

## PERFORMANCE REPORT

**State:** New Hampshire **Grant: W-89-R-6**

**Grant Type:** Survey and Inventory

**Period Covered:** July 1, 2005 – June 30, 2006

**Project II:** MOOSE RESEARCH AND MANAGEMENT

**Job 1:** Harvest Data Collection, Entry and Analysis

**Job Objective:** To efficiently gather biological and harvest information on harvested moose including but not limited to age, sex, date, hunter effort, method and location of take and to collect biological samples from harvested moose for condition evaluation and for periodic toxicological and pathological examination.

**Summary:** The 2005 season ran from October 15<sup>th</sup> through October 23<sup>rd</sup>. The entire state was open. Both either-sex (506) and antlerless-only (20) permits were drawn. Antlerless-only permits were issued in units A2. A total of 526 permits were drawn and 526 were issued statewide. Four hundred and eight animals were taken during the 2005 season for an overall success rate of 78%. All animals had a tooth pulled for aging. Age structure was similar to past years (see Table 1). Mean corpora lutea count was 1.18 for animals 4.5 years of age or older and 0.18 for yearlings. The five-year trend analysis suggests an increase in the either-sex hunter success rate of 1.63 ( $R^2 = 0.89$ , Prob>F 0.0155), which is similar to last year. In addition the percentage of antlered bulls that is yearlings has increased 0.82 ( $R^2 = 0.86$ , Prob>F 0.0224). Corpora lutea counts of yearling cows have declined by -0.09 since 2001 ( $R^2 = 0.79$ , Prob >F = 0.0447). All other indices remain stable. The statewide take consisted of approximately 66% bulls (280), 31% cows (96) and 3% calves (12). Fifty-five percent of animals were taken in the first three days of the season. While 94.61% of animals were taken using rifles, animals were also taken using shotguns (2.21%), muzzleloaders (1.23%) and handguns (0.49%). No animals were taken with a bow. Moose were taken in all management units. Liver and kidney samples were not collected and ectoparasite checks were not conducted this year. Successful moose hunters averaged 3.42 days of hunting/moose killed. Data pertinent to this job can be found in Tables 1 and 2 attached. Additional data can be found in PR W-89-R, Project I, Job 4, Appendix 1, entitled 2005 Big Game Harvest Summary.

**Target Date:** June 30, annually.

**Status of Progress:** On schedule.

**Significant Deviations:** This year's data analysis will be reported using the new Ct. Lakes Region as defined in the 2005 planning process. The Ct. Lakes Region is comprised of WMU A1 and A2. The North Region is now comprised of B, C2 and D1. A map of the new regions can be found in Appendix 1 of this report.

**Total Cost:**

**Procedures:** Registration stations shall be equipped, set up and manned under this job. As required by state law, all harvested moose, including antlers, the intact skull, and female reproductive tracts and mammarys, must be brought to a moose registration station manned by wildlife staff and distributed throughout the state. Information gathered on harvested moose will include sex, weight, method of take, age and place of take. One or both primary incisors or canines will be removed and sectioned for aging by cementum annuli technique. Reproductive tracts of cows will be collected and ovaries sectioned to

determine number of corpora lutea. Evidence of lactation will be recorded. Antler beam diameters and spread will be measured and morphology recorded. Samples of liver and kidney may be removed for toxicological exam. Moose may be checked for presence of internal or ecto-parasites and samples of these parasites may be turned in to the state entomologist for identification. Successful and unsuccessful hunters will be questioned regarding level of hunter effort, wounding losses, shot placement, etc. All data analysis and report writing on data collected under this job will be charged to this job.

**Results:** Statewide indices reflected a statistically significant increase in the percentage of bulls taken that were yearlings (0.82 annual increase,  $R^2 = 0.82$ ,  $\text{Prob} > F = 0.0224$ ). The bulk of this increase (from 17.6 % to 20.1%) has occurred in the last two years. In addition either-sex success rate have increased from 63.8% in 2000 to 77.3% in 2005. Success rates for all permits combined was 77.6%, which is the highest success rate in the past five years. Yearling corpora lutea counts saw an annual decline of  $-0.09$  ( $R^2 = 0.79$ ,  $\text{Prob} > F = 0.0447$ ). From 2003 – 2005 adult corpora lutea declined from 1.36 to 1.18, and the five-year trend was identical to that of yearlings.

Regional comparison of these indices reveals that the increasing percentage of yearling moose is being most influenced by the Ct. Lake Region where percentage of antlered bulls that is yearlings has increased from 15% in 2003 to 21.7% in 2004 and 33.3% in 2005. The 2005 yearling percentage is the highest in the state and the highest seen in the northern four regions since 1993. The five-year trend of this parameter is not yet significant. Either-sex success rates have been most influenced by the North, White Mtn. and Central regions, which have generally seen increasing success rates over time. The Ct. Lakes Region has seen a decline in this parameter the last two years and the Southwest and Southeast are highly variable from year to year with no discernable trend. The White Mtn. Region saw good statistical significance in this trend ( $R^2 = 0.89$ ,  $\text{Prob} > F = 0.0159$ ). The declining yearling corpora lutea count was most influenced by the North Region, which declined  $-0.10$  annually ( $R^2=0.85$ ,  $\text{Prob} > F=0.0264$ ). The Central Region exhibited similar annual changes but without significance. The White Mtn. Region saw similar changes in the preceding four years while the Ct. Lakes Region is the only region to see this parameter increase from 2004 to 2005 (0.00 – 0.07).

Either-sex success rates declined from north to south with the North Region just slightly higher than Ct. Lakes (91.9 vs. 90.2). Success rates then declined from 75% in the White Mtn. Region down to 26.3% in the Southeast Region. Percent antlerless take was similar for all regions (around 30%) with the Southeast being the exception (60% antlerless).

The Ct. Lakes Region has exhibited a gradually increasing bull/cow ratio. At 2.9 bulls taken/cow this is the second highest in the state. This year however, this region also saw a very high proportion of yearling bulls in the antlered take (33.3 %), the highest in the state. Physical indices suggest this population may be approaching K. Yearling corpora lutea counts are low at 0.07 and have been the lowest of the northern four regions for the past five years. Adult corpora lutea counts have seen an increase this year to 1.33 but were also the lowest of the northern four regions for the preceding four years. However, this region continues to produce the heaviest adults and calves. Yearling cows are similar to other regions while yearling bull weights are the lowest of the northern four regions. Yearling spreads are similar to other regions and adult bulls spreads are the largest of the northern four.

The North Region showed small but significant changes in yearling corpora lutea counts ( $-0.10$ ,  $R^2=0.85$ ,  $\text{Prob} > F = 0.0264$ ) and yearling antler beam diameter (1.12,  $R^2= 0.85$ ,  $\text{Prob} > F=0.0271$ ). Yearling bull weights and spread declined slightly but not significantly.

Success rate for the White Mountains continued to exhibit a small increasing annual trend (1.73,  $R^2 0.89$ ,  $\text{Prob} > F=0.0159$ ) even though moose seen per hour declined slightly from 0.17 in 2004 to 0.14 in 2005. All other parameters remained stable.

Trend analysis for the Central Region suggests very little change here. The success rate at 71% is within normal limits for this region.

There are no significant changes coming from the Southwest Region. The apparent significant change in yearling spread is sample size related. Success rate in this region has been quite variable over the years and continues to exhibit large fluctuations from year to year.

Small sample sizes in the Southeast make interpretation of data difficult. All trend indices with sufficient sample size are stable. Success rate at 26% is similar to past years.

**Conclusions:** Mandatory moose registration coupled with the operation of 7 biological moose check stations successfully facilitates the collection of biological data that serves as the cornerstone of moose management decision-making in New Hampshire. Overall copora lutea information, carcass weights and antler measurements indicate animals are in good shape. Moose density in the Ct. Lakes Region may be approaching carrying capacity. The increase in mean days hunted/moose killed is undoubtedly attributable to the severe weather experienced during the season.

**Recommendations:** Continue this job as planned. Trend analysis of parameters with very small sample sizes is very misleading. To make this information more useable, years of data should be grouped together and trend analysis done on the groups of data. The Ct. Lakes Region should be carefully monitored and densities reduced if physical parameters continue to decline.

Prepared by: \_\_\_\_\_  
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Date: \_\_\_\_\_

**Table 1. Results of Cementum Aging for Moose Taken in the 2005 Season.**

<b>CALVES</b>	<b>YEARLINGS</b>	<b>2.5 AND 3.5 YEARS</b>	<b>4.5 YEARS AND OLDER</b>
3.43%	23.04%	36.72%	36.81%

**Table 2.** 2005 CT LAKE REGION MOOSE HARVEST SUMMARY WITH PREVIOUS 4 YEARS  
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YEAR	-----ALL PERMITS-----			--EITHER SEX PERMITS---			ANTLERLESS ONLY PERMITS SUCCESS			TOTAL KILL/SQ MI	FOR EITHER SEX AND (ALL PERMITS)...		% ANT. BULLS AGE 1.5	CORP. LUTEA COUNTS		MOOSE SEEN/HOUR	YEAR		
	TOTAL HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*		PERCENT ANTLERLESS	ADULT BULLS PER COW		AGE 1.5 N	MEAN			AGE 4.5+ N	MEAN
2001	108	125	86.4	64	70	91.4	44	55	80.0	0.193	45.3 (67.6)	1.3 ( 0.5)	14.3	25	0.56	17	1.29	0.26	2001
2002	71	75	94.7	52	55	94.5	19	20	95.0	0.127	28.8 (46.5)	2.8 ( 1.4)	21.1	11	0.09	7	0.71	0.32	2002
2003	71	75	94.7	53	55	96.4	18	20	90.0	0.127	27.8 (44.4)	2.6 ( 1.3)	15.0	13	0.31	8	1.13	0.31	2003
2004	99	107	92.5	82	88	93.2	17	19	89.5	0.177	28.0 (39.4)	2.8 ( 1.7)	21.7	8	0.00	12	1.17	0.27	2004
2005	100	112	89.3	83	92	90.2	17	20	85.0	0.179	27.7 (40.0)	2.9 ( 1.6)	33.3	14	0.07	9	1.33	0.24	2005

\* - NOTE: Permits issued and success rates prior to 1996 based on old unit boundaries.

2005 CT LAKE REGION MOOSE HARVEST SUMMARY (UNIT DETAIL)

UNIT	-----ALL PERMITS-----			--EITHER SEX PERMITS---			ANTLERLESS ONLY PERMITS SUCCESS			TOTAL KILL/SQ MI	FOR EITHER SEX AND (ALL PERMITS)...		% ANT. BULLS AGE 1.5	CORP. LUTEA COUNTS		MOOSE SEEN/HOUR	UNIT		
	TOTAL HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*		PERCENT ANTLERLESS	ADULT BULLS PER COW		AGE 1.5 N	MEAN			AGE 4.5+ N	MEAN
A1	14	15	93.3	14	15	93.3	.	0	.	0.093	28.6 (28.6)	2.5 ( 2.5)	10.0	3	0.00	1	2.00	0.33	A1
A2	86	97	88.7	69	77	89.6	17	20	85.0	0.211	27.5 (41.9)	2.9 ( 1.5)	38.0	11	0.09	8	1.25	0.22	A2

2005 CT LAKE REGION HARVEST TREND ANALYSES  
(BASED ON CURRENT AND PREVIOUS 4 YEARS)

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
ES SUCCESS RATE	5	-0.38	0.06	0.6909
ES ADULT BULLS/COW	5	0.30	0.53	0.1637
ES % COWS & CALVES	5	-3.60	0.54	0.1545
CL COUNT (AGE 1.5)	5	-0.11	0.54	0.1545
% ANT. BULLS AGE 1.5	5	3.87	0.64	0.1034
MOOSE SEEN/HOUR	5	-0.01	0.18	0.4818
AGE 1.5 BULL ABD	5	-0.56	0.32	0.3245
AGE 1.5 BULL WEIGHT	5	0.59	0.00	0.9439
AGE 1.5 BULL SPREAD	5	-0.90	0.53	0.1619

2005 CT LAKE REGION SUMMARY OF MISCELLANEOUS BIOLOGICAL VARIABLES

VARIABLE	----- AGE 1.5 -----				----- AGE 5.5+ -----			
	N	MIN.	MAX.	MEAN (SE)	N	MIN.	MAX.	MEAN (SE)
ANTLER BEAM DIAMETER	18	22.0	43.0	34.8 ( 1.4)	16	51.0	67.0	60.0 ( 1.1)
ANTLER SPREAD	16	16.0	27.5	23.5 ( 0.8)	16	33.0	60.5	51.0 ( 2.0)
TOTAL POINTS	20	0	8	3.7 ( 0.5)	16	6	22	16.6 ( 1.1)
CARCASS WEIGHT (BULLS)	17	205	560	450.6 ( 20.2)	12	680	955	772.9 ( 20.5)
CARCASS WEIGHT (COWS)	12	350	500	434.6 ( 13.5)	7	485	685	597.1 ( 26.2)
CARCASS WEIGHT (CALVES)	3	140	340	240.0 ( 57.7)				

