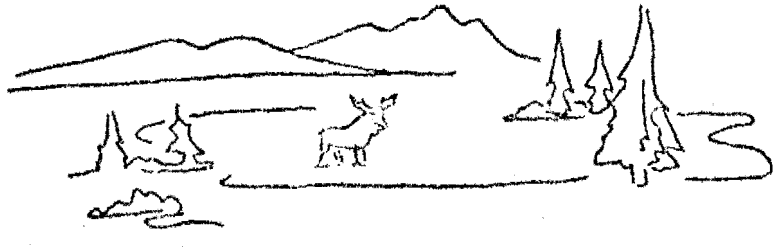
Vol III file
No. 51

SUMMARY OF MOOSE INVESTIGATIONS 1964



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INTRODUCTION

Regulations covering the utilization of moose through hunting have been progressively liberalized since statehood while at the same time becoming more complex. The latter consideration is in part a recognition of an increased knowledge of moose population ecology and the effects that hunting and other aspects of civilization and natural phenomenons have upon these populations. But the regulations also reflect the impact of considerations that are purely human--emotion, regionalism, resistance to change, etc. The human considerations frequently are diametrically opposed to the "best use" as viewed by the technician or resource administrator, still, until these views are effectively inosculated through time and improved communications, views of a few or on occasion many will continue to contribute to regulation complexity.

The data presented in the following summary are not intended to provide comment on external pressures that affect regulations but are presented to serve as an index to biological data collected primarily in 1964 that may be useful in the deliberations associated with the season and bag limit proposals for 1965.

Some data gathered in 1964 is not presented here because of special limitations, and the proximity of the deliberations to the data gathering period which precluded detailed analyses of much of the data. Generally the information gathered from areas of prime importance from the standpoint of public interest and level of utilization is included.

The summary consists of five parts*: 1. Harvest inforamtion obtained from returned moose harvest tickets; 2. Aerial sex and age composition counts; 3. Age composition of the harvest based on cementum deposition; 4. Reproductive performance based on *in utero* examinations and aerial counts at parturition; 5. Suggestions pertaining to seasons and bag limits.

R. A. Rausch

* The summary was compiled in Anchorage and Fairbanks, more or less simultaneously, pagination, proofing, tabulating, etc. proved interesting and close inspection may reveal a few errors--I hope no entire segments were omitted.

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Kenai County Boise

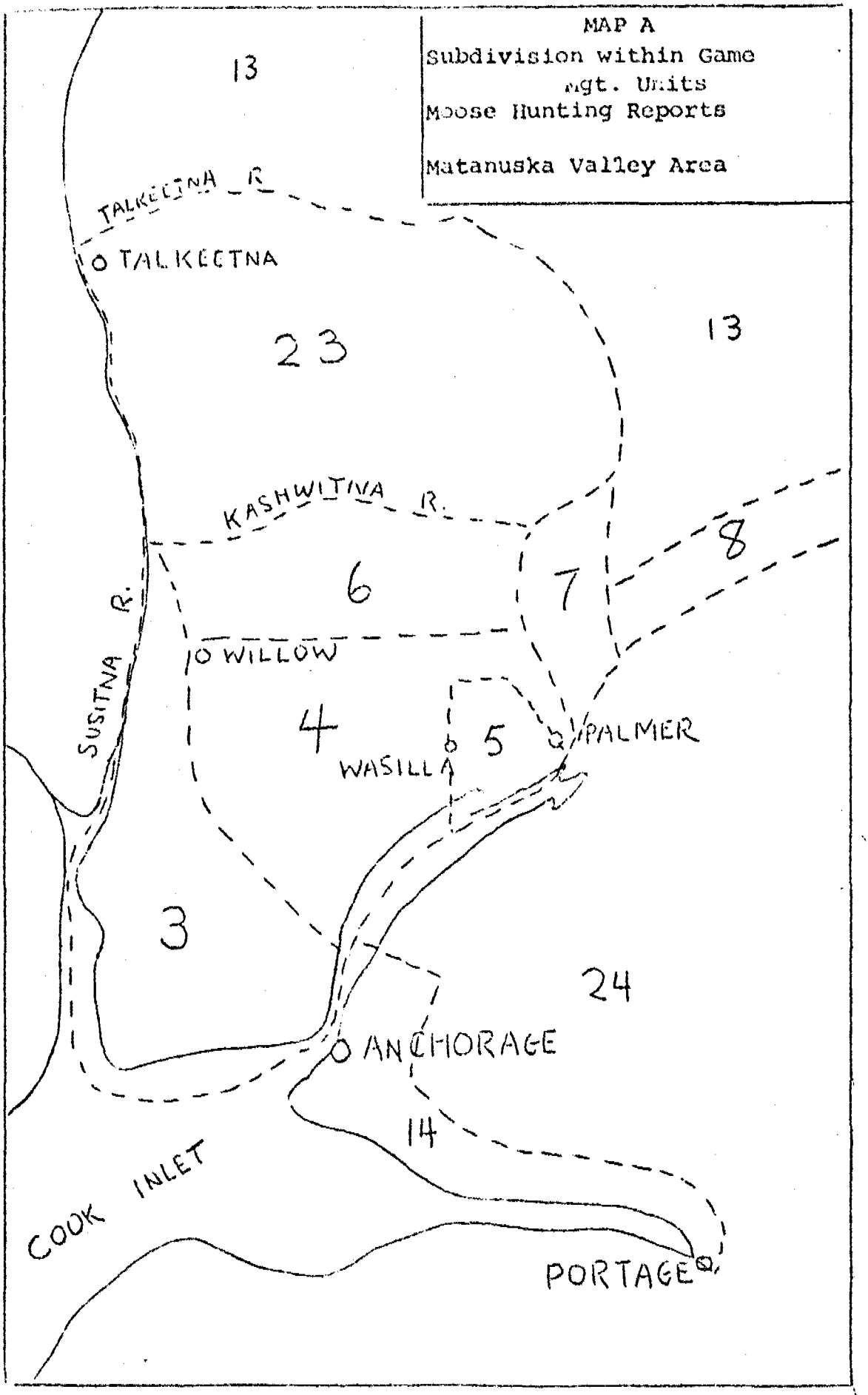
Harvest Statistics

A projection of the moose harvest ticket returns indicates that the total kill will not exceed 9,000 animals. A compilation made in late December 1963 shows about 600 fewer animals than a similar computation of the 1964 tickets. The composition of the harvest is quite different, in 1963 5,071 males and 1,544 females had been reported by December 20; in 1964 4,898 males and 2,236 females have been reported. Further liberalization and fortunate weather conditions combined to increase the harvest of female moose to nearly 50 per cent of the total reported harvest of Males. The harvest of males has remained static or decreased slightly although there are important local exceptions. I doubt that the reported harvest of female moose will increase in direct proportion to the male segment on the late ticket returns because successful hunters who participated in the antlerless seasons in Southcentral Alaska had ample opportunity to turn in tickets and considerable contact with Department personnel.

A sample of tickets received this past week shows a success ratio of 8 to 14 per cent. If this trend continues, the total harvest will be close to the 9,000 mark.

