	733	541	65	125	42	20	3	2

Estimates for Total Number of Elk							
Stratum	Number of Units		Estimate	-----Variance-----			Bound 90%
	Popn.	Sample		Sampling	Sightability	Model	
1	7	7	842	0	3182	318	98
2	10	7	210	1324	2145	347	102
3	16	6	703	24118	13721	3784	337
Total	33	20	1755	25442	19048	4449	365

The total population within the block survey area was  $1755 \pm 365$  (90% CI, Table 2). The estimate is not significantly lower than in 1992 ( $2023 \pm 328$ ) and the confidence limits are similar. Thirteen range units are contained within MU 4-03 (Figure 3). We estimated the number of elk in each range unit by summing the estimates for all survey blocks within each unit (Table 3). Those estimates were very similar between 1992 and 1993.

The proportion of calves per 100 cows in 1993 ( $22.4 \pm 7.1$ , Appendix I) was not significantly lower than in 1992 ( $30.7 \pm 4.2$ ). The bulls per 100 cows ratio was similar in 1992 ( $24.0 \pm 14.4$ ) and 1993 ( $24.7 \pm 15.4$ ). Complete details of the counts, classifications and estimates for each block are appended (Appendix I).

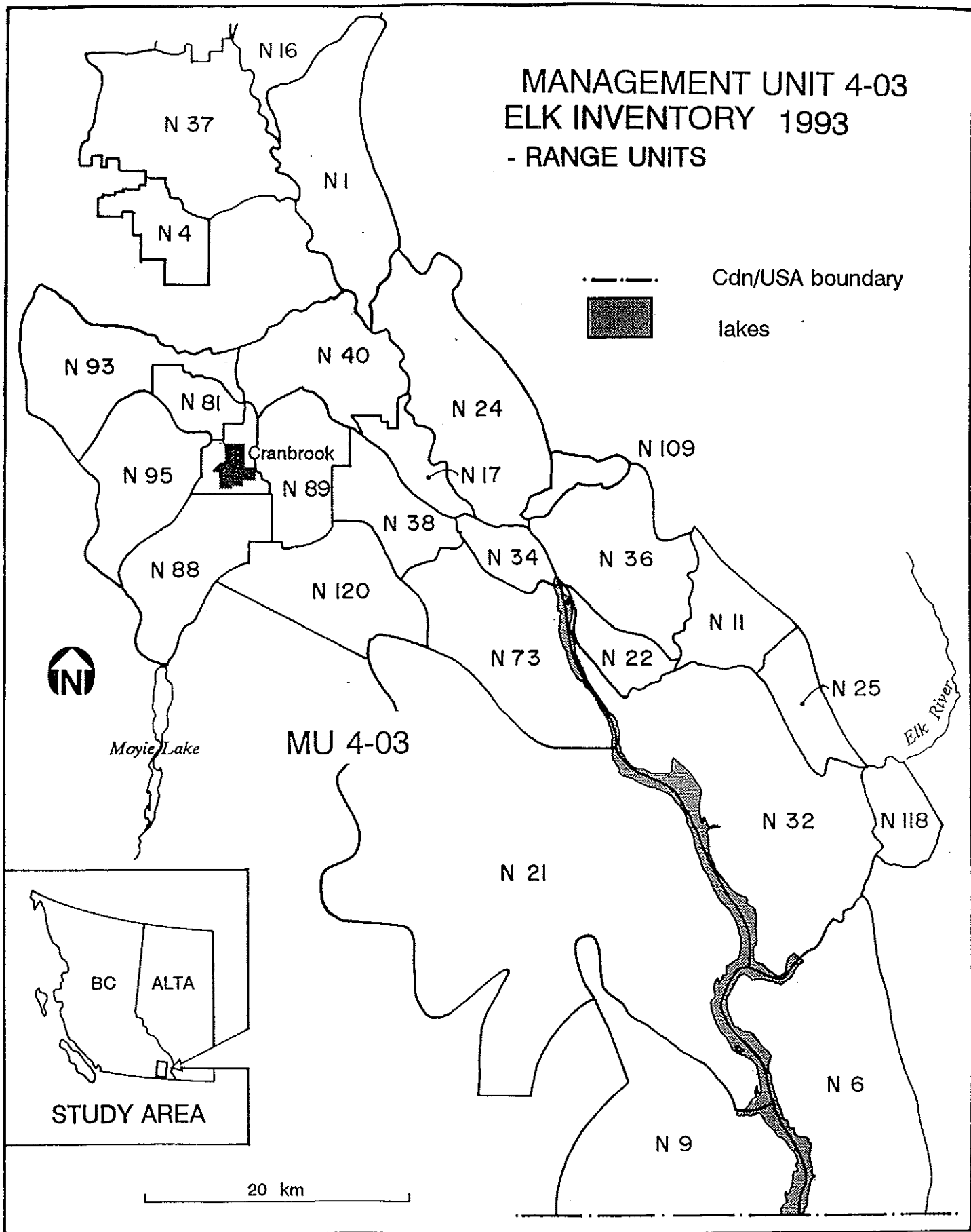


Figure 3. Range units contained within Management Unit 4-03.