NOTE: 1 CALVES ( 33%) WEIGHED LESS THAN 200 POUNDS

2005 NORTH REGION MOOSE HARVEST SUMMARY WITH PREVIOUS 4 YEARS  
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YEAR	-----ALL PERMITS-----			--EITHER SEX PERMITS---			ANTLERLESS ONLY PERMITS			TOTAL KILL/ SQ MI	FOR EITHER SEX AND (ALL PERMITS)...		% ANT. BULLS AGE 1.5	CORP. LUTEA COUNTS		MOOSE SEEN/ HOUR	YEAR		
	TOTAL HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*		PERCENT ANTLERLESS	ADULT BULLS PER COW		AGE 1.5 N	AGE 4.5+ N			MEAN	MEAN
2001	89	99	89.9	80	89	89.9	9	10	90.0	0.114	21.3 (28.1)	4.2 ( 2.8)	15.6	6	0.67	11	1.36	0.30	2001
2002	93	100	93.0	65	70	92.9	28	30	93.3	0.119	27.7 (49.5)	2.8 ( 1.2)	19.1	5	0.40	17	0.94	0.26	2002
2003	89	99	89.9	65	69	94.2	24	30	80.0	0.114	15.2 (37.8)	5.6 ( 1.8)	23.2	11	0.45	9	1.67	0.30	2003
2004	99	110	90.0	99	110	90.0	.	0	.	0.126	16.2 (16.2)	5.9 ( 5.9)	18.1	3	0.33	7	1.57	0.32	2004
2005	102	111	91.9	102	111	91.9	.	0	.	0.130	34.3 (34.3)	2.2 ( 2.2)	16.4	10	0.20	15	1.27	0.22	2005

\* - NOTE: Permits issued and success rates prior to 1996 based on old unit boundaries.

2005 NORTH REGION MOOSE HARVEST SUMMARY (UNIT DETAIL)

UNIT	-----ALL PERMITS-----			--EITHER SEX PERMITS---			ANTLERLESS ONLY PERMITS			TOTAL KILL/ SQ MI	FOR EITHER SEX AND (ALL PERMITS)...		% ANT. BULLS AGE 1.5	CORP. LUTEA COUNTS		MOOSE SEEN/ HOUR	UNIT		
	TOTAL HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*		PERCENT ANTLERLESS	ADULT BULLS PER COW		AGE 1.5 N	AGE 4.5+ N			MEAN	MEAN
B	47	51	92.2	47	51	92.2	.	0	.	0.142	27.7 (27.7)	2.6 ( 2.6)	20.6	5	0.20	6	1.33	0.21	B
C2	39	41	95.1	39	41	95.1	.	0	.	0.164	38.5 (38.5)	1.8 ( 1.8)	12.5	3	0.00	7	1.14	0.27	C2
D1	16	19	84.2	16	19	84.2	.	0	.	0.074	43.8 (43.8)	1.8 ( 1.8)	11.1	2	0.50	2	1.50	0.13	D1

\* - NOTE: Permits issues and success rates prior to 1996 based on old unit boundaries.

2005 NORTH REGION HARVEST TREND ANALYSES  
 (BASED ON CURRENT AND PREVIOUS 4 YEARS)

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
ES SUCCESS RATE	5	0.12	0.01	0.8754
ES ADULT BULLS/COW	5	-0.09	0.01	0.8899
ES % COWS & CALVES	5	1.46	0.08	0.6415
CL COUNT (AGE 1.5)	5	-0.10	0.85	0.0264
% ANT. BULLS AGE 1.5	5	0.05	0.00	0.9656
MOOSE SEEN/HOUR	5	-0.01	0.16	0.5101
AGE 1.5 BULL ABD	5	1.12	0.85	0.0271
AGE 1.5 BULL WEIGHT	5	-5.13	0.25	0.3951
AGE 1.5 BULL SPREAD	5	-0.12	0.01	0.8567

2005 NORTH REGION SUMMARY OF MISCELLANEOUS BIOLOGICAL VARIABLES

VARIABLE	N	AGE 1.5			AGE 5.5+			
		MIN.	MAX.	MEAN (SE)	N	MIN.	MAX.	MEAN (SE)
ANTLER BEAM DIAMETER	11	30.0	42.0	35.8 ( 1.2)	17	49.0	65.0	57.4 ( 1.2)
ANTLER SPREAD	11	14.0	28.0	20.9 ( 1.1)	17	40.5	60.5	50.2 ( 1.4)
TOTAL POINTS	11	3	6	4.1 ( 0.3)	17	8	29	16.8 ( 1.4)
CARCASS WEIGHT (BULLS)	11	390	550	462.3 ( 15.3)	16	445	930	774.4 ( 28.1)
CARCASS WEIGHT (COWS)	8	325	570	452.5 ( 25.1)	7	470	680	567.9 ( 27.2)
CARCASS WEIGHT (CALVES)	3	210	260	236.7 ( 14.5)				

NOTE: 1 CALVES ( 33%) WEIGHED LESS THAN 200 POUNDS

2005 W. MTN. REGION MOOSE HARVEST SUMMARY WITH PREVIOUS 4 YEARS  
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YEAR	-----ALL PERMITS-----			--EITHER SEX PERMITS---			ANTLERLESS ONLY PERMITS			TOTAL KILL/SQ MI	FOR EITHER SEX AND (ALL PERMITS)...		% ANT. BULLS AGE 1.5	CORP. LUTEA COUNTS		MOOSE SEEN/HOUR	YEAR		
	TOTAL HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*		PERCENT ANTLERLESS	ADULT BULLS PER COW		AGE 1.5 N	AGE 4.5+ N			MEAN	MEAN
2001	87	130	66.9	87	130	66.9	.	0	.	0.049	37.9 (37.9)	2.1 ( 2.1)	33.3	5	0.40	12	1.58	0.14	2001
2002	71	100	71.0	71	100	71.0	.	0	.	0.040	35.2 (35.2)	2.2 ( 2.2)	17.4	4	0.50	12	1.17	0.15	2002
2003	70	98	71.4	70	98	71.4	.	0	.	0.039	28.6 (28.6)	2.5 ( 2.5)	12.0	5	0.60	11	1.18	0.12	2003
2004	83	115	72.2	83	115	72.2	.	0	.	0.046	26.5 (26.5)	3.2 ( 3.2)	21.3	5	0.40	7	1.29	0.17	2004
2005	87	116	75.0	87	116	75.0	.	0	.	0.049	33.3 (33.3)	2.2 ( 2.2)	19.0	9	0.22	5	1.20	0.14	2005

\* - NOTE: Permits issued and success rates prior to 1996 based on old unit boundaries.

2005 W. MTN. REGION MOOSE HARVEST SUMMARY (UNIT DETAIL)

UNIT	-----ALL PERMITS-----			--EITHER SEX PERMITS---			ANTLERLESS ONLY PERMITS			TOTAL KILL/SQ MI	FOR EITHER SEX AND (ALL PERMITS)...		% ANT. BULLS AGE 1.5	CORP. LUTEA COUNTS		MOOSE SEEN/HOUR	UNIT		
	TOTAL HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*		PERCENT ANTLERLESS	ADULT BULLS PER COW		AGE 1.5 N	AGE 4.5+ N			MEAN	MEAN
C1	23	25	92.0	23	25	92.0	.	0	.	0.117	30.4 (30.4)	2.7 ( 2.7)	31.3	2	0.00	2	1.00	0.24	C1
D2	19	25	76.0	19	25	76.0	.	0	.	0.045	36.8 (36.8)	1.7 ( 1.7)	8.3	3	0.33	1	1.00	0.12	D2
E1	10	15	66.7	10	15	66.7	.	0	.	0.054	40.0 (40.0)	3.0 ( 3.0)	16.7	1	1.00	1	2.00	0.16	E1
E2	5	5	100.0	5	5	100.0	.	0	.	0.021	20.0 (20.0)	4.0 ( 4.0)	0.0	0	.	1	1.00	0.13	E2
E3	10	21	47.6	10	21	47.6	.	0	.	0.034	40.0 (40.0)	1.5 ( 1.5)	0.0	1	0.00	0	.	0.06	E3
F	20	25	80.0	20	25	80.0	.	0	.	0.044	30.0 (30.0)	2.3 ( 2.3)	28.6	2	0.00	0	.	0.10	F

\* - NOTE: Permits issued and success rates prior to 1996 based on old unit boundaries.

2005 W. MTN. REGION HARVEST TREND ANALYSES  
 (BASED ON CURRENT AND PREVIOUS 4 YEARS)

TREND	YEARS USED (N)	ANNUAL TREND	R	
			SQUARE	PROB>F
ES SUCCESS RATE	5	1.73	0.89	0.0159
ES ADULT BULLS/COW	5	0.13	0.21	0.4363
ES % COWS & CALVES	5	-1.79	0.36	0.2838
CL COUNT (AGE 1.5)	5	-0.05	0.26	0.3759
% ANT. BULLS AGE 1.5	5	-2.48	0.25	0.3946
MOOSE SEEN/HOUR	5	0.00	0.03	0.7795
AGE 1.5 BULL ABD	5	0.10	0.01	0.8699
AGE 1.5 BULL WEIGHT	5	2.90	0.17	0.4907
AGE 1.5 BULL SPREAD	5	-0.22	0.04	0.7491

2005 W. MTN. REGION SUMMARY OF MISCELLANEOUS BIOLOGICAL VARIABLES

VARIABLE	N	AGE 1.5		MEAN (SE)	N	AGE 5.5+		MEAN (SE)
		MIN.	MAX.			MIN.	MAX.	
ANTLER BEAM DIAMETER	11	24.0	50.0	34.5 ( 1.9)	14	50.0	61.0	57.5 ( 0.9)
ANTLER SPREAD	11	21.0	28.8	23.9 ( 0.8)	14	42.5	57.5	49.8 ( 1.5)
TOTAL POINTS	11	0	7	4.5 ( 0.5)	14	7	20	14.7 ( 0.9)
CARCASS WEIGHT (BULLS)	8	360	550	456.3 ( 22.7)	9	655	890	730.6 ( 23.0)
CARCASS WEIGHT (COWS)	9	330	550	422.2 ( 30.2)	6	530	620	585.0 ( 15.0)

NOTE: 2 CALVES (100%) WEIGHED LESS THAN 200 POUNDS

2005 CENTRAL REGION MOOSE HARVEST SUMMARY WITH PREVIOUS 4 YEARS  
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YEAR	-----ALL PERMITS-----			--EITHER SEX PERMITS---			ANTLERLESS ONLY PERMITS			TOTAL KILL/ SQ MI	FOR EITHER SEX AND (ALL PERMITS)...		% ANT. BULLS AGE 1.5	CORP. LUTEA COUNTS		MOOSE SEEN/ HOUR	YEAR
	TOTAL HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*		PERCENT ANTLERLESS	ADULT BULLS PER COW		AGE 1.5 N MEAN	AGE 4.5+ N MEAN		
2001	88	135	65.2	88	135	65.2	.	0	.	0.031	26.1 (26.1)	3.6 ( 3.6)	12.3	2 1.00	9 1.33	0.14	2001
2002	89	141	63.1	89	141	63.1	.	0	.	0.032	34.8 (34.8)	2.0 ( 2.0)	17.2	7 0.71	13 1.54	0.13	2002
2003	101	140	72.1	101	140	72.1	.	0	.	0.036	29.7 (29.7)	2.5 ( 2.5)	21.1	4 1.00	14 1.43	0.11	2003
2004	84	140	60.0	84	140	60.0	.	0	.	0.030	26.2 (26.2)	3.1 ( 3.1)	17.7	7 0.57	8 1.50	0.11	2004
2005	98	138	71.0	98	138	71.0	.	0	.	0.035	28.6 (28.6)	2.8 ( 2.8)	15.7	5 0.40	12 1.00	0.10	2005

\* - NOTE: Permits issued and success rates prior to 1996 based on old unit boundaries.