The return of moose harvest tickets is closely paralleling the pattern established in 1963. Problems relating to the system are also similar. Compilation and analysis at the regional level has provided a weekly analysis of the harvest and has also provided a statewide chronology of the harvest (Page 9).

The slow return particularly of the "unsuccessful" and "did not hunt" categories is discouraging. Efforts to obtain publicity in newspapers and through other news media have not always been successful. Reminder letters are now being sent to those individuals who have not completed their harvest ticket obligation. I have arbitrarily set March 1 as the target date for completing the project. If 95 per cent of the tickets have been returned by that date, I suggest the balance of the non-cooperators, many falling in the category of "non-deliverable" be prosecuted.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TALKEETNA
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WILLOW
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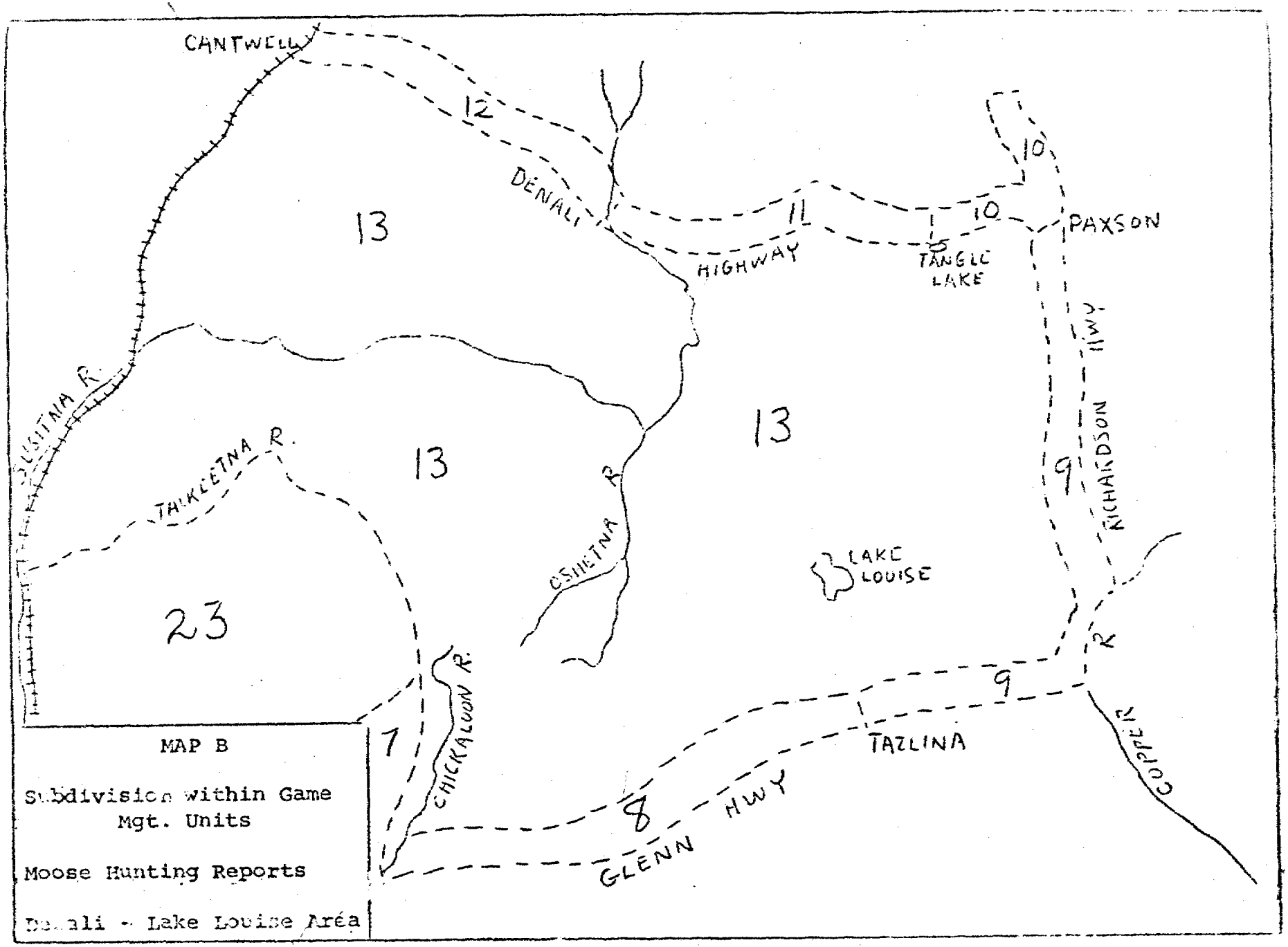
5
PALMER
WASILLA
3
24
ANCHORAGE
14
COOK INLET
PORTAGE


CANTWELL
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TANGLE LAKE
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TALKEETNA R.
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R
7
CHICKALOON R.
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GLENN HWY
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COPPER
MAP B
Subdivision within Game Mgt. Units
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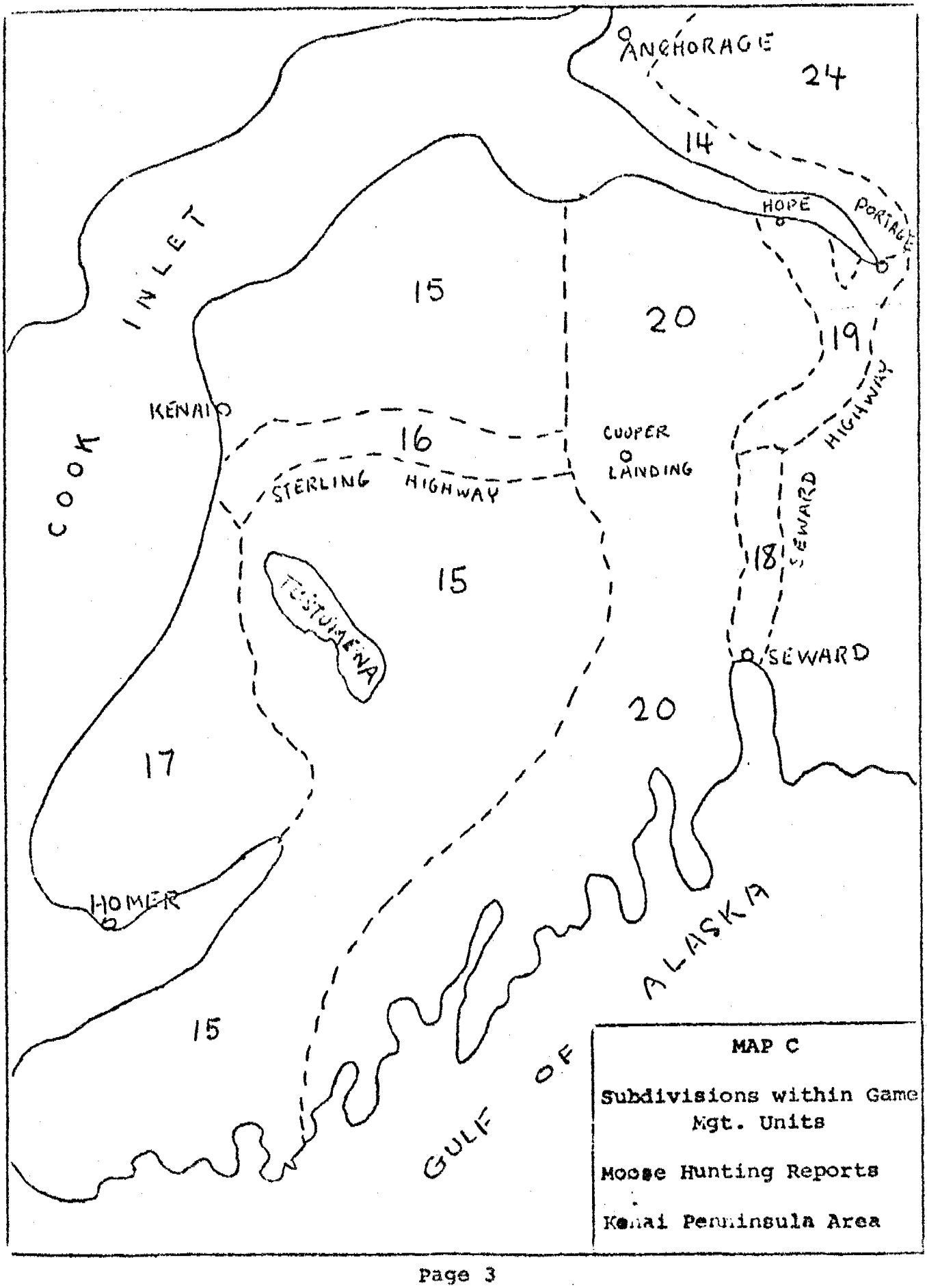
Denali - Lake Louise Area