Table 3. The number of elk estimated in each range unit within Management Unit 4-03 in 1993.

Range Unit	Number of blocks	Estimated number of elk	
		1993	1992
N 9	3	149	101
N 17	1	47	55
N 21	12	1045	1454
N 34	1	3	54
N 38	2	94	78
N 40	4	108	108
N 73	3	103	52
N 81 (MU 4-20)	1	40	78
N 88 (MU 4-04)	1	44	50
N 89	3	99	69
N 93 (MU 4-20)	1	44	3
N 95	1	43	0
N 120	0	0	0
Totals	33	1,819	2,102

Note: Annual totals differ from the model estimates due to rounding errors.

#### REFERENCES

- Simpson, K. 1992. Elk inventory in the East Kootenay. Rept. to BCE, Cranbrook. 58pp.
- Unsworth, J.W., F.A. Leban, E. Garton and J.R. Pope. 1991. Elk sightability surveys. Revised edition. Idaho Department of Fish and Game, Boise, ID. 42pp.

Appendix I. Counts and estimates for numbers of elk in each survey block and the population structure in Management Unit 4-03, Gold Creek, in 1993.

MU 403 1993

Estimates for Total Number of Cows

Stratum	Number of Units		Estimate	-----Variance-----			Bound 90%
	Popn.	Sample		Sampling	Sightability	Model	
1	7	7	656	0	2444	244	86
2	10	7	139	622	1194	182	74
3	16	6	396	5989	5177	1117	183
Total	33	20	1191	6611	8814	1542	215

MU 403 1993

Estimates for Total Number of Bulls

Stratum	Number of Units		Estimate	-----Variance-----			Bound 90%
	Popn.	Sample		Sampling	Sightability	Model	
1	7	7	47	0	54	5	13
2	10	7	44	224	685	91	52
3	16	6	203	7468	4348	1182	188
Total	33	20	294	7692	5087	1278	196

MU 403 1993

Estimates for Total Number of Calves

Stratum	Number of Units		Estimate	-----Variance-----			Bound 90%
	Popn.	Sample		Sampling	Sightability	Model	
1	7	7	136	0	173	17	23
2	10	7	28	23	49	7	15
3	16	6	104	1203	1198	240	85
Total	33	20	267	1226	1421	265	89

MU 403 1993

Estimates for Total Number of Spikes

Stratum	Number of Units		Estimate	-----Variance-----			Bound 90%
	Popn.	Sample		Sampling	Sightability	Model	
1	7	7	34	0	37	4	10
2	10	7	44	224	685	91	52
3	16	6	96	1931	2789	472	119
Total	33	20	174	2156	3511	567	130

MU 403 1993

Estimates for Total Number of Rag-horns

Stratum	Number of Units		Estimate	-----Variance-----			Bound 90%
	Popn.	Sample		Sampling	Sightability	Model	
1	7	7	8	0	1	0	2
2	10	7	0	0	0	0	0
3	16	6	96	3161	1474	463	118
Total	33	20	104	3161	1475	464	118

MU 403 1993

Estimates for Total Number of Adult Bulls

Stratum	Number of Units		Estimate	-----Variance-----			Bound 90%
	Popn.	Sample		Sampling	Sightability	Model	
1	7	7	5	0	16	2	7
2	10	7	0	0	0	0	0
3	16	6	12	87	76	16	22
Total	33	20	16	87	92	18	23

MU 403 1993

Estimates for Total Number of Unclassified

Stratum	Number of Units		Estimate	-----Variance-----			Bound 90%
	Popn.	Sample		Sampling	Sightability	Model	
1	7	7	4	0	4	0	3
2	10	7	0	0	0	0	0
3	16	6	0	0	0	0	0
Total	33	20	4	0	4	0	3

MU 403 1993

Estimates for Proportion of Cows

Stratum	Number of Units		Estimate	-----Variance-----			Bound 90%
	Popn.	Sample		Sampling	Sightability	Model	
1	7	7	0.7791	0.00000	0.00026	0.00003	0.0278
2	10	7	0.6585	0.00298	0.00924	0.00122	0.1913
3	16	6	0.5635	0.00248	0.00407	0.00065	0.1400
Total	33	20	0.6783	0.00044	0.00084	0.00000	0.0592