2005 CENTRAL REGION MOOSE HARVEST SUMMARY (UNIT DETAIL)

UNIT	-----ALL PERMITS-----			--EITHER SEX PERMITS---			ANTLERLESS ONLY PERMITS			TOTAL KILL/ SQ MI	FOR EITHER SEX AND (ALL PERMITS)...		% ANT. BULLS AGE 1.5	CORP. LUTEA COUNTS		MOOSE SEEN/ HOUR	UNIT
	TOTAL HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*		PERCENT ANTLERLESS	ADULT BULLS PER COW		AGE 1.5 N MEAN	AGE 4.5+ N MEAN		
G	30	40	75.0	30	40	75.0	.	0	.	0.050	20.0 (20.0)	4.0 ( 4.0)	4.2	1 1.00	2 1.00	0.12	G
H1	7	10	70.0	7	10	70.0	.	0	.	0.020	14.3 (14.3)	6.0 ( 6.0)	16.7	0 .	1 1.00	0.13	H1
I1	13	20	65.0	13	20	65.0	.	0	.	0.041	61.5 (61.5)	0.6 ( 0.6)	20.0	2 0.50	4 1.25	0.13	I1
I2	23	29	79.3	23	29	79.3	.	0	.	0.065	17.4 (17.4)	4.8 ( 4.8)	26.3	2 0.00	1 1.00	0.07	I2
J1	11	15	73.3	11	15	73.3	.	0	.	0.025	36.4 (36.4)	3.5 ( 3.5)	14.3	0 .	1 0.00	0.13	J1
J2	14	24	58.3	14	24	58.3	.	0	.	0.019	35.7 (35.7)	2.3 ( 2.3)	22.2	0 .	3 1.00	0.06	J2

\* - NOTE: Permits issued and success rates prior to 1996 based on old unit boundaries.

\*\* - NOTE: Permits issued and success rates based on I as a whole, prior to 2000 unit split.

2005 CENTRAL REGION HARVEST TREND ANALYSES  
 (BASED ON CURRENT AND PREVIOUS 4 YEARS)

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
ES SUCCESS RATE	5	0.85	0.07	0.6721
ES ADULT BULLS/COW	5	-0.05	0.02	0.8264
ES % COWS & CALVES	5	-0.38	0.03	0.7879
CL COUNT (AGE 1.5)	5	-0.13	0.64	0.1020
% ANT. BULLS AGE 1.5	5	0.73	0.13	0.5511
MOOSE SEEN/HOUR	5	-0.01	0.93	0.0088
AGE 1.5 BULL ABD	5	-0.21	0.05	0.7265
AGE 1.5 BULL WEIGHT	5	6.96	0.22	0.4243
AGE 1.5 BULL SPREAD	5	0.51	0.20	0.4502

2005 CENTRAL REGION SUMMARY OF MISCELLANEOUS BIOLOGICAL VARIABLES

VARIABLE	AGE 1.5			AGE 5.5+		
	N	MIN.	MAX.	N	MIN.	MAX.
ANTLER BEAM DIAMETER	11	12.0	55.0	19	48.0	68.0
ANTLER SPREAD	10	22.0	50.5	20	25.0	65.5
TOTAL POINTS	11	2	21	20	5	21
CARCASS WEIGHT (BULLS)	11	420	720	18	520	870
CARCASS WEIGHT (COWS)	5	315	500	10	410	625
CARCASS WEIGHT (CALVES)	2	200	230			

NOTE: 1 CALVES ( 50%) WEIGHED LESS THAN 200 POUNDS

2005 S. WEST REGION MOOSE HARVEST SUMMARY WITH PREVIOUS 4 YEARS  
 [C:\SAS FILES\MOOSE\MOOSHNT3.SAS]

YEAR	-----ALL PERMITS-----			--EITHER SEX PERMITS---			ANTLERLESS ONLY PERMITS			TOTAL KILL/SQ MI	FOR EITHER SEX AND (ALL PERMITS)...		% ANT. BULLS AGE 1.5	CORP. LUTEA COUNTS		MOOSE SEEN/HOUR	YEAR
	TOTAL HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*		PERCENT ANTLERLESS	ADULT BULLS PER COW		AGE 1.5 N	AGE 4.5+ N		
2001	28	35	80.0	28	35	80.0	.	0	.	0.023	28.6 (28.6)	3.3 ( 3.3)	10.0	0 .	4 1.00	0.09	2001
2002	19	34	55.9	19	34	55.9	.	0	.	0.016	21.1 (21.1)	5.0 ( 5.0)	0.0	1 0.00	1 2.00	0.08	2002
2003	24	35	68.6	24	35	68.6	.	0	.	0.020	25.0 (25.0)	3.6 ( 3.6)	5.6	2 0.00	2 1.50	0.10	2003
2004	14	30	46.7	14	30	46.7	.	0	.	0.012	21.4 (21.4)	3.7 ( 3.7)	18.2	0 .	0 .	0.10	2004
2005	16	30	53.3	16	30	53.3	.	0	.	0.013	25.0 (25.0)	3.0 ( 3.0)	8.3	1 0.00	3 1.00	0.06	2005

\* - NOTE: Permits issued and success rates prior to 1996 based on old unit boundaries.

2005 S. WEST REGION MOOSE HARVEST SUMMARY (UNIT DETAIL)

UNIT	-----ALL PERMITS-----			--EITHER SEX PERMITS---			ANTLERLESS ONLY PERMITS			TOTAL KILL/SQ MI	FOR EITHER SEX AND (ALL PERMITS)...		% ANT. BULLS AGE 1.5	CORP. LUTEA COUNTS		MOOSE SEEN/HOUR	UNIT
	TOTAL HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*		PERCENT ANTLERLESS	ADULT BULLS PER COW		AGE 1.5 N	AGE 4.5+ N		
H2N	7	10	70.0	7	10	70.0	.	0	.	0.022	14.3 (14.3)	6.0 ( 6.0)	16.7	0 .	1 1.00	0.08	H2N
H2S	2	5	40.0	2	5	40.0	.	0	.	0.007	100 ( 100)	0.0 ( 0.0)	.	1 0.00	1 1.00	0.03	H2S
K	7	15	46.7	7	15	46.7	.	0	.	0.012	14.3 (14.3)	6.0 ( 6.0)	0.0	0 .	1 1.00	0.06	K

\* - NOTE: Permits issued and success rates prior to 1996 based on old unit boundaries.

\*\* - NOTE: Permits issued and success rates based on H2 as a whole, prior to 2000 unit split.

2005 S. WEST REGION HARVEST TREND ANALYSES  
 (BASED ON CURRENT AND PREVIOUS 4 YEARS)

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
ES SUCCESS RATE	5	-6.25	0.55	0.1502
ES ADULT BULLS/COW	5	-0.20	0.17	0.4873
ES % COWS & CALVES	5	-0.68	0.12	0.5669
CL COUNT (AGE 1.5)	.	.	.	.
% ANT. BULLS AGE 1.5	5	1.48	0.12	0.5600
MOOSE SEEN/HOUR	5	-0.00	0.14	0.5305
AGE 1.5 BULL ABD	3	-2.08	0.67	0.3912
AGE 1.5 BULL WEIGHT	4	-0.29	0.00	0.9793
AGE 1.5 BULL SPREAD	3	-2.48	0.98	0.0934

2005 S. WEST REGION SUMMARY OF MISCELLANEOUS BIOLOGICAL VARIABLES

VARIABLE	----- AGE 1.5 -----				----- AGE 5.5+ -----			
	N	MIN.	MAX.	MEAN (SE)	N	MIN.	MAX.	MEAN (SE)
ANTLER BEAM DIAMETER	1	28.0	28.0	28.0 ( . )	2	46.0	60.0	53.0 ( 7.0)
ANTLER SPREAD	1	22.0	22.0	22.0 ( . )	2	47.3	50.0	48.6 ( 1.4)
TOTAL POINTS	1	4	4	4.0 ( . )	2	10	12	11.0 ( 1.0)
CARCASS WEIGHT (BULLS)	1	400	400	400.0 ( . )	2	680	875	777.5 ( 97.5)
CARCASS WEIGHT (COWS)	1	390	390	390.0 ( . )	0	.	.	( . )
CARCASS WEIGHT (CALVES)	0	.	.	( . )				

NOTE: 0 CALVES ( .%) WEIGHED LESS THAN 200 POUNDS



2005 S. EAST REGION MOOSE HARVEST SUMMARY WITH PREVIOUS 4 YEARS  
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YEAR	-----ALL PERMITS-----			--EITHER SEX PERMITS---			ANTLERLESS ONLY PERMITS SUCCESS			TOTAL KILL/SQ MI	FOR EITHER SEX AND (ALL PERMITS)...		% ANT. BULLS AGE 1.5	CORP. LUTEA COUNTS		MOOSE SEEN/HOUR	YEAR
	TOTAL HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*		PERCENT ANTLERLESS	ADULT BULLS PER COW		AGE 1.5 N	AGE 4.5+ N		
2001	19	60	31.7	19	60	31.7	.	0	.	0.020	36.8 (36.8)	1.7 ( 1.7)	0.0	0 .	3 1.00	0.10	2001
2002	12	34	35.3	12	34	35.3	.	0	.	0.013	58.3 (58.3)	0.8 ( 0.8)	20.0	1 0.00	4 1.25	0.07	2002
2003	7	35	20.0	7	35	20.0	.	0	.	0.007	57.1 (57.1)	1.0 ( 1.0)	33.3	1 0.00	1 1.00	0.06	2003
2004	9	20	45.0	9	20	45.0	.	0	.	0.010	66.7 (66.7)	0.8 ( 0.8)	33.3	1 0.00	1 1.00	0.04	2004
2005	5	19	26.3	5	19	26.3	.	0	.	0.005	60.0 (60.0)	1.0 ( 1.0)	0.0	0 .	0 .	0.07	2005

\* - NOTE: Permits issued and success rates prior to 1996 based on old unit boundaries.

2005 S. EAST REGION MOOSE HARVEST SUMMARY (UNIT DETAIL)

UNIT	-----ALL PERMITS-----			--EITHER SEX PERMITS---			ANTLERLESS ONLY PERMITS SUCCESS			TOTAL KILL/SQ MI	FOR EITHER SEX AND (ALL PERMITS)...		% ANT. BULLS AGE 1.5	CORP. LUTEA COUNTS		MOOSE SEEN/HOUR	UNIT
	TOTAL HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*		PERCENT ANTLERLESS	ADULT BULLS PER COW		AGE 1.5 N	AGE 4.5+ N		
L	1	10	10.0	1	10	10.0	.	0	.	0.002	100 ( 100)	0.0 ( 0.0)	.	0 .	0 .	0.05	L
M	4	9	44.4	4	9	44.4	.	0	.	0.008	50.0 (50.0)	2.0 ( 2.0)	0.0	0 .	0 .	0.07	M

\* - NOTE: Permits issued and success rates prior to 1996 based on old unit boundaries.

2005 S. EAST REGION HARVEST TREND ANALYSES  
 (BASED ON CURRENT AND PREVIOUS 4 YEARS)

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
ES SUCCESS RATE	5	-0.10	0.00	0.9787
ES ADULT BULLS/COW	5	-0.15	0.39	0.2583
ES % COWS & CALVES	5	5.46	0.59	0.1275
CL COUNT (AGE 1.5)	.	.	.	.
% ANT. BULLS AGE 1.5	5	1.33	0.02	0.8400
MOOSE SEEN/HOUR	5	-0.01	0.43	0.2289
AGE 1.5 BULL ABD	2	3.00	1.00	.
AGE 1.5 BULL WEIGHT	3	-43.50	0.79	0.3007
AGE 1.5 BULL SPREAD	2	-4.00	1.00	.

2005 S. EAST REGION SUMMARY OF MISCELLANEOUS BIOLOGICAL VARIABLES

VARIABLE	----- AGE 1.5 -----			----- AGE 5.5+ -----				
	N	MIN.	MAX.	MEAN (SE)	N	MIN.	MAX.	MEAN (SE)
ANTLER BEAM DIAMETER	0	.	.	( . )	0	.	.	( . )
ANTLER SPREAD	0	.	.	( . )	0	.	.	( . )
TOTAL POINTS	0	.	.	( . )	0	.	.	( . )
CARCASS WEIGHT (BULLS)	0	.	.	( . )	0	.	.	( . )
CARCASS WEIGHT (COWS)	1	450	450	450.0 ( . )	0	.	.	( . )
CARCASS WEIGHT (CALVES)	1	230	230	230.0 ( . )				

NOTE: 0 CALVES ( 0%) WEIGHED LESS THAN 200 POUNDS

2005 OVERALL STATEWIDE MOOSE HARVEST SUMMARY WITH PREVIOUS 4 YEARS

[C:\SAS FILES\MOOSE\MOOSHNT3.SAS]

YEAR	-----ALL PERMITS-----			--EITHER SEX PERMITS---			ANTLERLESS ONLY PERMITS			TOTAL KILL/SQ MI	FOR EITHER SEX AND (ALL PERMITS)...		% ANT. BULLS AGE 1.5	CORP. LUTEA COUNTS		MOOSE SEEN/HOUR	YEAR		
	TOTAL HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*	HARVEST	PERMITS ISSUED*	SUCCESS RATE*		PERCENT ANTLERLESS	ADULT BULLS PER COW		AGE 1.5 N	MEAN			AGE 4.5+ N	MEAN
2001	419	584	71.7	366	519	70.5	53	65	81.5	0.052	32.0 (40.3)	2.5 ( 1.7)	17.2	38	0.58	56	1.34	0.19	2001
2002	355	484	73.3	308	434	71.0	47	50	94.0	0.044	32.5 (41.1)	2.3 ( 1.6)	17.2	29	0.34	54	1.15	0.19	2002
2003	362	482	75.1	320	432	74.1	42	50	84.0	0.045	26.4 (34.6)	2.9 ( 2.0)	17.6	36	0.44	45	1.36	0.19	2003
2004	388	522	74.3	371	503	73.8	17	19	89.5	0.048	24.8 (27.8)	3.4 ( 2.9)	19.6	24	0.29	35	1.34	0.20	2004
2005	408	526	77.6	391	506	77.3	17	20	85.0	0.051	31.2 (34.1)	2.5 ( 2.2)	20.1	39	0.18	44	1.18	0.17	2005

\* - NOTE: Permits issued and success rates prior to 1996 based on old unit boundaries.