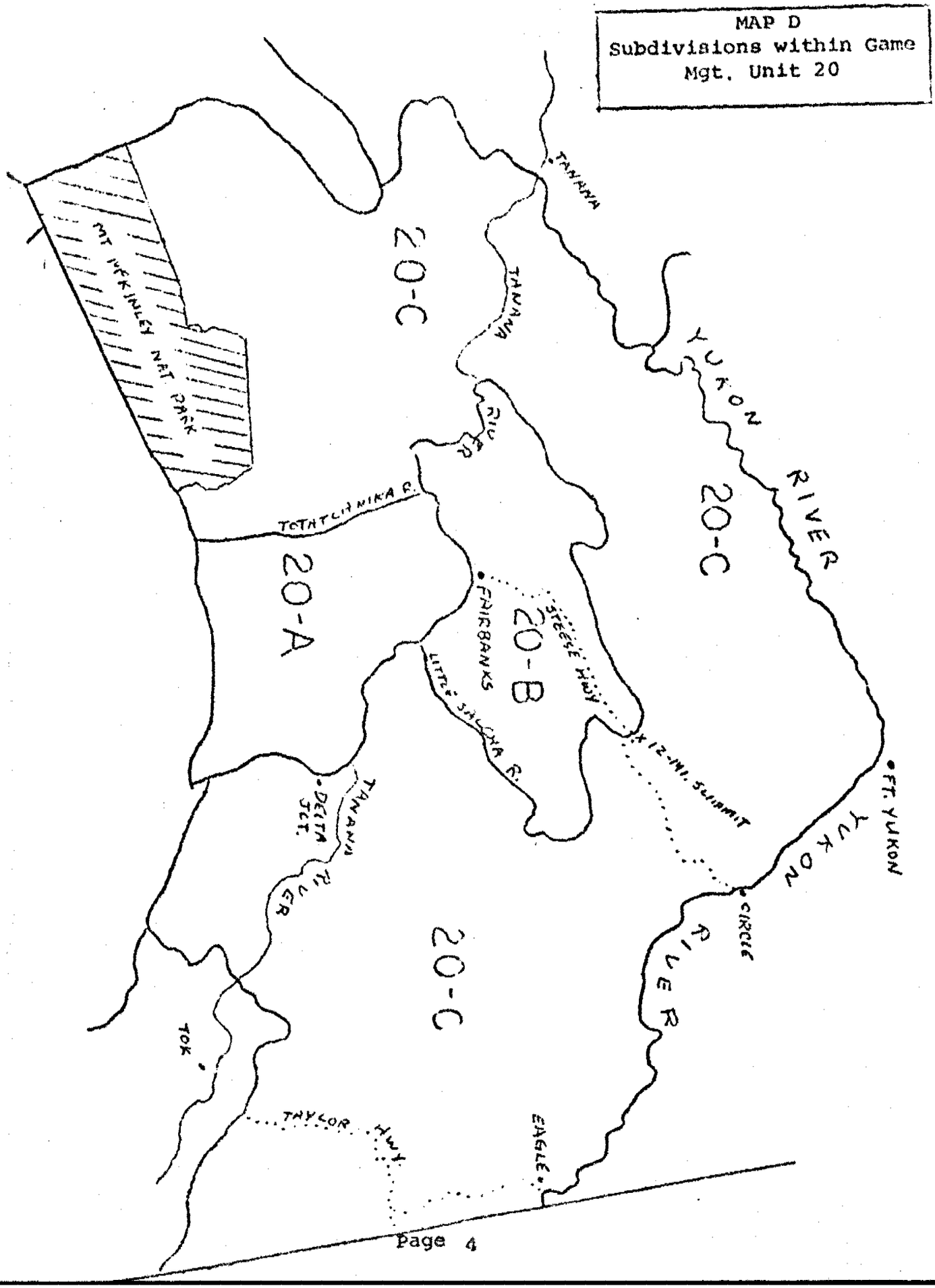


MAP C

Subdivisions within Game Mgt. Units

Moose Hunting Reports

Kenai Peninsula Area


MAP D
Subdivisions within Game
Mgt. Unit 20
20-C
20-A
20-B
20-C
20-C
MT MCKINLEY NAT PARK
TANANA
TANANA
YUKON RIVER
TOTATLANIKA R.
FAIRBANKS
STEESE HWY
LITTLE SALCHA R.
TANANA
DELTA JCT.
TOK
TAYLOR HWY
12-MI. SUMMIT
FT. YUKON
YUKON
CIRCLE
EAGLE

1964 Moose Harvest by Game Management Unit*

Unit	♂	♀	Total
1	142	58	200
5	140	100	240
6	15	0	15
7	141	166	307
9	131	37	168
11	70	29	99
12	150	23	173
13	1005	332	1337
14	643	445	1088
15	1009	730	1739
16	230	55	285
17	15	0	15
18	15	0	15
19	83	23	106
20	807	194	1001
21	83	28	111
22	44	0	44
23	57	1	58
24	71	15	86
25	37	0	37
26	10	0	10
Totals	4898	2236	7134

*Data taken from preliminary compilation of 12/24/64

1963 Moose Harvest by Game Management Unit, Dec. 20, 1963.

Southcentral

Unit	♂	♀	Total
6	10	1	11
7	209	155	364
9	112	24	136
11	90	20	110
13	1094	274	1368
14	698	463	1161
15	821	356	1177
16	267	18	285
17	21	0	21
Totals	3322	1311	4633