MU 403 1993

Estimates for Proportion of Bulls

Stratum	Number of Units		Estimate	-----Variance-----			Bound 90%
	Popn.	Sample		Sampling	Sightability	Model	
1	7	7	0.0553	0.00000	0.00008	0.00001	0.0153
2	10	7	0.2107	0.00302	0.01111	0.00141	0.2057
3	16	6	0.2889	0.00568	0.00582	0.00115	0.1856
Total	33	20	0.1675	0.00095	0.00111	0.00000	0.0750

MU 403 1993

Estimates for Proportion of Calves

Stratum	Number of Units		Estimate	-----Variance-----			Bound 90%
	Popn.	Sample		Sampling	Sightability	Model	
1	7	7	0.1613	0.00000	0.00018	0.00002	0.0231
2	10	7	0.1309	0.00008	0.00101	0.00011	0.0573
3	16	6	0.1476	0.00257	0.00152	0.00041	0.1107
Total	33	20	0.1522	0.00041	0.00030	0.00000	0.0441

MU 403 1993

Estimates for Proportion of Spikes

Stratum	Number of Units		Estimate	-----Variance-----			Bound 90%
	Popn.	Sample		Sampling	Sightability	Model	
1	7	7	0.0406	0.00000	0.00005	0.00001	0.0125
2	10	7	0.2107	0.00302	0.01111	0.00141	0.2057
3	16	6	0.1361	0.00335	0.00452	0.00079	0.1535
Total	33	20	0.0992	0.00058	0.00090	0.00000	0.0634

MU 403 1993

Estimates for Proportion of Rag-horns

Stratum	Number of Units		Estimate	-----Variance-----			Bound 90%
	Popn.	Sample		Sampling	Sightability	Model	
1	7	7	0.0093	0.00000	0.00000	0.00000	0.0023
2	10	7	0.0000	0.00000	0.00000	0.00000	0.0000
3	16	6	0.1361	0.00311	0.00268	0.00058	0.1316
Total	33	20	0.0590	0.00050	0.00043	0.00000	0.0503



MU 403 1993

Estimates for Proportion of Adult Bulls

Stratum	Number of Units		Estimate	-----Variance-----			Bound 90%
	Popn.	Sample		Sampling	Sightability	Model	
1	7	7	0.0054	0.00000	0.00002	0.00000	0.0083
2	10	7	0.0000	0.00000	0.00000	0.00000	0.0000
3	16	6	0.0167	0.00010	0.00016	0.00003	0.0278
Total	33	20	0.0093	0.00002	0.00003	0.00000	0.0113

MU 403 1993

Estimates for Proportion of Unclassified

Stratum	Number of Units		Estimate	-----Variance-----			Bound 90%
	Popn.	Sample		Sampling	Sightability	Model	
1	7	7	0.0042	0.00000	0.00001	0.00000	0.0040
2	10	7	0.0000	0.00000	0.00000	0.00000	0.0000
3	16	6	0.0000	0.00000	0.00000	0.00000	0.0000
Total	33	20	0.0020	0.00000	0.00000	0.00000	0.0018

MU 403 1993

Estimates for the Ratio of Bulls per 100 Cows

Stratum	Number of Units		Estimate	-----Variance-----			Bound 90%
	Popn.	Sample		Sampling	Sightability	Model	
1	7	7	7.1	0.0	1.5	0.1	2.1
2	10	7	32.0	120.4	420.6	54.1	40.3
3	16	6	51.3	289.6	352.2	64.2	43.8
Total	33	20	24.7	33.7	45.2	7.9	15.4

MU 403 1993

Estimates for the Ratio of Calves per 100 Cows

Stratum	Number of Units		Estimate	-----Variance-----			Bound 90%
	Popn.	Sample		Sampling	Sightability	Model	
1	7	7	20.7	0.0	4.3	0.4	3.6
2	10	7	19.9	4.8	27.9	3.3	9.9
3	16	6	26.2	81.1	54.8	13.6	20.2
Total	33	20	22.4	9.1	7.8	1.7	7.1

MU 403 1993

Estimates for the Ratio of Spikes per 100 Bulls

Stratum	Number of Units		Estimate	-----Variance-----			Bound 90%
	Popn.	Sample		Sampling	Sightability	Model	
1	7	7	748.5	0.0	455108.2	45510.8	1167.4
2	10	7	0.0	0.0	0.0	0.0	0.0
3	16	6	813.1	1570.2	562888.0	56445.8	1300.2
Total	33	20	59.2	2.5	1011.0	101.4	55.1