2005 OVERALL HARVEST TREND ANALYSES  
(BASED ON CURRENT AND PREVIOUS 4 YEARS)

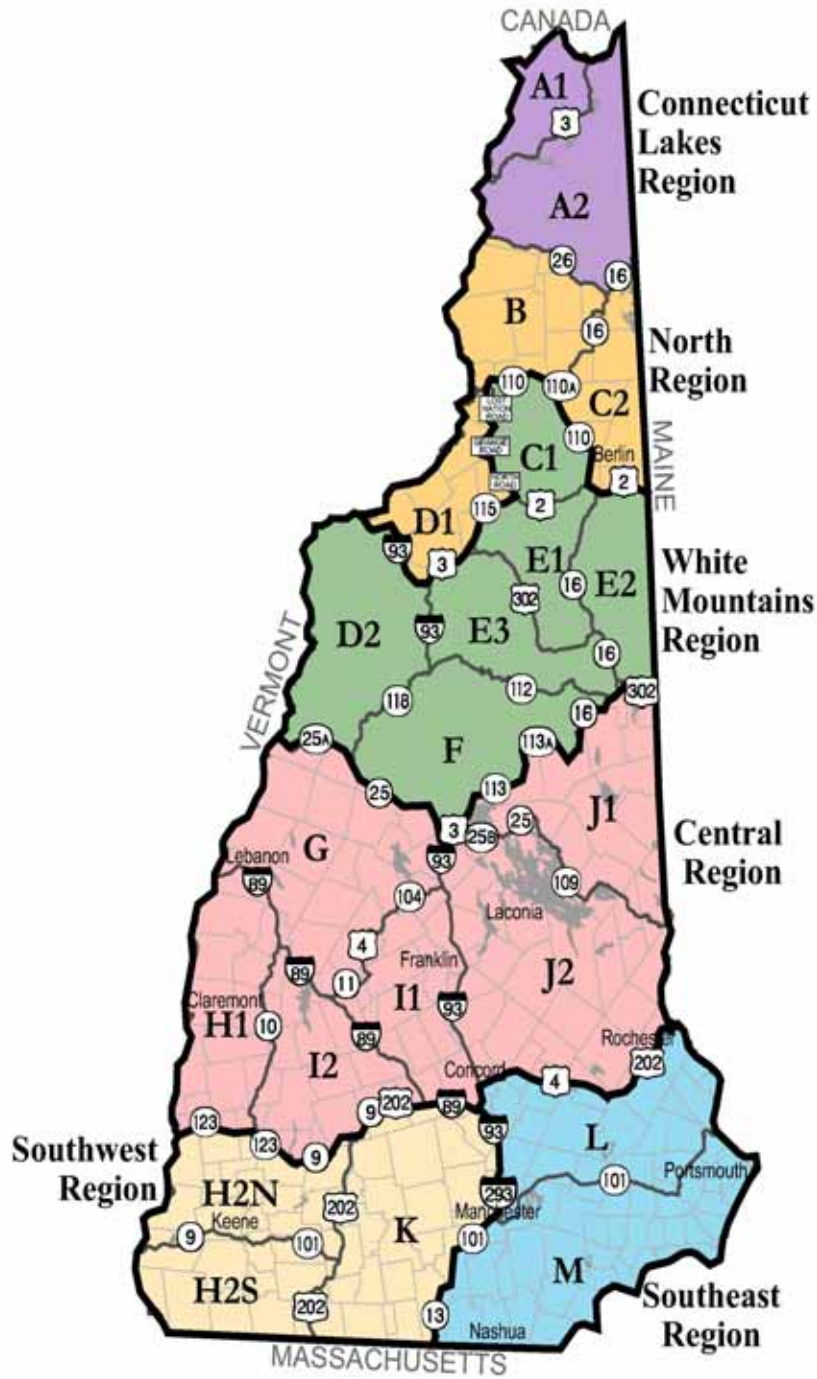
2005 OVERALL SUMMARY OF MISCELLANEOUS BIOLOGICAL VARIABLES

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
ES SUCCESS RATE	5	1.63	0.89	0.0155
ES ADULT BULLS/COW	5	0.10	0.11	0.5774
ES % COWS & CALVES	5	-0.92	0.17	0.4886
CL COUNT (AGE 1.5)	5	-0.09	0.79	0.0447
% ANT. BULLS AGE 1.5	5	0.82	0.86	0.0224
MOOSE SEEN/HOUR	5	-0.00	0.19	0.4664
AGE 1.5 BULL ABD	5	0.06	0.01	0.8723
AGE 1.5 BULL WEIGHT	5	0.33	0.00	0.9344
AGE 1.5 BULL SPREAD	5	-0.22	0.13	0.5511

VARIABLE	----- AGE 1.5 -----				----- AGE 5.5+ -----			
	N	MIN.	MAX.	MEAN (SE)	N	MIN.	MAX.	MEAN (SE)
ANTLER BEAM DIAMETER	52	12.0	55.0	34.7 ( 0.9)	68	46.0	68.0	57.7 ( 0.6)
ANTLER SPREAD	49	14.0	50.5	23.8 ( 0.7)	69	25.0	65.5	49.8 ( 0.9)
TOTAL POINTS	54	0	21	4.4 ( 0.4)	69	5	29	15.3 ( 0.6)
CARCASS WEIGHT (BULLS)	48	205	720	462.6 ( 10.5)	57	445	955	750.6 ( 12.5)
CARCASS WEIGHT (COWS)	36	315	570	430.6 ( 11.0)	30	410	685	566.3 ( 11.9)
CARCASS WEIGHT (CALVES)	11	140	340	228.2 ( 14.8)				

NOTE: 5 CALVES ( 45%) WEIGHED LESS THAN 200 POUNDS

APPENDIX 1.



## PERFORMANCE REPORT

**State:** New Hampshire **Grant:** W-89-R-6

**Grant Type:** Survey and Inventory

**Period Covered:** July 1, 2005 – June 30, 2006

**Project II:** MOOSE RESEARCH AND MANAGEMENT

**Job 2:** Non-Harvested Data Collection, Entry and Analysis

**Job Objective:** To annually determine sex and age class and cause, location and timing of non-harvest moose mortalities in a reliable and cost effective fashion.

To annually determine sex ratios, rate of change, fall recruitment, distribution, relative density patterns and age structure of the statewide moose population in a cost effective and reliable manner.

To determine regional moose densities as needed basis using aerial infrared thermal imagery or other accepted census methodologies and to determine the relationship between regional moose observation rates and population density using aerial infrared thermal imagery or other accepted census methodology.

To accurately identify and map moose habitats statewide on an annual or biennial basis in a reliable and cost effective fashion.

To measure available browse and or browsing impacts as needed, using methods that are cost effective and reliable.

**Summary:** Statewide, two hundred and forty-eight animals were discovered killed by means other than legal hunting in 2005. Vehicle kills accounted for 227 of these; down from 266 in 2004. The bull/cow ratio of all kills was 1.0/1.0; up from 0.9 /1.0 in 2004. Linear trend analysis of accident/nuisance and vehicle kill indicates an increasing annual trend in the sex ratio of 0.06 ( $R^2 = 0.83$ , Prob > F = 0.0315). Brainworm related deaths declined from 14 down to 9. Tick related deaths increased from 0 back up to 6.

There were no significant statewide trends in the moose seen/hour, adult sex ratio, or age class of moose seen by moose hunters.

The number of reported deer hunter days increased from approximately 12,720 in 2004 to 13,833 in 2005. This accounted for 1,775 moose observations statewide; 1,133 of which could be sexed and aged. The average number of moose seen per hundred deer hunter hours was 2.33 up from 2.10 in 2004. Calves/cow averaged 0.45/1.0. Approximately 44.6% of adults were bulls, and calves comprised 20% of the population. Four-year trend analysis of these parameters suggests that all parameters have been relatively stable during the past five-year period.

No population census were conducted this segment. Previous research (see W-89-R-1, Project II, Job 5) allowed for the determination of the relationship between actual moose numbers (as determined through IR surveys) and hunter observation rates. Applying the regression equation ( $Y = .3003x + .0175$ ,  $R^2 = .6332$ ) to the average of this year's and the preceding two years deer hunter observation rates ( $x$ ) for each region yields a population density ( $Y$ ) for the regions as follows: Ct. Lakes - 3.70 moose/mi<sup>2</sup>, North - 2.09 moose/mi<sup>2</sup>, White Mtn. - .89 moose/mi<sup>2</sup>, Central - .50 moose/mi<sup>2</sup>, Southwest - .33 moose/mi<sup>2</sup>, Southeast - .17 moose/mi<sup>2</sup>.

All information can be found in Tables 1- 3 and in Figure 1 of this job. No work mapping or browse impact work was conducted during this job segment.

**Target Date:** June 30, annually.

**Status of Progress:** On schedule.

**Significant Deviations:** None.

**Total Cost:**

**Procedures:** Fish and Game personnel or their designee will record sex, age class, cause, location and date of all known moose mortalities. If significant numbers of moose are found to be dying from winter tick, early spring aerial surveys may be employed to determine tick incidence by visual observation of hair loss on moose. When deemed necessary, biological samples may be removed for toxicological, pathologic and condition evaluation.

Moose hunters will be provided with a diary card prior to each moose season. The completed cards will be turned in at the biological check stations or mailed into the Concord office by Nov. 1. Information obtained will include numbers, sex, age class and location of moose seen and number of hours hunted during the moose season. Deer hunters that were successful in the previous year's deer hunt will be asked for similar information using a similar format. This survey is referred to as the Deer Hunter Mail Survey. Data will be collected from deer hunters during the muzzleloader season and the first 12 days of the regular firearms deer season.

Occasionally it may be necessary to obtain a population estimate for a region using proven census methodologies. The department has used aerial thermal infrared imagery. Past experience indicates that precision equal to or greater than a 90% confidence with a confidence interval less than  $\pm 25\%$  of the population estimate, are achievable. Information regarding New Hampshire's past work with aerial thermal infrared imagery survey design can be found in previous grant reports (see W-89-R-1, Project II, Job 5).

The moose project will continue to co-fund research directed at creating essential habitat layers for New Hampshire. Division GIS resources will be used to identify and map specific moose habitat in New Hampshire. Coarse habitat categories will be defined using existing moose literature as well as input from Fish and Game Department staff habitat biologists. Regional maps will be generated for use in moose management and habitat management decision-making.

Browse impacts and/or available browse will be measured by the department or it's designee when deemed necessary for the formulation of management strategies. Methods used may include transect plot sampling with actual counts of browse by species and age or ocular estimates of browse available and/or consumed.

**Results:**

Nonharvest Kill

Non-harvest kill data are summarized by region, in Table 1. Statewide, two hundred and twenty-seven animals were killed by vehicle in 2005. Statewide the vehicle kill has fluctuated around the 250 mark since 1996. An additional 21 animals were killed by other causes. The sex ratio for these animals was 1.0 bull per cow. Nine animals were reported to have died of brainworm this year, compared to 14 in 2004. Four of the brainworm kills were reported from the Southwest Region, four from the Central Region and 1 from the White Mtns. Six animals were reported killed by winter tick, which is similar to the five reported in 2003 and seven in 2002. Linear trend analysis of these data indicate an increase in the number of males killed per female of 0.06 annually ( $R^2 = 0.83$ , Prob  $>F = 0.0315$ ).

Regionally, only the Southeast Region had a significant trend ( $-1.80 R^2=0.72$ , Prob $>F=0.0679$ ) in vehicle kill. Five animals were killed by vehicle in this region, which is similar to last years total and the lowest kill rate since 1989. The White Mountain Region that did have the highest vehicle kill rate ever recorded (103 kills) last year declined back to more normal levels at 84. All regions saw a reduction in the vehicle kill, this year with the exception of the Ct. Lakes that increased by 2. The four northern regions account for the majority of these accidents; 92% in year 2005. WMU D1 in the North Region accounted for 30 of this region's 53 vehicle kills. This unit consistently reports the greatest number of vehicle kills in the North Region. E1 and C1 also reported high numbers of vehicle kills at 22 and 14. All three of these units share common boundaries.