1963 Moose Harvest by Game Management Unit*

UNIT	MALE	FEMALE	UNKNOWN	TOTAL
1	149	1	--	150
2	2	--	--	2
3	4	--	--	4
4	1	2	--	3
5	189	111	2	302
6	15	2	--	17
7	251	174	2	427
8	--	--	--	--
9	179	46	2	227
10	1	--	--	1
11	86	37	--	123
12	138	22	1	161
13	1385	343	7	1735
14	925	557	4	1486
15	1021	417	2	1440
16	344	27	2	373
17	61	--	--	61
18	75	3	--	78
19	144	24	--	168
20	1314	131	2	1457
21	168	72	7	247
22	68	1	--	69
23	76	1	--	77
24	92	4	--	96
25	77	2	--	79
26	13	--	--	13
Unknown	59	4	1	64
Total	6847	1982	32	8861

* Data taken from Coordinator's Report, Sept 1964

1964 Moose Harvest by Subdivision of Game Management Unit*

Subdivision	♂	♀	Total
1-Haines	74	58	132
1-Berners Bay	5	0	7
1-Taku	35	0	35
1-Stikine	27	0	27
5-Yakutat	140	100	140
7-18	32	29	61
7-19	66	115	181
7-20	31	20	51
7-22	8	2	10
13-8	140	71	211
13-9	130	28	158
13-10	64	18	82
13-11	71	46	117
13-12	160	68	228
13-13	440	100	540
14-3	34	13	47
14-4	135	119	254
14-5	56	34	90
14-6	89	49	138
14-7	34	9	43
14-14	116	127	243
14-23	66	28	94
14-24	113	66	179
15-15	426	225	651
15-16	185	210	395
15-17	398	295	693
20-A	107	39	146
20-B	172	3**	175
20-C	528	152	680

*Data taken from preliminary compilation of 12/24/64
**Illegal

1963 Moose Harvest by Subdivision of Game Management Unit,

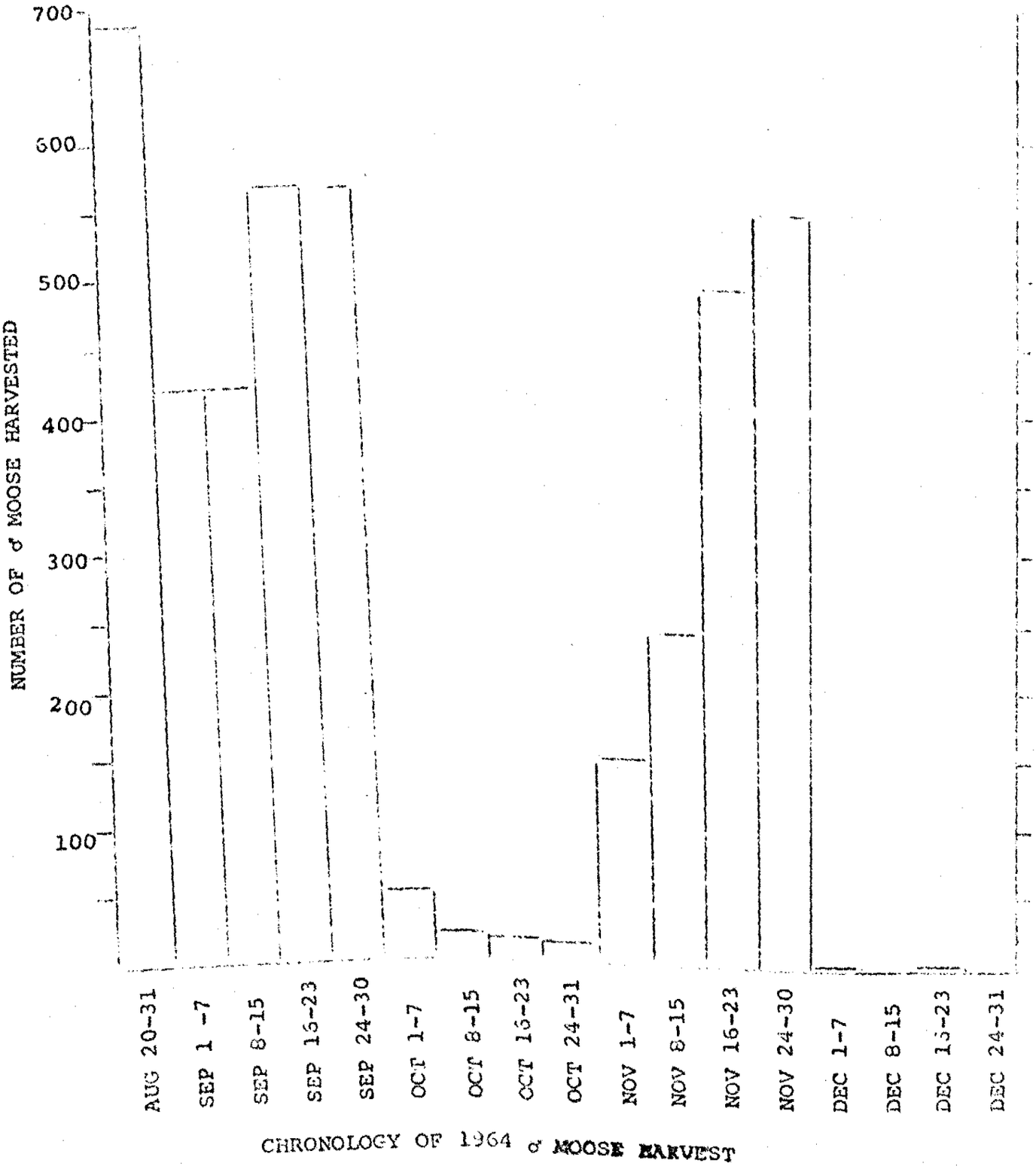
Southcentral, Dec. 20, 1963

Subdivision	♂	♀	Total
7-18	33	26	59
7-19	104	91	195
7-20	67	26	93
7-22	5	12	17
13-8	165	63	228
13-9	110	25	135
13-10	86	40	126
13-11	205	88	293
13-12	97	29	126
13-13	431	29	460
14-3	32	25	57
14-4	142	110	252
14-5	48	64	112
14-6	89	24	113
14-7	56	28	84
14-14	132	96	228
14-23	39	13	52
14-24	160	103	263
14-15	347	104	451
14-16	196	129	325
14-17	278	123	401

1963 Moose Harvest by Suldivision of Game Managements Units *

Unit & Subdivision	Unknown Sex	♂	♀	Total
7-Unknown		36	3	39
7-18		34	32	66
7-19		107	97	204
7-20		69	28	97
7-22		7	14	21
13-Unknown	7	278	22	307
13-8		168	70	238
13-9		111	28	139
13-10		86	51	137
13-11		208	93	301
13-12		99	36	135
13-13		435	43	478
14-Unknown	4	197	11	212
14-3		34	28	62
14-4		148	137	285
14-5		48	69	117
14-6		91	29	120
14-7		62	35	97
14-14		140	109	249
14-23		43	18	61
14-24		162	121	283
15-Unknown	2	179	10	191
15-15		352	120	472
15-16		202	143	345
15-17		288	144	432
20-Unknown	2	297	27	326
20-A		142	64	206
20-B		221	1	222
20-C		664	39	703

* ♀ data taken from final IBM tabulation.
♂ data taken from the preliminary tabulation of the 1963 harvest as of Jan. 4, 1964. The subunit unknown data adjust these figures to coincide with the final IBM tabulation for males. (The IBM tabulation did not break down the ♂ data by subunit).