MU 403 1993

Estimates for the Ratio of Raghorns per 100 Bulls

Stratum	Number of Units		Estimate	-----Variance-----			Bound 90%
	Popn.	Sample		Sampling	Sightability	Model	
1	7	7	171.7	0.0	23523.6	2352.4	265.4
2	10	7	0.0	0.0	0.0	0.0	0.0
3	16	6	813.5	135.8	468320.3	46845.6	1184.4
Total	33	20	35.2	0.2	755.6	75.6	47.6

SUBUNIT 2.00 STRATUM Moderate

Characteristic	Total	Cows	Bulls	Calves	Spikes	Raghrn	Ad.Bul	Unclass
Group No. 1	6	4	0	2	0	0	0	0
Total Counted	6	4	0	2	0	0	0	0
Corrected Estimates	6.46	4.31	0.00	2.15	0.00	0.00	0.00	0.00
Corrected Proportions	1.00	0.67	0.00	0.33	0.00	0.00	0.00	0.00
Non-resp. Variance	2.97	1.32	0.00	0.33	0.00	0.00	0.00	0.00
Bulls per 100 Cows	0.00							
Calves per 100 Cows	50.00							

SUBUNIT 6.00 STRATUM Low

Characteristic	Total	Cows	Bulls	Calves	Spikes	Raghrn	Ad.Bul	Unclass
Group No. 1	2	2	0	0	0	0	0	0
Group No. 2	2	2	0	0	0	0	0	0
Group No. 3	2	1	0	1	0	0	0	0
Group No. 4	6	3	3	0	3	0	0	0
Group No. 5	1	1	0	0	0	0	0	0
Group No. 6	3	3	0	0	0	0	0	0
Group No. 7	2	0	2	0	0	0	2	0
Group No. 8	2	0	2	0	0	2	0	0
Group No. 9	1	1	0	0	0	0	0	0
Group No. 10	2	2	0	0	0	0	0	0
Group No. 11	3	0	3	0	0	3	0	0
Group No. 12	4	2	2	0	0	2	0	0
Group No. 13	4	2	2	0	2	0	0	0
Group No. 14	2	0	2	0	0	2	0	0
Total Counted	36	19	16	1	5	9	2	0
Corrected Estimates	98.70	49.97	41.18	7.54	9.04	27.73	4.41	0.00
Corrected Proportions	1.00	0.51	0.42	0.08	0.09	0.28	0.04	0.00
Non-resp. Variance	633.68	213.13	225.84	49.33	22.64	192.55	10.65	0.00
Bulls per 100 Cows	82.41							
Calves per 100 Cows	15.09							
Spikes per 100 Adult Bulls		204.80						
Raghrns per 100 Adult Bulls		628.42						

SUBUNIT 12.00 STRATUM High

Characteristic	Total	Cows	Bulls	Calves	Spikes	Raghrn	Ad.Bul	Unclass
Group No. 1	1	0	1	0	1	0	0	0
Group No. 2	5	4	0	1	0	0	0	0
Group No. 3	1	1	0	0	0	0	0	0
Group No. 4	4	3	0	1	0	0	0	0
Group No. 5	1	1	0	0	0	0	0	0
Group No. 6	1	1	0	0	0	0	0	0
Group No. 7	1	0	1	0	1	0	0	0
Group No. 8	3	3	0	0	0	0	0	0
Group No. 9	4	2	0	2	0	0	0	0
Group No. 10	2	1	0	1	0	0	0	0
Group No. 11	4	2	0	2	0	0	0	0
Group No. 12	1	1	0	0	0	0	0	0
Group No. 13	1	0	1	0	0	1	0	0
Total Counted	29	19	3	7	2	1	0	0
Corrected Estimates	77.95	58.45	8.31	11.18	7.07	1.25	0.00	0.00
Corrected Proportions	1.00	0.75	0.11	0.14	0.09	0.02	0.00	0.00
Non-resp. Variance	563.85	500.59	20.34	11.54	20.03	0.31	0.00	0.00
Bulls per 100 Cows	14.22							
Calves per 100 Cows	19.13							