### Moose Hunter Diary

Moose hunter diary data are summarized in Table 2 of this job. Statewide numbers of moose seen/hour has declined slightly and without significance, from 0.20 in 2004 to 0.17 in 2005. Percent calves has declined annually by  $-2.69$  and this approaches significance at an  $R^2$  of 0.67 and  $\text{Prob} > F = 0.0892$ . The reduction seen in percent calves is being influenced most by the Ct. Lakes Region where this parameter has declined  $-3.36$  annually ( $R^2 = 0.89$ ,  $\text{Prob} > F = .0157$ ). This parameter did show declines in all regions. The only other significant trend for the regional moose hunter diary data set was a very small decline in moose seen/hour for both successful ( $-0.01$ ,  $R^2 = 0.95$ ,  $\text{Prob} > F = 0.0052$ ) and all ( $-0.00$ ,  $R^2 = 0.82$ ,  $\text{Prob} > F = 0.0352$ ) hunters in the Central Region.

Moose hunters in the Ct. Lakes Region saw the greatest numbers of moose at 0.24 seen/hour. The North Region was very similar at 0.22. This number declines from north to south with the fewest moose seen in the Southwest Region at 0.06 moose seen/hour. The Southeast was slightly higher at 0.07.

Hunters in the Ct. Lakes Region saw the fewest bulls/cows of the four northern regions (0.84) and the fewest calves/cow (0.31). Mean days hunted/moose killed increased in all regions with the exception of the Central and Southwest.

### Deer Hunter Mail Survey

See Table 3 for a listing of all deer hunter mail survey data. Number of hunter days increased from 12,720 in 2004 to 13,833 in 2005. The mail survey recorded 1,775 moose in 74,463 hours of hunter effort. Sixteen hundred and thirty-three of these animals could be identified by sex and age cohort (calf or adult). Less than 200 moose were observed in the Southwest (170) and Southeast (52). Numbers of moose seen per hundred hunter hours declined as one traveled from the Ct. Lakes Region (15.55) to the Southeast (0.38). Calves were observed in all zones. Statewide five-year trend analysis exhibited no significant changes in observation rate parameters.

There was no significant change in five-year trend analysis of the Ct. Lakes Region parameters. The observation rate at 15.55 moose seen/hundred hunter hours is the highest it's ever been. The percentage of adults that are bulls increased to 43.1% this year after four years of being below 40%. A1 continues to have a low adult bull to female sex ratio at 35.8%

Five-year trend analysis of the North Region parameters reveals an increasing population with an annual increase of 0.55 ( $R^2 = 0.91$ ,  $\text{Prob} > F = 0.0121$ ). Adult sex ratio is good at 48.2% bulls. WMU D1 had a low sex ratio at 38.9% bulls. This is the first time this unit has fallen below 40%.

The White Mtn. Region is exhibiting an annual increase in the moose seen per 100 hours of 0.41 ( $R^2 = 0.84$ ,  $\text{Prob} > F = 0.0286$ ). The adult bull percentage is borderline acceptable at 40.4%. There are no significant trends in the Central Region. Adult bull percentage is good at 43.6%.

The Southwest Region has experienced a slight increase in the moose observation rate over the past 3 years (0.85 (2003), 1.07 (2004), and 1.22 (2005)). Although this is not yet significant it reverses a four-year decline from a high of 1.31 in 2000. Percentage of adult bulls is good at 54.9%.

The Southeast Region is exhibiting a significant positive trend ( $5.80$   $R^2 = 0.84$   $\text{Prob} > F = 0.0290$ ) in the percentage of barren cows (75%) in the population. This is the highest regional barren cow percentage. Calves/adult cow and percentage of the population that is calves, are also declining although not significantly. The percentage of adult moose that are bulls is quite low at 25.7%, the lowest in the state and well below the objective of 40%.

Regional adult sex ratios are all above 40% with the exception the Southeast. It is desirable to maintain the sex ratio at or above 40% to provide maximum reproductive success. The Southwest is exhibiting the smallest calf component at 13% of its population and this is the lowest this parameter has fallen in this region. Statewide, the regional percentage of the population that is calves ranges from 13% to 22%. Calf/cow ratios range from 0.49 to 0.31; percentage of adult cows that are barren ranges from 75% to 55% and bull percentages range from 54.9% to 25.7%.

### Census Work

It is very important to remember that the regression illustrated in Figure 1 is best applied in the infrared (IR) study area of WMUs A1 – D1. While it can be cautiously applied to other areas there is no way of

knowing how closely the regression fits the real relationship between MSHHH (moose seen per hundred hunting hours) and moose densities. Because the IR area is not a defined management area, using the regression to determine a population estimate for the management regions yields predicted densities with neither a confidence interval nor a measurable variance around the prediction. These predicted densities (Ct. Lakes - 3.70 moose/mi<sup>2</sup>, North - 2.09 moose/mi<sup>2</sup>, White Mtn. - .89 moose/mi<sup>2</sup>, Central - .50 moose/mi<sup>2</sup>, Southwest - .33 moose/mi<sup>2</sup>, Southeast - .17 moose/mi<sup>2</sup>) follow the annual trend pattern of the MSHHH for these areas. This lends credence to the assumption that the regression holds true for areas outside of the survey area.

The infrared survey may occasionally be used to check on our management progress and/or check on populations of concern.

#### Habitat Mapping and Browse Impacts

No habitat mapping work or browse impact studies were done on this project this year. Work done on the browse study and reported in W-89-R-5, Project II, Job 8, suggested that carrying capacity for the Ct. Lakes Region was between 1.8 and 2.6 moose/mi<sup>2</sup>.

**Conclusions:** Incidental reporting of non-harvest and non-vehicle related mortality is insufficient to determine rates or causes of mortality. Vehicle related mortality is well reported and while only capturing those mortalities that occur on the road, is probably accurately portraying both trends and trouble areas. The highways that are boundaries for units C1, D1, E3 and E1 account for a large number of accidents (75) in that northern area.

Currently, the deer hunter mail survey is providing a sufficient number of sightings to stand as a representative sample of the populations in each region with the exception of the Southeast Region where only 52 moose were seen. The low bull/cow ratio in A1 region is cause for concern. When looked at by WMU, A1 and A2 routinely exhibit low ratios, although A2 is rarely below 40%. While the adult sex ratio is low, the percentage of calves in the population is the highest in the state at 22%, as is the calf/cow ratio at 0.49. The jump in observation rate in this region is the highest it's ever been and is probably an anomaly. The Ct. Lakes population, at an estimated 3.7 moose/mi<sup>2</sup> is well above the estimated carrying capacity of 1.8 – 2.6 moose/mi<sup>2</sup> as reported in W-89-R-5, Project II, Job 8. The fact that neither moose nor deer hunters were able to see appreciable numbers of bulls suggests that bulls are in very short supply in these units.

The low reproductive parameters and bull/cow ratio of the Southeast Region suggest that this population will continue to decline unless immigration contributes substantially to the population. All other regions are healthy and appear to be moving toward goal.

Using infrared technology in a Gasaway type aerial survey has proven to be an effective method for estimating moose numbers in the state of New Hampshire. Regressing this survey's results against the data collected in the deer hunter mail survey suggests that the mail survey can be relied on to accurately track changes in moose densities in the North Region.

The mapping job has been in the past and will be in the future, a very helpful adjunct to other jobs in this project.

**Recommendations:** The department should continue work with moose vehicle committee to increase moose crossing signage in WMU D1, E1, E3 and C1.

Make adjustments to allowable antlered take in the Ct. Lakes Region for the 2006 season to rectify the low bull/cow ratio. Reduce this population to 2.6 moose/mi<sup>2</sup> to avoid over browsing. Due to high human population density, make no changes to the low reproductive parameters and adult sex ratio of the Southeast Region.

Sightability of the infrared technology has only been partially tested. In order to have the best confidence in the population estimate of this survey a more rigorous test of sightability should be conducted. This test should include a large sample of known targets (i.e., radio collared moose) as well as unknown targets.

Important habitats identified as a result of the habitat work described in Job 5, should be mapped for the northern regions. A future job would be to map all vehicle-kill locations, perhaps with the help of the Department of Transportation

This job should be continued as planned.

**Prepared by:** \_\_\_\_\_  
Kristine M Rines  
Moose Project Leader

**Date:** \_\_\_\_\_



Table 1. 2005 CT LAKE REGION NON-HARVEST ACCIDENTAL KILL SUMMARY WITH PREVIOUS 4 YEARS (DECEMBER-NOVEMBER YEAR)

NOTE: Final year's data may be incomplete.

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----- NUMBER OF KILLS BY CAUSE -----															
YEAR	ACCIDENTS	BRAINWORM	ILLEGAL	NUISANCE	TICK RELATED	VEHICLE	OTHER	TOTAL	ACCIDENT+ NUISANCE	MALES	FEMALES	80% LCL	MALES / FEMALE	80% UCL	YEAR
2001	0	1	0	0	0	21	1	23	0	10	13	0.4	0.8	1.4	2001
2002	0	2	0	0	2	18	4	26	0	10	14	0.4	0.7	1.3	2002
2003	0	3	0	0	0	10	1	14	0	8	6	0.6	1.3	3.1	2003
2004	0	0	0	0	0	10	0	10	0	4	6	0.2	0.7	1.8	2004
2005	0	0	0	0	2	12	1	15	0	6	9	0.3	0.7	1.5	2005

2005 CT LAKE REGION ACCIDENTAL KILL SUMMARY (UNIT DETAIL)

NOTE: Data may be incomplete.

----- NUMBER OF KILLS BY CAUSE -----															
UNIT	ACCIDENTS	BRAINWORM	ILLEGAL	NUISANCE	TICK RELATED	VEHICLE	OTHER	TOTAL	ACCIDENT+ NUISANCE	MALES	FEMALES	80% LCL	MALES / FEMALE	80% UCL	UNIT
A1	0	0	0	0	1	2	0	3	0	1	2	0.0	0.5	4.1	A1
A2	0	0	0	0	1	10	1	12	0	5	7	0.3	0.7	1.8	A2

2005 CT LAKE REGION ACCIDENTAL KILL TREND ANALYSIS

(BASED ON CURRENT AND PREVIOUS 4 YEARS)

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
ACCIDENT+NUISANCE KILL	.	.	.	.
VEHICULAR KILL	5	-2.60	0.67	0.0899
MALES / FEMALE	5	-0.03	0.02	0.8217

2005 NORTH REGION ACCIDENTAL KILL SUMMARY WITH PREVIOUS 4 YEARS (DECEMBER-NOVEMBER YEAR)

NOTE: Final year's data may be incomplete.

[C:\SAS FILES\MOOSE\MOOSAK03.SAS]

----- NUMBER OF KILLS BY CAUSE -----															
YEAR	ACCIDENTS	BRAINWORM	ILLEGAL	NUISANCE	TICK RELATED	VEHICLE	OTHER	TOTAL	ACCIDENT+ NUISANCE	MALES	FEMALES	80% LCL	MALES / FEMALE	80% UCL	YEAR
2001	0	1	0	0	0	66	2	69	0	29	38	0.5	0.8	1.1	2001
2002	0	1	0	0	2	51	1	55	0	17	34	0.3	0.5	0.8	2002
2003	0	0	0	0	0	48	2	50	0	27	22	0.8	1.2	1.9	2003
2004	0	0	1	0	0	64	0	65	0	31	34	0.6	0.9	1.3	2004
2005	0	0	0	0	1	53	0	54	0	25	29	0.6	0.9	1.3	2005

2005 NORTH REGION ACCIDENTAL KILL SUMMARY (UNIT DETAIL)

NOTE: Data may be incomplete.