(Data taken from preliminary compilation, Dec.24,1964)
(Excludes Southeastern data which was not available)

Results of 1963 and 1964 Harvest Ticket Distribution and Return

	1963*	1964**
Unsuccessful	16,287	5,817
Did Not Hunt	5,415	2,933
Successful	8,861	7,056
Tickets not returned	1,849	12,264
Total moose harvest tickets issued	32,412	28,173***

*Extracted from final IBM tabulation

**Data taken from preliminary tabulation of 12/28/64

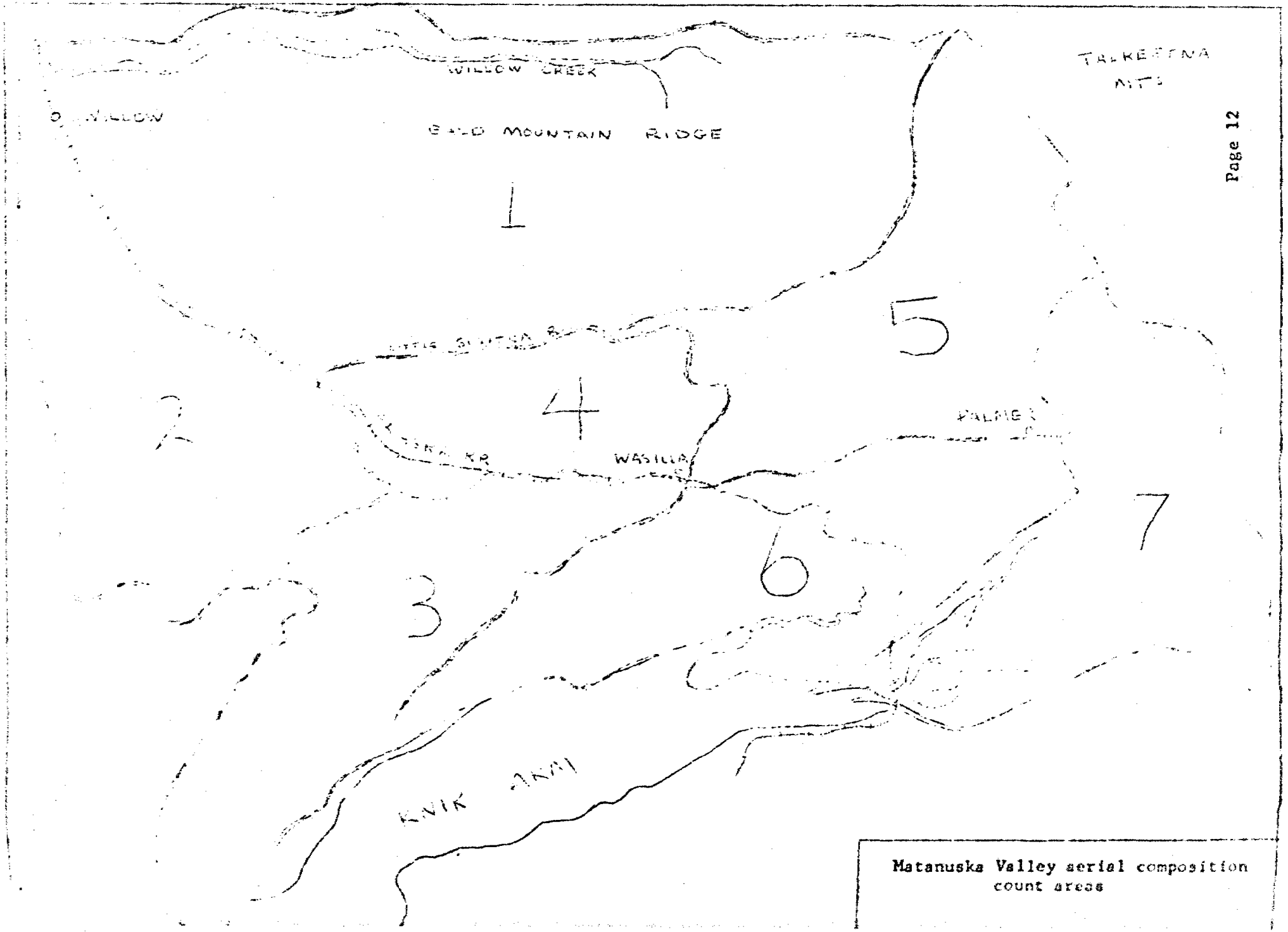
***Overlays returned as of 12/28/64

Aerial Composition Counts

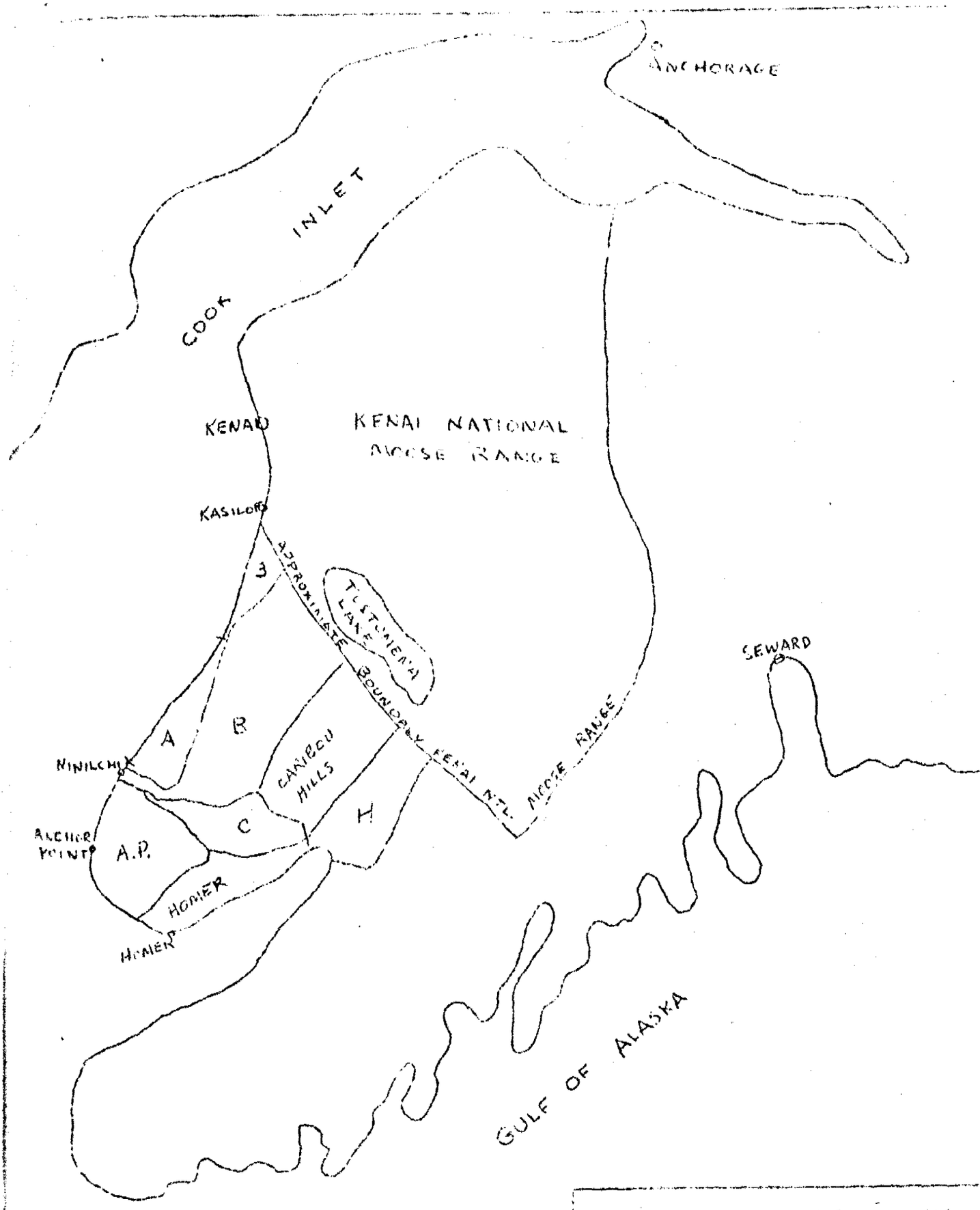
The tabulated information (Pages 12-17) needs relatively little explanation. Production of calves through 6 months is good to excellent in all heavily utilized areas. Moose abundance, as measured by moose seen per hour with all its variables, is relatively unchanged from 1963. Actually, composition counts probably are not sensitive to minor changes in abundance unless the change is also reflected in a changed composition.