SUBUNIT 15.00 STRATUM High

Characteristic	Total	Cows	Bulls	Calves	Spikes	Raghrn	Ad.Bul	Unclass
Group No. 1	3	2	0	1	0	0	0	0
Group No. 2	1	1	0	0	0	0	0	0
Group No. 3	3	3	0	0	0	0	0	0
Group No. 4	3	3	0	0	0	0	0	0
Group No. 5	3	3	0	0	0	0	0	0
Group No. 6	1	1	0	0	0	0	0	0
Group No. 7	1	0	1	0	0	1	0	0
Group No. 8	2	2	0	0	0	0	0	0
Group No. 9	2	2	0	0	0	0	0	0
Group No. 10	2	2	0	0	0	0	0	0
Group No. 11	3	1	0	2	0	0	0	0
Group No. 12	6	6	0	0	0	0	0	0
Group No. 13	3	3	0	0	0	0	0	0
Group No. 14	12	10	0	2	0	0	0	0
Group No. 15	4	3	0	1	0	0	0	0
Total Counted	49	42	1	6	0	1	0	0
Corrected Estimates	83.41	74.95	1.25	7.21	0.00	1.25	0.00	0.00
Corrected Proportions	1.00	0.90	0.01	0.09	0.00	0.01	0.00	0.00
Non-resp. Variance	346.10	337.37	0.31	2.39	0.00	0.31	0.00	0.00
Bulls per 100 Cows	1.66							
Calves per 100 Cows	9.62							

SUBUNIT 19.00 STRATUM Low

Characteristic	Total	Cows	Bulls	Calves	Spikes	Raghrn	Ad.Bul	Unclass
Group No. 1	2	0	2	0	0	2	0	0
Group No. 2	3	2	0	1	0	0	0	0
Group No. 3	2	1	0	1	0	0	0	0
Group No. 4	2	2	0	0	0	0	0	0
Group No. 5	3	0	3	0	2	1	0	0
Total Counted	12	5	5	2	2	3	0	0
Corrected Estimates	25.14	13.14	8.18	3.83	2.51	5.67	0.00	0.00
Corrected Proportions	1.00	0.52	0.33	0.15	0.10	0.23	0.00	0.00
Non-resp. Variance	76.99	50.44	13.52	3.67	1.28	10.97	0.00	0.00
Bulls per 100 Cows	62.23							
Calves per 100 Cows	29.14							

SUBUNIT 20.00 STRATUM High

Characteristic	Total	Cows	Bulls	Calves	Spikes	Raghrn	Ad.Bul	Unclass
Group No. 1	6	3	2	1	2	0	0	0
Group No. 2	8	5	1	2	1	0	0	0
Group No. 3	1	0	1	0	1	0	0	0
Group No. 4	3	2	0	1	0	0	0	0
Group No. 5	1	1	0	0	0	0	0	0
Group No. 6	5	5	0	0	0	0	0	0
Group No. 7	11	10	0	1	0	0	0	0
Group No. 8	2	1	0	0	0	0	0	1
Group No. 9	2	1	1	0	0	1	0	0
Group No. 10	1	0	1	0	1	0	0	0
Group No. 11	3	3	0	0	0	0	0	0
Group No. 12	5	4	0	1	0	0	0	0
Group No. 13	7	6	0	1	0	0	0	0
Group No. 14	2	2	0	0	0	0	0	0
Group No. 15	13	6	2	5	0	2	0	0
Group No. 16	3	3	0	0	0	0	0	0
Group No. 17	3	2	0	1	0	0	0	0
Group No. 18	7	5	0	2	0	0	0	0
Group No. 19	4	3	0	1	0	0	0	0
Group No. 20	2	2	0	0	0	0	0	0
Group No. 21	9	8	0	1	0	0	0	0
Total Counted	98	72	8	17	5	3	0	1
Corrected Estimates	112.06	83.06	10.04	17.89	6.95	3.09	0.00	1.08
Corrected Proportions	1.00	0.74	0.09	0.16	0.06	0.03	0.00	0.01
Non-resp. Variance	71.96	56.12	4.55	1.36	4.44	0.11	0.00	0.09
Bulls per 100 Cows	12.09							
Calves per 100 Cows	21.53							