----- NUMBER OF KILLS BY CAUSE -----															
UNIT	ACCIDENTS	BRAINWORM	ILLEGAL	NUISANCE	TICK RELATED	VEHICLE	OTHER	TOTAL	ACCIDENT+ NUISANCE	MALES	FEMALES	80% LCL	MALES / FEMALE	80% UCL	UNIT
B	0	0	0	0	0	19	0	19	0	10	9	0.6	1.1	2.2	B
C2	0	0	0	0	0	4	0	4	0	1	3	0.0	0.3	2.1	C2
D1	0	0	0	0	1	30	0	31	0	14	17	0.5	0.8	1.4	D1

2005 NORTH REGION ACCIDENTAL KILL TREND ANALYSIS

(BASED ON CURRENT AND PREVIOUS 4 YEARS)

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
ACCIDENT+NUISANCE KILL	.	.	.	.
VEHICULAR KILL	5	-1.30	0.06	0.6797
MALES / FEMALE	5	0.06	0.13	0.5438

2005 W. MTN. REGION ACCIDENTAL KILL SUMMARY WITH PREVIOUS 4 YEARS (DECEMBER-NOVEMBER YEAR)  
 NOTE: Final year's data may be incomplete.  
 [C:\SAS FILES\MOOSE\MOOSAK03.SAS]

----- NUMBER OF KILLS BY CAUSE -----															
YEAR	ACCIDENTS	BRAINWORM	ILLEGAL	NUISANCE	TICK RELATED	VEHICLE	OTHER	TOTAL	ACCIDENT+ NUISANCE	MALES	FEMALES	80% LCL	MALES / FEMALE	80% UCL	YEAR
2001	1	0	0	2	0	55	1	59	3	18	41	0.3	0.4	0.7	2001
2002	0	0	3	0	0	79	1	83	0	38	39	0.7	1.0	1.3	2002
2003	1	1	0	0	1	84	0	87	1	37	49	0.6	0.8	1.0	2003
2004	1	1	1	0	0	103	0	106	1	54	50	0.8	1.1	1.4	2004
2005	0	1	0	0	2	84	1	88	0	40	46	0.6	0.9	1.2	2005

2005 W. MTN. REGION ACCIDENTAL KILL SUMMARY (UNIT DETAIL)  
 NOTE: Data may be incomplete.

----- NUMBER OF KILLS BY CAUSE -----															
UNIT	ACCIDENTS	BRAINWORM	ILLEGAL	NUISANCE	TICK RELATED	VEHICLE	OTHER	TOTAL	ACCIDENT+ NUISANCE	MALES	FEMALES	80% LCL	MALES / FEMALE	80% UCL	UNIT
C1	0	0	0	0	1	14	0	15	0	6	9	0.3	0.7	1.5	C1
D2	0	0	0	0	0	14	1	15	0	4	11	0.1	0.4	0.9	D2
E1	0	0	0	0	0	22	0	22	0	14	7	1.0	2.0	4.1	E1
E2	0	1	0	0	1	9	0	11	0	3	8	0.1	0.4	1.0	E2
E3	0	0	0	0	0	9	0	9	0	6	3	0.7	2.0	6.7	E3
F	0	0	0	0	0	16	0	16	0	7	8	0.4	0.9	1.9	F

2005 W. MTN. REGION ACCIDENTAL KILL TREND ANALYSIS  
 (BASED ON CURRENT AND PREVIOUS 4 YEARS)

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
ACCIDENT+NUISANCE KILL	5	-0.50	0.42	0.2394
VEHICULAR KILL	5	8.20	0.57	0.1407
MALES / FEMALE	5	0.10	0.38	0.2646

2005 CENTRAL REGION ACCIDENTAL KILL SUMMARY WITH PREVIOUS 4 YEARS (DECEMBER-NOVEMBER YEAR)

NOTE: Final year's data may be incomplete.

[C:\SAS FILES\MOOSE\MOOSAK03.SAS]

----- NUMBER OF KILLS BY CAUSE -----															
YEAR	ACCIDENTS	BRAINWORM	ILLEGAL	NUISANCE	TICK RELATED	VEHICLE	OTHER	TOTAL	ACCIDENT+ NUISANCE	MALES	FEMALES	80% LCL	MALES / FEMALE	80% UCL	YEAR
2001	0	1	0	0	1	71	7	80	0	35	42	0.6	0.8	1.1	2001
2002	0	1	0	0	2	66	2	71	0	36	32	0.8	1.1	1.6	2002
2003	2	2	0	0	3	42	2	51	2	28	20	0.9	1.4	2.1	2003
2004	1	8	0	1	0	64	1	75	2	37	37	0.7	1.0	1.4	2004
2005	0	4	2	0	1	56	2	65	0	33	30	0.8	1.1	1.6	2005

2005 CENTRAL REGION ACCIDENTAL KILL SUMMARY (UNIT DETAIL)

NOTE: Data may be incomplete.

----- NUMBER OF KILLS BY CAUSE -----															
UNIT	ACCIDENTS	BRAINWORM	ILLEGAL	NUISANCE	TICK RELATED	VEHICLE	OTHER	TOTAL	ACCIDENT+ NUISANCE	MALES	FEMALES	80% LCL	MALES / FEMALE	80% UCL	UNIT
G	0	1	1	0	1	14	0	17	0	7	9	0.4	0.8	1.7	G
H1	0	0	0	0	0	7	0	7	0	3	4	0.2	0.8	2.6	H1
I1	0	0	0	0	0	8	1	9	0	3	6	0.1	0.5	1.5	I1
I2	0	1	0	0	0	8	1	10	0	6	4	0.5	1.5	4.3	I2
J1	0	1	1	0	0	5	0	7	0	5	2	0.7	2.5	11.7	J1
J2	0	1	0	0	0	14	0	15	0	9	5	0.8	1.8	4.4	J2

2005 CENTRAL REGION ACCIDENTAL KILL TREND ANALYSIS

(BASED ON CURRENT AND PREVIOUS 4 YEARS)

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
ACCIDENT+NUISANCE KILL	5	0.20	0.08	0.6376
VEHICULAR KILL	5	-3.20	0.20	0.4506
MALES / FEMALE	5	0.04	0.10	0.6094

2005 S. WEST REGION ACCIDENTAL KILL SUMMARY WITH PREVIOUS 4 YEARS (DECEMBER-NOVEMBER YEAR)

NOTE: Final year's data may be incomplete.

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----- NUMBER OF KILLS BY CAUSE -----															
YEAR	ACCIDENTS	BRAINWORM	ILLEGAL	NUISANCE	TICK RELATED	VEHICLE	OTHER	TOTAL	ACCIDENT+ NUISANCE	MALES	FEMALES	80% LCL	MALES / FEMALE	80% UCL	YEAR
2001	0	1	0	0	0	16	2	19	0	8	11	0.4	0.7	1.5	2001
2002	1	1	0	0	1	22	1	26	1	15	11	0.8	1.4	2.5	2002
2003	1	6	3	0	1	28	0	39	1	14	25	0.3	0.6	0.9	2003
2004	1	4	0	0	0	20	1	26	1	10	14	0.4	0.7	1.3	2004
2005	0	4	0	0	0	17	0	21	0	14	7	1.0	2.0	4.1	2005

2005 S. WEST REGION ACCIDENTAL KILL SUMMARY (UNIT DETAIL)

NOTE: Data may be incomplete.

----- NUMBER OF KILLS BY CAUSE -----															
UNIT	ACCIDENTS	BRAINWORM	ILLEGAL	NUISANCE	TICK RELATED	VEHICLE	OTHER	TOTAL	ACCIDENT+ NUISANCE	MALES	FEMALES	80% LCL	MALES / FEMALE	80% UCL	UNIT
H2N	0	1	0	0	0	7	0	8	0	6	2	0.9	3.0	13.6	H2N
H2S	0	2	0	0	0	3	0	5	0	4	1	0.7	4.0	47.0	H2S
K	0	1	0	0	0	7	0	8	0	4	4	0.3	1.0	3.2	K

2005 S. WEST REGION ACCIDENTAL KILL TREND ANALYSIS

(BASED ON CURRENT AND PREVIOUS 4 YEARS)

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
ACCIDENT+NUISANCE KILL	5	0.00	0.00	1.0000
VEHICULAR KILL	5	-0.00	0.00	1.0000
MALES / FEMALE	5	0.19	0.25	0.3943

2005 S. EAST REGION ACCIDENTAL KILL SUMMARY WITH PREVIOUS 4 YEARS (DECEMBER-NOVEMBER YEAR)

NOTE: Final year's data may be incomplete.

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----- NUMBER OF KILLS BY CAUSE -----															
YEAR	ACCIDENTS	BRAINWORM	ILLEGAL	NUISANCE	TICK RELATED	VEHICLE	OTHER	TOTAL	ACCIDENT+ NUISANCE	MALES	FEMALES	80% LCL	MALES / FEMALE	80% UCL	YEAR
2001	0	0	0	0	0	13	0	13	0	6	7	0.4	0.9	2.0	2001
2002	0	0	0	0	0	7	0	7	0	2	4	0.1	0.5	2.0	2002
2003	0	0	0	0	0	9	0	9	0	3	6	0.1	0.5	1.5	2003
2004	0	1	0	0	0	5	0	6	0	0	6	.	0.0	0.5	2004
2005	0	0	0	0	0	5	0	5	0	4	1	0.7	4.0	47.0	2005

2005 S. EAST REGION ACCIDENTAL KILL SUMMARY (UNIT DETAIL)

NOTE: Data may be incomplete.

----- NUMBER OF KILLS BY CAUSE -----															
UNIT	ACCIDENTS	BRAINWORM	ILLEGAL	NUISANCE	TICK RELATED	VEHICLE	OTHER	TOTAL	ACCIDENT+ NUISANCE	MALES	FEMALES	80% LCL	MALES / FEMALE	80% UCL	UNIT
L	0	0	0	0	0	3	0	3	0	3	0	0.9	.	.	L
M	0	0	0	0	0	2	0	2	0	1	1	0.1	1.0	18.5	M

2005 S. EAST REGION ACCIDENTAL KILL TREND ANALYSIS

(BASED ON CURRENT AND PREVIOUS 4 YEARS)

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
ACCIDENT+NUISANCE KILL	.	.	.	.
VEHICULAR KILL	5	-1.80	0.72	0.0679
MALES / FEMALE	5	0.58	0.32	0.3178

2005 OVERALL ACCIDENTAL KILL SUMMARY WITH PREVIOUS 4 YEARS (DECEMBER-NOVEMBER YEAR)

NOTE: Final year's data may be incomplete.

[C:\SAS FILES\MOOSE\MOOSAK03.SAS]

----- NUMBER OF KILLS BY CAUSE -----															
YEAR	ACCIDENTS	BRAINWORM	ILLEGAL	NUISANCE	TICK RELATED	VEHICLE	OTHER	TOTAL	ACCIDENT+ NUISANCE	MALES	FEMALES	80% LCL	MALES / FEMALE	80% UCL	YEAR
2001	1	4	0	2	1	242	13	263	3	106	152	0.6	0.7	0.8	2001
2002	1	5	3	0	7	243	9	268	1	118	134	0.7	0.9	1.0	2002
2003	4	12	3	0	5	221	5	250	4	117	128	0.8	0.9	1.1	2003
2004	3	14	2	1	0	266	2	288	4	136	147	0.8	0.9	1.1	2004
2005	0	9	2	0	6	227	4	248	0	122	122	0.8	1.0	1.2	2005

2005 OVERALL ACCIDENTAL KILL TREND ANALYSIS

(BASED ON CURRENT AND PREVIOUS 4 YEARS)

TREND	YEARS			
	USED (N)	ANNUAL TREND	R SQUARE	PROB>F
ACCIDENT+NUISANCE KILL	5	-0.30	0.07	0.6714
VEHICULAR KILL	5	-0.70	0.00	0.9193
MALES / FEMALE	5	0.06	0.83	0.0315

TABLE 2. 2005 CT LAKE REGION MOOSE HUNTER DIARY - MOOSE OBSERVATION SUMMARY (WITH PREVIOUS 4 YEARS)  
[C:\SAS FILES\MOOSE\MDIARY03.SAS]

YEAR	SUCCESSFUL HUNTERS		UNSUCCESSFUL HUNTERS		ALL HUNTERS					TOTAL SEEN	YEAR
	MOOSE SEEN/ HOUR	MEAN DAYS HUNTED/MOOSE KILLED (SE)	MOOSE SEEN/ HOUR	MEAN DAYS HUNTED DURING SEASON (SE)	MOOSE SEEN/ HOUR	ADULT BULLS / COW	CALVES SEEN / COW	PERCENT CALVES			
2001	0.26	2.85 (0.16)	0.15	6.17 (0.91)	0.25	0.75	0.40	26.3	623	2001	
2002	0.32	2.61 (0.20)	0.17	9.00 ( . )	0.33	0.79	0.52	22.6	443	2002	
2003	0.31	2.83 (0.20)	0.34	4.50 (0.50)	0.31	0.96	0.27	20.7	502	2003	
2004	0.27	2.76 (0.16)	0.04	4.75 (0.75)	0.26	0.81	0.27	13.0	581	2004	
2005	0.24	3.30 (0.18)	0.12	6.60 (0.75)	0.23	0.84	0.31	14.3	614	2005	

2005 CT LAKE REGION MOOSE HUNTER DIARY - MOOSE OBSERVATION SUMMARY (UNIT DETAIL)

UNIT	SUCCESSFUL HUNTERS		UNSUCCESSFUL HUNTERS		ALL HUNTERS					TOTAL SEEN	UNIT
	MOOSE SEEN/ HOUR	MEAN DAYS HUNTED/MOOSE KILLED (SE)	MOOSE SEEN/ HOUR	MEAN DAYS HUNTED DURING SEASON (SE)	MOOSE SEEN/ HOUR	ADULT BULLS / COW	CALVES SEEN / COW	PERCENT CALVES			
A1	0.33	3.07 (0.38)	0.08	7.00 ( . )	0.29	0.57	0.22	12.5	112	A1	
A2	0.22	3.34 (0.20)	0.13	6.50 (0.96)	0.22	0.91	0.33	14.7	502	A2	