There is a definite need for more precise estimates of numbers of moose inhabiting areas hunted intensively. The harvest information is one valuable tool and development of complimentary census techniques continues. Possible techniques include "aerial strip counts", "Random Plot Counts" as used by several Canadian provinces and experimented with by F.W.S. on the proposed Rampart impoundment and on the Kenai National Moose Refuge, and estimates derived from "tagged vs. untagged calves" and then extrapolating to include the balance of the population components. The techniques all have application and they all have potentially serious weaknesses.

The technique of comparing tagged and untagged calves yielded good results last spring. Duplicate flights of the Matanuska Valley and Willow areas yielded nearly identical results and therefore a very low sampling error. Extrapolation to include the balance of the population components is possible in these areas considerable sex and age composition material is available. The technique in combination with other techniques will be tested further next year.



Matanuska Valley aerial composition count areas



Kenai Peninsula aerial composition count areas below National Moose Refuge

Sex and Age Composition Counts

Game Mgmt. Unit	Date	Adult Males	Young Males	Females Without Calves	Females With 1 Calf	Females With 2 Calves	Adults	Total Moose
Unit 7	Feb. '64	4	8		323	29	607	1383
Unit 9	Nov. '64	397	84	598	100	11		1312
Unit 13 Paxson Lake and a portion of Alphabet Hills	Dec. '64	122	61	336	111	5	0	756
Unit 14	Feb. '64							
1					78	7	206	291
2		2	3		39	1	62	148
3					28		27	83
4					85	1	182	365
5			1		94	10	203	422
6			1		32		23	88
7					43	3	92	188
Totals		2	5		399	22	795	1667
1	Dec. '64							
1		0	2	20	7	0	0	38
2		4	1	23	18	1	0	67
3		5	7	83	70	4	10	258
4		3	7	84	61	2	0	227
5		4	9	135	62	1	0	278
6		3	22	67	99	3	22	321
7		18	5	94	61	1	16	258
Totals		37	53	506	378	12	48	1447

Sex and Age Composition Counts--(Continued)

Game Mgmt. Unit	Date	Adult Males	Young Males	Females Without Calves	Females With 1 Calf	Females With 2 Calves	Adults	Total Moose
Unit 15 (below Kenai Moose Refuge	Dec. '64							
Homer					102	3	176	389
"C"					20	0	54	94
Caribou Hills					27	0	207	261
"H"					57	2	184	305
Anchor Point					58	1	140	260
A		2	2	1	7	0	0	31
B		12	2	69	15	0	0	113
"3"		6	14	69	25	1	0	146
Totals		20	18	139	311	7	761	1599*
Kenai Moose Refuge	Jan. '64				521	32	2666	3802
	Dec. '64	576	119		652	34	2898*	4344
Unit 20 (Delta Junction area)	Dec. '64	23	29	71	56	6	7	260
Healy, Good Pasture, Volkmar		3	5	22	14	2	0	64
Totals		26	34	93	70	8	7	324

* Lone calves are included throughout these tables; consequently totals frequently are not precise.

Sex and Age Composition Ratios

Game Mgmt. Unit	Males:100 Females	Calves:100 Females	Twin Calves 100 females With Calves	% Calves in Population	Total Moose	Moose Per Hour	Date
Unit 7			8.2	30	1383	43	Feb. '64
Unit 9	68	21	11	11	1312	146	Nov. '64
Unit 13	41	26	4	16	621		Dec. '64
Unit 14							Feb. '64
Matanuska Valley 1				24	383	113	
2				28	148	44	
3				34	83	42	
4				25	355	162	
5				27	422		
6				36	88	29	
7				27	188	65	
Totals	—			27	1667	64	
Matanuska Valley 1	7	26	0	18	38	12	Dec. '64
2	12	48	5	30	67	34	
3	7.6	50	5	31	258	53	
4	15	48	3	31	227	94	
5	6.5	34	2	24	278	81	
6	15	62	3	35	321	115	
7	15	40	2	24	258	177	
Totals	10	46	3	30	1447	81	

Sex and Age Composition Ratios (Continued)

Game Mgmt. Unit	Males:100 Females	Calves:100 Females	Twin Calves 100 Females With Calves	% Calves in Population	Total Moose	Moose Per Hour	Date
Unit 15 (below Kenai Moose Refuge)							Dec. '64
Homer			3	29	389	53	
"C"			0	21	94	39	
Caribou Hills			0	10	261	75	
"H"			2	27	305	81	
Anchor Point			2	23	260	49	
A	21	50	0	29	31	22	
B	17	18	0	13	113	28	
"3"	22	33	4	21	146	146	
Totals			2	21	1599	56.3	
Kenai Moose				15	3804	43	Jan. '64
Refuge	31	34	5	17.2	4344	62	Dec. '64
Unit 20							Dec. '64
Delta Jct. area	39	51	11	26	260		
Healy, Good Pasture, Volkmer	21	47	14	28	64		
Totals	35	50	10	27	324	33	

Age Composition of Harvested Moose

Indices to the well being of big game populations based on the age of the animals harvested has been used successfully as a management tool on deer, elk, and moose (Newfoundland). Most previous studies have relied upon comparative wear of the cheek teeth to establish age classes which correspond roughly to the chronological age of the animal. The data presented here on 928 moose (10-13 per cent of the total harvest) is based on seasonal variations in cell structure discernable in the cementum of I'. The technique is accurate through 5 or 6 age classes and as many as 19 distinct rings have been observed in older animals. The accuracy of the estimates for older animals must await collection of known age specimens.