SUBUNIT 21.00 STRATUM High

Characteristic	Total	Cows	Bulls	Calves	Spikes	Raghrn	Ad.Bul	Unclass
Group No. 1	29	21	3	5	3	0	0	0
Group No. 2	1	1	0	0	0	0	0	0
Group No. 3	6	2	4	0	4	0	0	0
Group No. 4	2	2	0	0	0	0	0	0
Group No. 5	12	10	0	2	0	0	0	0
Group No. 6	6	4	0	2	0	0	0	0
Group No. 7	3	2	0	1	0	0	0	0
Group No. 8	4	3	0	1	0	0	0	0
Group No. 9	11	10	0	1	0	0	0	0
Group No. 10	10	8	0	2	0	0	0	0
Group No. 11	1	1	0	0	0	0	0	0
Group No. 12	2	1	0	1	0	0	0	0
Group No. 13	1	1	0	0	0	0	0	0
Group No. 14	2	1	0	1	0	0	0	0
Group No. 15	1	0	1	0	0	1	0	0
Group No. 16	10	9	1	0	0	1	0	0
Group No. 17	2	2	0	0	0	0	0	0
Group No. 18	7	6	0	1	0	0	0	0
Group No. 19	1	1	0	0	0	0	0	0
Group No. 20	2	2	0	0	0	0	0	0
Total Counted	113	87	9	17	7	2	0	0
Corrected Estimates	124.13	96.29	9.57	18.26	7.32	2.25	0.00	0.00
Corrected Proportions	1.00	0.78	0.08	0.15	0.06	0.02	0.00	0.00
Non-resp. Variance	54.85	38.82	1.67	2.05	1.36	0.31	0.00	0.00
Bulls per 100 Cows	9.94							
Calves per 100 Cows	18.96							

SUBUNIT 25.00 STRATUM High

Characteristic	Total	Cows	Bulls	Calves	Spikes	Raghrn	Ad.Bul	Unclass
Group No. 1	2	2	0	0	0	0	0	0
Group No. 2	2	1	0	1	0	0	0	0
Group No. 3	9	9	0	0	0	0	0	0
Group No. 4	1	1	0	0	0	0	0	0
Group No. 5	9	9	0	0	0	0	0	0
Group No. 6	5	4	0	1	0	0	0	0
Group No. 7	3	2	0	1	0	0	0	0
Group No. 8	8	7	0	1	0	0	0	0
Group No. 9	1	1	0	0	0	0	0	0
Total Counted	40	36	0	4	0	0	0	0
Corrected Estimates	97.63	85.50	0.00	12.13	0.00	0.00	0.00	0.00
Corrected Proportions	1.00	0.88	0.00	0.12	0.00	0.00	0.00	0.00
Non-resp. Variance	811.19	643.68	0.00	53.13	0.00	0.00	0.00	0.00
Bulls per 100 Cows	0.00							
Calves per 100 Cows	14.19							

SUBUNIT 26.00 STRATUM High

Characteristic	Total	Cows	Bulls	Calves	Spikes	Raghrn	Ad.Bul	Unclass
Group No. 1	13	10	0	3	0	0	0	0
Group No. 2	7	4	0	3	0	0	0	0
Group No. 3	3	2	0	0	0	0	0	1
Group No. 4	5	5	0	0	0	0	0	0
Group No. 5	1	1	0	0	0	0	0	0
Group No. 6	17	13	2	2	2	0	0	0
Group No. 7	6	4	1	1	1	0	0	0
Group No. 8	1	1	0	0	0	0	0	0
Group No. 9	19	14	0	5	0	0	0	0
Group No. 10	1	1	0	0	0	0	0	0
Group No. 11	2	1	0	1	0	0	0	0
Group No. 12	2	2	0	0	0	0	0	0
Group No. 13	4	3	0	1	0	0	0	0
Group No. 14	3	3	0	0	0	0	0	0
Group No. 15	4	3	0	1	0	0	0	0
Group No. 16	30	24	0	6	0	0	0	0
Group No. 17	9	6	1	2	1	0	0	0
Group No. 18	5	4	0	1	0	0	0	0
Group No. 19	6	6	0	0	0	0	0	0
Group No. 20	2	1	0	1	0	0	0	0
Group No. 21	5	3	0	2	0	0	0	0
Group No. 22	6	5	0	1	0	0	0	0
Group No. 23	4	1	2	1	2	0	0	0
Group No. 24	2	1	0	1	0	0	0	0
Total Counted	157	118	6	32	6	0	0	1
Corrected Estimates	238.27	178.58	9.11	48.10	9.11	0.00	0.00	2.48
Corrected Proportions	1.00	0.75	0.04	0.20	0.04	0.00	0.00	0.01
Non-resp. Variance	1041.47	680.42	9.68	81.85	9.68	0.00	0.00	3.67
Bulls per 100 Cows	5.10							
Calves per 100 Cows	26.94							