2005 CT LAKE REGION MOOSE HUNTER DIARY OBSERVATION TREND ANALYSES  
(BASED ON CURRENT AND PREVIOUS 4 YEARS)

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
MOOSE SEEN / HOUR (SUCCESSFUL HUNTERS) -	5	-0.01	0.16	0.5064
MOOSE SEEN / HOUR (ALL HUNTERS) -----	5	-0.01	0.16	0.5107
ADULT BULLS / COW (ALL HUNTERS) -----	5	0.02	0.15	0.5201
CALVES SEEN / COW (ALL HUNTERS) -----	5	-0.04	0.41	0.2429
PERCENT CALVES (ALL HUNTERS) -----	5	-3.36	0.89	0.0157



2005 NORTH REGION MOOSE HUNTER DIARY - MOOSE OBSERVATION SUMMARY (WITH PREVIOUS 4 YEARS)  
 [C:\SAS FILES\MOOSE\MDIARY03.SAS]

YEAR	SUCCESSFUL HUNTERS		UNSUCCESSFUL HUNTERS		ALL HUNTERS					TOTAL SEEN	YEAR
	MOOSE SEEN / HOUR	MEAN DAYS HUNTED/MOOSE KILLED (SE)	MOOSE SEEN / HOUR	MEAN DAYS HUNTED DURING SEASON (SE)	MOOSE SEEN / HOUR	ADULT BULLS / COW	CALVES SEEN / COW	PERCENT CALVES			
2001	0.30	2.62 (0.20)	0.06	6.13 (1.01)	0.25	1.02	0.29	23.0	459	2001	
2002	0.26	2.54 (0.17)	0.07	4.00 (0.89)	0.24	1.09	0.28	11.9	449	2002	
2003	0.30	2.66 (0.21)	0.13	6.80 (0.97)	0.28	1.25	0.27	17.5	572	2003	
2004	0.32	2.35 (0.16)	0.14	6.50 (0.46)	0.28	0.97	0.23	10.6	543	2004	
2005	0.22	3.19 (0.18)	0.10	6.29 (0.42)	0.20	1.00	0.33	14.1	505	2005	

2005 NORTH REGION MOOSE HUNTER DIARY - MOOSE OBSERVATION SUMMARY (UNIT DETAIL)

UNIT	SUCCESSFUL HUNTERS		UNSUCCESSFUL HUNTERS		ALL HUNTERS					TOTAL SEEN	UNIT
	MOOSE SEEN / HOUR	MEAN DAYS HUNTED/MOOSE KILLED (SE)	MOOSE SEEN / HOUR	MEAN DAYS HUNTED DURING SEASON (SE)	MOOSE SEEN / HOUR	ADULT BULLS / COW	CALVES SEEN / COW	PERCENT CALVES			
B	0.21	3.13 (0.24)	0.15	6.75 (0.48)	0.20	1.45	0.36	12.8	226	B	
C2	0.27	2.95 (0.28)	.	. ( . )	0.27	0.71	0.28	14.1	220	C2	
D1	0.13	4.00 (0.64)	0.00	5.67 (0.67)	0.10	0.84	0.44	19.3	59	D1	

2005 NORTH REGION MOOSE HUNTER DIARY OBSERVATION TREND ANALYSES  
 (BASED ON CURRENT AND PREVIOUS 4 YEARS)

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
MOOSE SEEN / HOUR (SUCCESSFUL HUNTERS) -	5	-0.01	0.15	0.5229
MOOSE SEEN / HOUR (ALL HUNTERS) -----	5	-0.01	0.09	0.6287
ADULT BULLS / COW (ALL HUNTERS) -----	5	-0.02	0.05	0.7195
CALVES SEEN / COW (ALL HUNTERS) -----	5	0.00	0.01	0.8605
PERCENT CALVES (ALL HUNTERS) -----	5	-1.90	0.36	0.2809

2005 W. MTN. REGION MOOSE HUNTER DIARY - MOOSE OBSERVATION SUMMARY (WITH PREVIOUS 4 YEARS)  
[C:\SAS FILES\MOOSE\MDIARY03.SAS]

YEAR	SUCCESSFUL HUNTERS		UNSUCCESSFUL HUNTERS		ALL HUNTERS					TOTAL SEEN	YEAR
	MOOSE SEEN / HOUR	MEAN DAYS HUNTED/MOOSE KILLED (SE)	MOOSE SEEN / HOUR	MEAN DAYS HUNTED DURING SEASON (SE)	MOOSE SEEN / HOUR	ADULT BULLS / COW	CALVES SEEN / COW	PERCENT CALVES			
2001	0.14	3.19 (0.22)	0.04	6.63 (0.53)	0.10	1.05	0.37	31.4	312	2001	
2002	0.15	3.03 (0.22)	0.06	5.25 (0.75)	0.13	1.13	0.53	19.8	257	2002	
2003	0.12	3.68 (0.29)	0.02	7.82 (0.50)	0.09	1.17	0.29	17.8	231	2003	
2004	0.17	2.66 (0.21)	0.02	7.07 (0.52)	0.12	1.30	0.43	15.6	277	2004	
2005	0.14	3.69 (0.24)	0.03	5.44 (0.45)	0.11	1.14	0.46	17.7	343	2005	

2005 W. MTN. REGION MOOSE HUNTER DIARY - MOOSE OBSERVATION SUMMARY (UNIT DETAIL)

UNIT	SUCCESSFUL HUNTERS		UNSUCCESSFUL HUNTERS		ALL HUNTERS					TOTAL SEEN	UNIT
	MOOSE SEEN / HOUR	MEAN DAYS HUNTED/MOOSE KILLED (SE)	MOOSE SEEN / HOUR	MEAN DAYS HUNTED DURING SEASON (SE)	MOOSE SEEN / HOUR	ADULT BULLS / COW	CALVES SEEN / COW	PERCENT CALVES			
C1	0.24	3.83 (0.48)	.	. ( . )	0.24	1.06	0.42	16.8	143	C1	
D2	0.12	3.16 (0.50)	0.03	4.60 (0.60)	0.09	0.90	0.60	24.0	51	D2	
E1	0.16	3.80 (0.63)	0.02	5.67 (0.88)	0.11	1.43	0.29	10.5	46	E1	
E2	0.13	4.00 (1.08)	.	. ( . )	0.13	1.40	0.40	14.3	14	E2	
E3	0.06	4.20 (0.80)	0.02	6.29 (0.68)	0.04	1.00	0.40	16.7	25	E3	
F	0.10	3.65 (0.49)	0.10	4.67 (1.86)	0.10	1.47	0.65	20.8	64	F	

2005 W. MTN. REGION MOOSE HUNTER DIARY OBSERVATION TREND ANALYSES  
(BASED ON CURRENT AND PREVIOUS 4 YEARS)

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
MOOSE SEEN / HOUR (SUCCESSFUL HUNTERS) -	5	0.00	0.06	0.6802
MOOSE SEEN / HOUR (ALL HUNTERS) -----	5	0.00	0.01	0.8925
ADULT BULLS / COW (ALL HUNTERS) -----	5	0.04	0.37	0.2747
CALVES SEEN / COW (ALL HUNTERS) -----	5	0.01	0.02	0.8036
PERCENT CALVES (ALL HUNTERS) -----	5	-3.15	0.63	0.1092

2005 CENTRAL REGION MOOSE HUNTER DIARY - MOOSE OBSERVATION SUMMARY (WITH PREVIOUS 4 YEARS)  
[C:\SAS FILES\MOOSE\MDIARY03.SAS]

YEAR	SUCCESSFUL HUNTERS		UNSUCCESSFUL HUNTERS		ALL HUNTERS					TOTAL SEEN	YEAR
	MOOSE SEEN/ HOUR	MEAN DAYS HUNTED/MOOSE KILLED (SE)	MOOSE SEEN/ HOUR	MEAN DAYS HUNTED DURING SEASON (SE)	MOOSE SEEN/ HOUR	ADULT BULLS / COW	CALVES SEEN / COW	PERCENT CALVES			
2001	0.14	3.10 (0.23)	0.02	7.60 (0.35)	0.09	1.79	0.47	23.1	309	2001	
2002	0.13	3.21 (0.24)	0.02	7.74 (0.39)	0.09	1.32	0.33	12.5	301	2002	
2003	0.11	3.61 (0.24)	0.02	6.58 (0.44)	0.08	1.35	0.38	26.3	340	2003	
2004	0.11	3.52 (0.26)	0.03	7.61 (0.39)	0.08	1.61	0.30	10.3	291	2004	
2005	0.10	3.39 (0.23)	0.02	7.00 (0.45)	0.07	1.73	0.34	11.0	252	2005	

2005 CENTRAL REGION MOOSE HUNTER DIARY - MOOSE OBSERVATION SUMMARY (UNIT DETAIL)

UNIT	SUCCESSFUL HUNTERS		UNSUCCESSFUL HUNTERS		ALL HUNTERS					TOTAL SEEN	UNIT
	MOOSE SEEN/ HOUR	MEAN DAYS HUNTED/MOOSE KILLED (SE)	MOOSE SEEN/ HOUR	MEAN DAYS HUNTED DURING SEASON (SE)	MOOSE SEEN/ HOUR	ADULT BULLS / COW	CALVES SEEN / COW	PERCENT CALVES			
G	0.12	3.32 (0.39)	0.03	8.00 (0.38)	0.08	1.78	0.37	11.8	92	G	
H1	0.13	2.43 (0.65)	0.02	8.50 (0.50)	0.06	3.00	0.00	0.0	18	H1	
I1	0.13	2.77 (0.53)	0.00	9.00 ( . )	0.09	0.75	0.33	16.0	28	I1	
I2	0.07	3.09 (0.46)	0.02	6.83 (0.91)	0.05	3.00	0.22	5.3	42	I2	
J1	0.13	3.58 (0.74)	0.02	5.00 (1.53)	0.10	1.58	0.50	16.2	42	J1	
J2	0.06	5.00 (0.68)	0.02	5.33 (1.45)	0.05	1.30	0.30	11.5	30	J2	

\* - NOTE: Observation data prior to 2000 reflects unit I as a whole, prior to unit split.

2005 CENTRAL REGION MOOSE HUNTER DIARY OBSERVATION TREND ANALYSES  
(BASED ON CURRENT AND PREVIOUS 4 YEARS)

TREND	YEARS USED (N)	ANNUAL TREND	R	
			SQUARE	PROB>F
MOOSE SEEN / HOUR (SUCCESSFUL HUNTERS) -	5	-0.01	0.95	0.0052
MOOSE SEEN / HOUR (ALL HUNTERS) -----	5	-0.00	0.82	0.0352
ADULT BULLS / COW (ALL HUNTERS) -----	5	0.02	0.01	0.8472
CALVES SEEN / COW (ALL HUNTERS) -----	5	-0.03	0.50	0.1843
PERCENT CALVES (ALL HUNTERS) -----	5	-2.64	0.31	0.3289

2005 S. WEST REGION MOOSE HUNTER DIARY - MOOSE OBSERVATION SUMMARY (WITH PREVIOUS 4 YEARS)  
[C:\SAS FILES\MOOSE\MDIARY03.SAS]

YEAR	SUCCESSFUL HUNTERS		UNSUCCESSFUL HUNTERS		ALL HUNTERS					YEAR
	MOOSE SEEN/ HOUR	MEAN DAYS HUNTED/MOOSE KILLED (SE)	MOOSE SEEN/ HOUR	MEAN DAYS HUNTED DURING SEASON (SE)	MOOSE SEEN/ HOUR	ADULT BULLS / COW	CALVES SEEN / COW	PERCENT CALVES	TOTAL SEEN	
2001	0.09	3.39 (0.45)	0.04	7.67 (0.67)	0.08	1.63	0.37	20.0	69	2001
2002	0.08	3.56 (0.63)	0.02	5.67 (0.99)	0.06	1.50	0.50	16.7	44	2002
2003	0.10	3.14 (0.42)	0.07	7.00 (0.91)	0.09	1.37	0.32	20.7	71	2003
2004	0.10	3.83 (0.55)	0.01	7.56 (0.82)	0.04	3.71	0.57	10.8	44	2004
2005	0.06	3.71 (0.60)	0.02	7.60 (0.68)	0.04	1.75	0.25	8.3	31	2005

2005 S. WEST REGION MOOSE HUNTER DIARY - MOOSE OBSERVATION SUMMARY (UNIT DETAIL)

UNIT	SUCCESSFUL HUNTERS		UNSUCCESSFUL HUNTERS		ALL HUNTERS					UNIT
	MOOSE SEEN/ HOUR	MEAN DAYS HUNTED/MOOSE KILLED (SE)	MOOSE SEEN/ HOUR	MEAN DAYS HUNTED DURING SEASON (SE)	MOOSE SEEN/ HOUR	ADULT BULLS / COW	CALVES SEEN / COW	PERCENT CALVES	TOTAL SEEN	
H2N	0.08	2.80 (1.11)	0.13	6.00 ( . )	0.09	1.50	0.25	9.1	14	H2N
H2S	0.03	5.50 (0.50)	0.00	8.67 (0.33)	0.01	0.00	0.00	0.0	4	H2S
K	0.06	3.86 (0.83)	0.00	6.00 ( . )	0.05	4.00	0.50	9.1	13	K

\* - NOTE: Observation data prior to 2000 reflects unit H2 as a whole, prior to unit split.