The data is largely self explanatory and some interesting life tables could be constructed from the data. A few samples are discussed below:

UNIT 1: Haines--an exceptionally even spread with yearlings a bit weak--probably a relatively young expanding population?

UNIT 5: Yakutat--calves, deliberately bypassed by hunters according to Crawford, and the first 4 age categories represent nearly 80 per cent of the harvest. Pimlott suggested, in Newfoundland, that yearlings were more vulnerable to hunting--the Yakutat data does show 30 per cent yearlings but 2 year-olds comprise 20 per cent of harvest--I suspect yearlings are the largest cohort in the sample because next to calves, they are the most abundant age class.

UNIT 13: Note the paucity of three-year-olds, calves during 1961-1962. The female sample suggests hunting has not greatly altered the age composition of this population segment.

UNIT 14: Hunter discrimination against calves went out-the-window in the Matanuska Valley during the one-day season. Calves equal 24 per cent of the antlerless harvest--very similar, considering sample size, to the 30 per cent indicated by the aerial surveys.

Age Composition Based on Cementum Layers In Central Incisors of Moose

Game Mgmt. Unit	Age	Number Male	Per Cent of Males	Number Females	Per Cent of Females	Unknown Number	Total Number	Per Cent of Total
Unit 1								
Haines	Calf	3		1	4.8		4	12.5
	1	1		3	14.3		4	12.5
	2	1		4	19.0	1	6	18.8
	3	1		5	23.8		6	18.8
	4	1		2	9.5		3	9.4
	5			4	19.0		4	12.5
	6			1	4.8		1	3.1
	7	1		1	4.8	1	3	9.4
	8					1	1	3.1
Totals		8		21		3	32	
Unit 5								
Yakutat	Calf	1	1.7	3	8.1	1	5	5.1
	1	22	37.9	8	21.6		30	30.6
	2	13	22.4	6	16.2	1	20	20.4
	3	9	15.5	3	8.1		12	12.2
	4	5	8.6	4	10.8	1	10	10.2
	5	2	3.4	4	10.8		6	6.1
	6	3	5.2	3	8.1		6	6.1
	7			2	5.4		2	2.0
	8	1	1.7	1	2.7		2	2.0
	9	1	1.7	1	2.7		2	2.0
	10			2	5.4		2	2.0
	11	1	1.7				1	1.0
Totals		58		37		3	98	
Unit 13								
Denali Hwy. and Paxson area	Calf	8	7.6	5	8.6		13	8.0
	1	37	35.6	7	12.1		44	27.2
	2	24	23.1	4	6.9		28	17.3
	3	8	7.7	2	3.4		10	6.2
	4	12	11.5	5	8.6		17	10.5
	5	6	5.8	8	13.8		14	8.6
	6	3	2.9	4	6.9		7	4.3
	7	3	2.9	3	5.2		6	3.7

Game Mgmt. Unit	Age	Number Male	Per Cent of Males	Number Females	Per Cent of Females	Unknown Number	Total Number	Per Cent of Total
Unit 13 (Contd.)	8			4	6.9		4	2.5
	9			2	3.4		2	1.2
	10			1	1.7		1	0.6
	11	2	1.9	3	5.2		5	3.1
	12	1	1.0	5	8.6		6	3.7
	13			3	5.2		3	1.9
	14							
	15							
	16			1	1.7		1	0.6
	17							
	18							
	19			1	1.7		1	0.6
Totals		104		58			162	
Unit 14 Matanuska	Calf	9	39.1	12	15.0		21	19.1
	1	6	26.1	11	13.8	2	19	17.3
	2	4	17.4	9	11.2	1	14	12.7
	3	1	4.3	6	7.5	1	8	7.3
	4	2	8.7	12	15.0		14	12.7
	5	1	4.3	9	11.2	1	11	10.0
	6			3	3.8		3	2.7
	7			5	6.2	2	7	6.4
	8			2	2.5		2	1.9
	9			2	2.5		2	1.9
	10			3	3.8		3	2.7
	11			1	1.2		1	0.9
	12			3	3.8		3	2.7
	13			2	2.5		2	1.9
Totals		23		80		7	110	
Unit 14 Willow	Calf	3	1.5	8	18.2	2	13	16.9
	1	4	15.4	3	6.8	2	9	11.7
	2	8	30.8	6	13.6	1	15	19.5
	3	4	15.4	5	11.4	1	10	13.0
	4	5	19.2	3	6.8		8	10.4
	5	2	7.7	6	13.6		8	10.4
	6			1	2.3		1	1.3
	7			4	9.1		4	5.2

Game Mgmt. Unit	Age	Number Male	Per Cent of Males	Number Females	Per Cent of Females	Unknown Number	Total Number	Per Cent of Total
Unit 14 (Contd.)	8			1	2.3		1	1.3
	9						0	0
	10			4	9.1		4	5.2
	11			2	4.5		2	2.6
	12						0	0
	13			1	2.3		1	1.3
	14					1	1	1.3
Totals		26		44		7	77	
Unit 7 Kenai Lake Check Station	Calf	1	12.5				1	1.7
	1	5	62.5	6	12.8		11	18.6
	2	1	12.5	12	25.5		13	22.0
	3			4	8.5	2	6	10.2
	4	1	12.5	5	10.6		6	10.2
	5			1	2.1		1	1.7
	6			3	6.4		3	5.1
	7			3	6.4		3	5.1
	8			5	10.6	1	6	10.2
	9			3	6.4		3	5.1
	10			3	6.4		3	5.1
	11			1	2.1		1	1.1
	12							
	13							
	14			1	2.1	1	2	3.4
Totals		8		47		4	59	
Unit 15 Soldotna	Calf	10	55.6	8	8.4		18	15.8
	1	6	33.3	15	15.8	1	22	19.3
	2			13	13.7		13	11.4
	3			10	10.5		10	8.8
	4			11	11.6		11	9.6
	5	2	11.1	9	9.5		11	9.6
	6			6	6.3		6	5.3
	7			4	4.2		4	3.5

Game Mgmt. Unit	Age	Number Male	Per Cent of Males	Number Females	Per Cent of Females	Unknown Number	Total Number	Per Cent of Total
Unit 15 (Contd.)								
Soldotna	8			7	7.4		7	6.1
	9			2	2.1		2	1.8
	10			2	2.1		2	1.8
	11			2	2.1		2	1.8
	12			5	5.3		5	4.4
Totals		18		95		1	114	
Unit 15								
Homer	Calf	7	24.1	7	6.4		14	10.0
	1	11	37.9	23	20.9		34	24.3
	2	7	24.1	19	17.3		26	18.6
	3	1	3.4	17	15.4		18	12.8
	4	1	3.4	15	13.6		16	11.4
	5			9	8.2	1	10	7.1
	6			6	5.4		6	4.3
	7			5	4.5		5	3.6
	8			4	3.6		4	2.8
	9						0	0
	10	1	3.4	1	0.9		2	1.4
	11						0	0
	12			2	1.8		2	1.4
	13			1	0.9		1	0.7
	14	1	3.4	1	0.9		2	1.4
Totals		29		110		1	140	
Unit 15 and 7								
Composite of	Calf	18	33.3	15	5.9		33	10.5
Kenai Lake,	1	22	40.7	44	17.4	1	67	21.4
Soldotna and	2	8	14.8	44	17.4		52	16.6
Homer	3	1	1.8	31	12.2	2	34	10.9
	4	2	3.7	31	12.2		33	10.5
	5	2	3.7	19	7.5	1	22	7.0
	6			15	5.9		15	4.8
	7			12	4.7		12	3.8
	8			17	6.7	1	18	5.8
	9			5	2.0		5	1.6
	10	1	1.8	6	2.4		7	2.2
	11			3	1.2		3	1.0
	12			7	2.8		7	2.2