SUBUNIT 33.00 STRATUM Moderate

Characteristic	Total	Cows	Bulls	Calves	Spikes	Raghrn	Ad.Bul	Unclass
Group No. 1	3	2	0	1	0	0	0	0
Group No. 2	2	0	2	0	2	0	0	0
Total Counted	5	2	2	1	2	0	0	0
Corrected Estimates	28.40	8.88	15.08	4.44	15.08	0.00	0.00	0.00
Corrected Proportions	1.00	0.31	0.53	0.16	0.53	0.00	0.00	0.00
Non-resp. Variance	334.76	61.09	197.31	15.27	197.31	0.00	0.00	0.00
Bulls per 100 Cows	169.86							
Calves per 100 Cows	50.00							

SUBUNIT 34.00 STRATUM High

Characteristic	Total	Cows	Bulls	Calves	Spikes	Raghrn	Ad.Bul	Unclass
Group No. 1	2	1	0	1	0	0	0	0
Group No. 2	9	5	0	4	0	0	0	0
Group No. 3	3	3	0	0	0	0	0	0
Group No. 4	5	3	1	1	1	0	0	0
Group No. 5	1	0	1	0	0	0	1	0
Group No. 6	1	1	0	0	0	0	0	0
Group No. 7	1	0	1	0	1	0	0	0
Group No. 8	11	6	1	4	1	0	0	0
Group No. 9	4	3	0	1	0	0	0	0
Group No. 10	1	1	0	0	0	0	0	0
Group No. 11	5	3	0	2	0	0	0	0
Group No. 12	4	4	0	0	0	0	0	0
Group No. 13	15	14	0	1	0	0	0	0
Group No. 14	5	4	0	1	0	0	0	0
Group No. 15	6	6	0	0	0	0	0	0
Group No. 16	4	3	0	1	0	0	0	0
Total Counted	77	57	4	16	3	0	1	0
Corrected Estimates	108.17	78.89	8.30	20.99	3.73	0.00	4.57	0.00
Corrected Proportions	1.00	0.73	0.08	0.19	0.03	0.00	0.04	0.00
Non-resp. Variance	292.40	186.54	17.40	20.89	1.12	0.00	16.28	0.00
Bulls per 100 Cows	10.52							
Calves per 100 Cows	26.61							
Spikes per 100 Adult Bulls	81.74							
Raghrns per 100 Adult Bulls	0.00							

SUBUNIT 53.00 STRATUM Moderate

Characteristic	Total	Cows	Bulls	Calves	Spikes	Raghrn	Ad.Bul	Unclass
Group No. 1	11	8	1	2	1	0	0	0
Group No. 2	4	4	0	0	0	0	0	0
Total Counted	15	12	1	2	1	0	0	0
Corrected Estimates	15.36	12.33	1.01	2.02	1.01	0.00	0.00	0.00
Corrected Proportions	1.00	0.80	0.07	0.13	0.07	0.00	0.00	0.00
Non-resp. Variance	2.25	1.69	0.01	0.04	0.01	0.00	0.00	0.00
Bulls per 100 Cows	8.19							
Calves per 100 Cows	16.39							

SUBUNIT 56.00 STRATUM Moderate

Characteristic	Total	Cows	Bulls	Calves	Spikes	Raghrn	Ad.Bul	Unclass
Group No. 1	1	1	0	0	0	0	0	0
Total Counted	1	1	0	0	0	0	0	0
Corrected Estimates	2.50	2.50	0.00	0.00	0.00	0.00	0.00	0.00
Corrected Proportions	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-resp. Variance	3.75	3.75	0.00	0.00	0.00	0.00	0.00	0.00
Bulls per 100 Cows	0.00							
Calves per 100 Cows	0.00							



SUBUNIT 65.00 STRATUM Moderate

Characteristic	Total	Cows	Bulls	Calves	Spikes	Raghrn	Ad.Bul	Unclass
Group No. 1	3	0	3	0	3	0	0	0
Group No. 2	3	3	0	0	0	0	0	0
Group No. 3	1	0	1	0	1	0	0	0
Group No. 4	8	6	0	2	0	0	0	0
Group No. 5	3	3	0	0	0	0	0	0
Group No. 6	6	4	0	2	0	0	0	0
Total Counted	24	16	4	4	4	0	0	0
Corrected Estimates	47.19	27.32	14.94	4.94	14.94	0.00	0.00	0.00
Corrected Proportions	1.00	0.58	0.32	0.10	0.32	0.00	0.00	0.00
Non-resp. Variance	235.56	82.59	138.44	2.33	138.44	0.00	0.00	0.00
Bulls per 100 Cows	54.67							
Calves per 100 Cows	18.08							

SUBUNIT 66.00 STRATUM Low

Characteristic	Total	Cows	Bulls	Calves	Spikes	Raghrn	Ad.Bul	Unclass
Group No. 1	4	4	0	0	0	0	0	0
Group No. 2	2	1	0	1	0	0	0	0
Group No. 3	1	0	1	0	0	1	0	0
Group No. 4	1	1	0	0	0	0	0	0
Group No. 5	3	2	0	1	0	0	0	0
Group No. 6	1	0	1	0	1	0	0	0
Group No. 7	4	2	2	0	2	0	0	0
Group No. 8	2	1	0	1	0	0	0	0
Total Counted	18	11	4	3	3	1	0	0
Corrected Estimates	49.72	21.44	24.48	3.80	21.98	2.50	0.00	0.00
Corrected Proportions	1.00	0.43	0.49	0.08	0.44	0.05	0.00	0.00
Non-resp. Variance	488.32	111.66	371.68	1.10	367.93	3.75	0.00	0.00
Bulls per 100 Cows	114.19							
Calves per 100 Cows	17.74							

SUBUNIT 70.00 STRATUM Moderate

Characteristic	Total	Cows	Bulls	Calves	Spikes	Raghrn	Ad.Bul	Unclass
Group No. 1	4	4	0	0	0	0	0	0
Total Counted	4	4	0	0	0	0	0	0
Corrected Estimates	7.68	7.68	0.00	0.00	0.00	0.00	0.00	0.00
Corrected Proportions	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-resp. Variance	28.24	28.24	0.00	0.00	0.00	0.00	0.00	0.00
Bulls per 100 Cows	0.00							
Calves per 100 Cows	0.00							

## SUBUNIT 74.00 STRATUM Low

Characteristic	Total	Cows	Bulls	Calves	Spikes	Raghrn	Ad.Bul	Unclass
Group No. 1	5	3	1	1	1	0	0	0
Group No. 2	1	0	1	0	1	0	0	0
Group No. 3	1	1	0	0	0	0	0	0
Total Counted	7	4	2	1	2	0	0	0
Corrected Estimates	11.34	7.88	2.35	1.11	2.35	0.00	0.00	0.00
Corrected Proportions	1.00	0.70	0.21	0.10	0.21	0.00	0.00	0.00
Non-resp. Variance	19.51	17.33	0.42	0.12	0.42	0.00	0.00	0.00
Bulls per 100 Cows	29.85							
Calves per 100 Cows	14.03							

## SUBUNIT 78.00 STRATUM Low

Characteristic	Total	Cows	Bulls	Calves	Spikes	Raghrn	Ad.Bul	Unclass
Group No. 1	3	2	0	1	0	0	0	0
Group No. 2	2	1	0	1	0	0	0	0
Group No. 3	2	1	0	1	0	0	0	0
Total Counted	7	4	0	3	0	0	0	0
Corrected Estimates	43.48	23.96	0.00	19.52	0.00	0.00	0.00	0.00
Corrected Proportions	1.00	0.55	0.00	0.45	0.00	0.00	0.00	0.00
Non-resp. Variance	532.07	159.74	0.00	113.93	0.00	0.00	0.00	0.00
Bulls per 100 Cows	0.00							
Calves per 100 Cows	81.47							

## SUBUNIT 79.00 STRATUM Moderate

Characteristic	Total	Cows	Bulls	Calves	Spikes	Raghrn	Ad.Bul	Unclass
Group No. 1	7	5	0	2	0	0	0	0
Group No. 2	1	1	0	0	0	0	0	0
Group No. 3	7	5	0	2	0	0	0	0
Total Counted	15	11	0	4	0	0	0	0
Corrected Estimates	39.69	33.97	0.00	5.72	0.00	0.00	0.00	0.00
Corrected Proportions	1.00	0.86	0.00	0.14	0.00	0.00	0.00	0.00
Non-resp. Variance	443.74	406.26	0.00	6.25	0.00	0.00	0.00	0.00
Bulls per 100 Cows	0.00							
Calves per 100 Cows	16.84							

SUBUNIT 80.00 STRATUM Low

Characteristic	Total	Cows	Bulls	Calves	Spikes	Raghrn	Ad.Bul	Unclass
Group No. 1	14	11	0	3	0	0	0	0
Group No. 2	3	3	0	0	0	0	0	0
Group No. 3	3	3	0	0	0	0	0	0
Total Counted	20	17	0	3	0	0	0	0
Corrected Estimates	35.34	32.21	0.00	3.12	0.00	0.00	0.00	0.00
Corrected Proportions	1.00	0.91	0.00	0.09	0.00	0.00	0.00	0.00
Non-resp. Variance	178.89	175.68	0.00	0.39	0.00	0.00	0.00	0.00
Bulls per 100 Cows	0.00							
Calves per 100 Cows	9.70							