Game Mgmt. Unit	Age	Number Male	Per Cent of Males	Number Females	Per Cent of Females	Unknown Number	Total Number	Per Cent of Total
Unit 15 and 17 (Continued)	13			1	0.4		1	0.3
	14			2	0.8	1	3	1.0
	15						0	0
	16						0	0
	17			1	0.4		1	0.3
Totals		54		253		6	313	
Unit 20 Delta	Calf	1	25.0	8	20.0		9	20.0
	1	1	25.0	4	10.0		5	11.1
	2			2	5.0		2	4.4
	3			2	5.0		2	4.4
	4	1	25.0	3	7.5		4	8.9
	5	1	25.0	5	12.5		6	13.3
	6					1	1	2.2
	7			1	2.5		1	2.2
	8			4	10.0		4	8.9
	9			2	5.0		2	4.4
	10			3	7.5		3	6.7
	11			1	2.5		1	2.2
	12			2	5.0		2	4.4
	13			1	2.5		1	2.2
	14			1	2.5		1	2.2
	15			1	2.5		1	2.2
Totals		4		40		1	45	
Unit 20 Steese and Elliott Hwy.	Calf						0	0
	1	3	8.3				3	7.7
	2	9	25.0				9	23.1
	3	7	19.4				7	17.9
	4	5	13.9				5	12.8
	5	4	11.1				4	10.2
	6	4	11.1				4	10.2
	7			1	33.3		1	2.6
	8						0	2.6
	9			1	33.3		1	2.6
	10			1	33.3		1	2.6
	11	2	5.6				2	5.1
	12						0	0
	13	1	2.8				1	2.6
	14	1	2.8				1	2.6
Totals		36		3			39	

Productivity Information

Collections of productivity information progressed satisfactorily during 1964 and preliminary examination of the data reveals several interesting facts pertinent to management and research.

In utero and ovulation site examination, both techniques may overestimate parturition rates slightly, show that 7 of 16 (44%) yearling females taken from the Matanuska Valley-Willow areas were pregnant or had ovulated. This is a considerable departure from past collections all of which indicated that yearling females rarely bred.

Parturition counts and tagging studies in the Matanuska Valley indicated an initial calf production of 65-70 calves per 100 cows including yearling females as adults, i.e., 12 months old at time of counts. The subsequent harvest comprised 24 per cent calves and aerial counts indicated a calf:cow ratio of nearly 50:100. These data also suggest excellent productivity.

The data from the Kenai Peninsula shows 5 of 23 (22%) yearling females were pregnant. Most of the pregnant females were from the Homer area.

Approximately 95 per cent of 250 uterii examined from moose more than one-year-old were pregnant. No regional variations were noticed.

Although a number of interrelated factors influence the age of sexual maturity and herd productivity, on the surface it would appear that yearlings in more intensively utilized herds are producing some calves (on their second birthday) and these same herds exhibit the greatest capacity to withstand continued intensive harvests.

Suggestions Relating to Seasons and Bag Limits

All available information suggests that the current levels of harvest can be maintained or increased without reducing the stocks of moose.

The following brief suggestions are presented by unit or sub unit and relate primarily to those units where harvests are sufficient to warrant consideration.

UNIT 1: The present or more liberal seasons seem justified.

UNIT 5. The age composition of the harvest indicates that yearlings constitute 30 per cent of the harvest and two-year-olds a close second. I suspect a high rate of productivity with the probability that yearling females are breeding. Sex and age ratio information is needed and should be obtained in the fall before the bulls shed their antlers.

UNIT 6: As suggested by Loyal Johnson, a later opening date (September 15-20) would probably change the age composition of the harvest--it's largely yearlings now.

UNIT 7: The harvest of females now exceeds the harvest of males, productivity is very high--in excess of 30 per cent calves in 1963-64--still with the female segment exceeding the male segment in the harvest, the area should be watched closely. I would attempt to keep these components equal in the harvest.

UNIT 9: The harvest is insignificant--the aerial counts reveal more moose in one hour of counting than have been reported killed by hunters. Productivity has dropped, as was predicted several years ago.

UNIT 11: A small harvest and an abundant population--access remains the key to satisfactory harvests and this unit does not have many roads.

UNIT 12: See comments on Unit 20.

UNIT 13: Age composition of harvest, harvest statistics, and aerial counts suggest current seasons are <u>good</u>. They permit a harvest when roads are open with no indication that the maximum yield has been reached.

UNIT 14: Matanuska Valley area--continued antlerless seasons in late November, 3-4 days, would be most beneficial in that in some years such as 1964 the alpine and valley populations have intermingled. The effects of the shortened, late season on bulls has not been determined but aerial surveys and age data show that the percentage of bulls has increased and some males are living until their second and third birthday--the latter probably due to the either sex seasons.

Unit 14--above Willow

The area can and should produce 2-4 times the harvest obtained this year. If the winter is severe, an emergency season in January or February is justified.

Unit 14--around Anchorage

Largely a Military problem but those straying off the bases might as well be taken by hunters as by cars.

UNIT 15: This year's biggest producer. Everything looks rosy. The late season when combined with snowfall will yield harvests comparable to this years. Still well within the capacity of the herd's production.

The Refuge desires a further build-up of those herds utilizing part of the 1947 burn if a "hedge effect" on the browse is to be achieved. I concur if access to harvest the herd is assured once the desired build-up has been achieved.

UNIT 16: Many moose--small harvest. Season on antlerless could be more liberal (only 7 days this year). The portion of Unit 16 affected by the new road across the Susitna River, opening the Peters Hills-Cache Creek area, will experience an increased harvest if the road is open by 1965--moose are very abundant and a large harvest should be effected.

UNIT 17: No data

UNIT 18: No data

UNIT 19: Low harvest--present seasons are fine.

UNIT 20:

20A Present liberal seasons are not producing the desired harvest--How about some airfields like they built in Southeast Alaska?

20B Need an antlerless season--let's combine 20B and C and ask for a 6 day season September 25-30. This includes one weekend which is essential to obtaining a harvest. No doubt some retrenchment would be necessary and this year's seasons were effective, though different, in case the heat becomes too great.

UNIT 21: Present seasons are fine.

UNIT 22: Present seasons are fine.

UNIT 23: Could take females.

UNIT 24: Present seasons are satisfactory.

UNIT 25: Present seasons are satisfactory.

UNIT 26: Could take females.