2005 S. WEST REGION MOOSE HUNTER DIARY OBSERVATION TREND ANALYSES  
(BASED ON CURRENT AND PREVIOUS 4 YEARS)

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
MOOSE SEEN / HOUR (SUCCESSFUL HUNTERS) -	5	-0.01	0.23	0.4099
MOOSE SEEN / HOUR (ALL HUNTERS) -----	5	-0.01	0.45	0.2161
ADULT BULLS / COW (ALL HUNTERS) -----	5	0.25	0.16	0.5065
CALVES SEEN / COW (ALL HUNTERS) -----	5	-0.02	0.04	0.7499
PERCENT CALVES (ALL HUNTERS) -----	5	-2.92	0.70	0.0772

2005 S. EAST REGION MOOSE HUNTER DIARY - MOOSE OBSERVATION SUMMARY (WITH PREVIOUS 4 YEARS)  
[C:\SAS FILES\MOOSE\MDIARY03.SAS]

YEAR	SUCCESSFUL HUNTERS		UNSUCCESSFUL HUNTERS		ALL HUNTERS					TOTAL SEEN	YEAR
	MOOSE SEEN / HOUR	MEAN DAYS HUNTED/MOOSE KILLED (SE)	MOOSE SEEN / HOUR	MEAN DAYS HUNTED DURING SEASON (SE)	MOOSE SEEN / HOUR	ADULT BULLS / COW	CALVES SEEN / COW	PERCENT CALVES			
2001	0.10	2.68 (0.49)	0.00	7.31 (0.51)	0.03	1.23	0.38	25.0	41	2001	
2002	0.07	3.55 (0.81)	0.00	6.40 (0.60)	0.03	0.86	0.71	27.8	22	2002	
2003	0.06	4.33 (1.20)	0.01	8.17 (0.31)	0.03	0.57	0.14	25.0	14	2003	
2004	0.04	4.60 (0.96)	0.00	7.75 (0.48)	0.03	0.43	0.57	28.6	17	2004	
2005	0.07	6.25 (0.75)	0.00	6.43 (0.75)	0.02	2.67	0.00	0.0	12	2005	

2005 S. EAST REGION MOOSE HUNTER DIARY - MOOSE OBSERVATION SUMMARY (UNIT DETAIL)

UNIT	SUCCESSFUL HUNTERS		UNSUCCESSFUL HUNTERS		ALL HUNTERS					TOTAL SEEN	UNIT
	MOOSE SEEN / HOUR	MEAN DAYS HUNTED/MOOSE KILLED (SE)	MOOSE SEEN / HOUR	MEAN DAYS HUNTED DURING SEASON (SE)	MOOSE SEEN / HOUR	ADULT BULLS / COW	CALVES SEEN / COW	PERCENT CALVES			
L	0.05	7.00 ( . )	0.00	6.50 (0.89)	0.01	0.00	0.00	0.0	3	L	
M	0.07	6.00 (1.00)	0.00	6.00 ( . )	0.05	8.00	0.00	0.0	9	M	

2005 S. EAST REGION MOOSE HUNTER DIARY OBSERVATION TREND ANALYSES  
(BASED ON CURRENT AND PREVIOUS 4 YEARS)

TREND	YEARS USED (N)	ANNUAL TREND	R	
			SQUARE	PROB>F
MOOSE SEEN / HOUR (SUCCESSFUL HUNTERS) -	5	-0.01	0.54	0.1581
MOOSE SEEN / HOUR (ALL HUNTERS) -----	5	-0.00	0.46	0.2110
ADULT BULLS / COW (ALL HUNTERS) -----	5	0.24	0.18	0.4714
CALVES SEEN / COW (ALL HUNTERS) -----	5	-0.09	0.24	0.4029
PERCENT CALVES (ALL HUNTERS) -----	5	-4.92	0.42	0.2366

2005 OVERALL STATEWIDE MOOSE HUNTER DIARY - MOOSE OBSERVATION SUMMARY (WITH PREVIOUS 4 YEARS)  
 [C:\SAS FILES\MOOSE\MDIARY03.SAS]

YEAR	SUCCESSFUL HUNTERS		UNSUCCESSFUL HUNTERS		ALL HUNTERS					TOTAL SEEN	YEAR
	MOOSE SEEN/ HOUR	MEAN DAYS HUNTED/MOOSE KILLED (SE)	MOOSE SEEN/ HOUR	MEAN DAYS HUNTED DURING SEASON (SE)	MOOSE SEEN/ HOUR	ADULT BULLS / COW	CALVES SEEN / COW	PERCENT CALVES			
2001	0.19	2.96 (0.10)	0.03	7.04 (0.24)	0.14	1.02	0.37	25.5	1813	2001	
2002	0.19	2.91 (0.11)	0.03	6.45 (0.32)	0.15	1.05	0.41	16.8	1516	2002	
2003	0.19	3.21 (0.12)	0.04	6.98 (0.28)	0.15	1.16	0.29	20.1	1730	2003	
2004	0.20	2.88 (0.10)	0.03	7.16 (0.25)	0.15	1.06	0.29	12.3	1753	2004	
2005	0.17	3.42 (0.10)	0.04	6.44 (0.24)	0.14	1.05	0.34	14.3	1757	2005	

2005 OVERALL STATEWIDE MOOSE HUNTER DIARY OBSERVATION TREND ANALYSES  
 (BASED ON CURRENT AND PREVIOUS 4 YEARS)

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
MOOSE SEEN / HOUR (SUCCESSFUL HUNTERS) -	5	-0.00	0.25	0.3873
MOOSE SEEN / HOUR (ALL HUNTERS) -----	5	-0.00	0.02	0.8211
ADULT BULLS / COW (ALL HUNTERS) -----	5	0.01	0.04	0.7377
CALVES SEEN / COW (ALL HUNTERS) -----	5	-0.02	0.29	0.3477
PERCENT CALVES (ALL HUNTERS) -----	5	-2.69	0.67	0.0892

Table 3. 2005 CT LAKE REGION MAIL SURVEY MOOSE OBSERVATION SUMMARY (WITH PREVIOUS YEARS)  
 [C:\SAS FILES\MOOSE\MOOSMS03.SAS]

YEAR	# OF HUNTER DAYS(N)	TOTAL HOURS OF EFFORT	-- # OF MOOSE OBSERVED --					80% LCL	MEAN TOTAL			CALVES			% OF ADULTS THAT ARE			80% LCL	80% UCL	% CALVES	80% LCL	% BARREN COWS	80% UCL	LONE COWS (N)
			BULL	COW	CALF	UNK.	TOTAL		# OBSERVED /100 HOURS	80% UCL	80% LCL	/ADULT COW	80% UCL	BULLS	UCL	UCL								
2001	656	4554	135	207	78	31	451	8.31	9.09	9.87	0.31	0.38	0.45	36.0	39.5	43.0	16	19	21	51	58	65	89	
2002	583	4067	96	174	97	24	391	9.09	10.06	11.03	0.47	0.56	0.66	31.7	35.6	39.5	23	26	30	45	52	60	86	
2003	669	4756	169	263	103	38	573	11.07	12.02	12.97	0.33	0.39	0.46	36.0	39.1	42.3	17	19	22	57	64	70	102	
2004	594	3870	96	179	81	25	381	8.34	9.18	10.03	0.38	0.45	0.54	31.1	34.9	38.8	20	23	26	52	59	66	95	
2005	543	3782	181	239	118	33	571	14.22	15.55	16.89	0.42	0.49	0.57	39.9	43.1	46.3	20	22	24	48	55	61	115	

2005 CT LAKE REGION MAIL SURVEY MOOSE OBSERVATION SUMMARY (UNIT DETAIL)

UNIT	# OF HUNTER DAYS(N)	TOTAL HOURS OF EFFORT	-- # OF MOOSE OBSERVED --					80% LCL	MEAN TOTAL			CALVES			% OF ADULTS THAT ARE			80% LCL	80% UCL	% CALVES	80% LCL	% BARREN COWS	80% UCL	LONE COWS (N)
			BULL	COW	CALF	UNK.	TOTAL		# OBSERVED /100 HOURS	80% UCL	80% LCL	/ADULT COW	80% UCL	BULLS	UCL	UCL								
A1	202	1443	57	102	48	16	223	13.81	15.87	17.96	0.37	0.47	0.60	30.8	35.8	41.2	19	23	27	44	54	65	46	
A2	309	2105	103	113	54	16	286	12.15	13.88	15.64	0.38	0.48	0.60	43.1	47.7	52.3	17	20	23	50	59	67	63	

2005 CT LAKE REGION MAIL SURVEY MOOSE OBSERVATION TREND ANALYSIS  
 OBSERVATIONS  
 (BASED ON CURRENT AND PREVIOUS 4 YEARS)

NOTE: % BARREN COWS IS BASED ON  
 OF SINGLE (LONE) COWS AND CALVES.

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
MEAN TOTAL #OBSERVED/100 HOURS	5	1.21	0.49	0.1858
CALVES / ADULT COW	5	0.01	0.08	0.6556
% OF ADULTS THAT ARE BULLS	5	0.66	0.10	0.6062
% CALVES	5	0.30	0.02	0.8051
% BARREN COWS	5	-0.07	0.00	0.9692

2005 NORTH REGION MAIL SURVEY MOOSE OBSERVATION SUMMARY (WITH PREVIOUS 4 YEARS)  
 [C:\SAS FILES\MOOSE\MOOSMS03.SAS]

YEAR	# OF HUNTER DAYS(N)	TOTAL HOURS OF EFFORT	-- # OF MOOSE OBSERVED --					80% LCL	MEAN TOTAL # OBSERVED /100 HOURS	80% UCL	CALVES			% OF ADULTS THAT ARE BULLS			80% LCL	80% UCL	% CALVES	80% LCL	80% UCL	% BARREN COWS	80% LCL	80% UCL	LONE COWS (N)
			BULL	COW	CALF	UNK.	TOTAL				80% LCL	80% UCL	80% /ADULT COW	80% LCL	80% UCL	80% LCL									
2001	1144	6416	114	179	62	25	380	5.01	5.46	5.92	0.28	0.35	0.42	35.2	38.9	42.8	15	17	20	56	63	70	98		
2002	776	4052	93	108	44	10	255	5.36	6.00	6.65	0.32	0.41	0.52	41.6	46.3	51.0	15	18	21	49	59	67	58		
2003	837	5005	129	125	40	25	319	5.34	5.94	6.54	0.25	0.32	0.41	46.6	50.8	55.0	11	14	17	57	67	76	49		
2004	841	5107	121	176	64	16	377	6.49	7.09	7.69	0.30	0.36	0.44	37.0	40.7	44.6	15	18	21	55	61	67	113		
2005	776	4212	120	129	62	23	334	6.82	7.66	8.50	0.39	0.48	0.59	44.0	48.2	52.5	17	20	23	47	56	64	66		

2005 NORTH REGION MAIL SURVEY MOOSE OBSERVATION SUMMARY (UNIT DETAIL)

UNIT	# OF HUNTER DAYS(N)	TOTAL HOURS OF EFFORT	-- # OF MOOSE OBSERVED --					80% LCL	MEAN TOTAL # OBSERVED /100 HOURS	80% UCL	CALVES			% OF ADULTS THAT ARE BULLS			80% LCL	80% UCL	% CALVES	80% LCL	80% UCL	% BARREN COWS	80% LCL	80% UCL	LONE COWS (N)
			BULL	COW	CALF	UNK.	TOTAL				80% LCL	80% UCL	80% /ADULT COW	80% LCL	80% UCL	80% LCL									
B	323	1733	82	75	37	12	206	9.16	10.86	12.59	0.37	0.49	0.65	46.8	52.2	57.6	15	19	23	37	49	61	35		
C2	170	1065	24	32	14	9	79	6.23	7.80	9.40	0.27	0.44	0.69	33.8	42.9	52.3	14	20	27	40	60	77	15		
D1	283	1414	14	22	11	2	49	3.13	3.92	4.72	0.29	0.50	0.85	27.8	38.9	50.9	15	23	33	50	69	84	16		

2005 NORTH REGION MAIL SURVEY MOOSE OBSERVATION TREND ANALYSIS  
 OBSERVATIONS  
 (BASED ON CURRENT AND PREVIOUS 4 YEARS)

NOTE: % BARREN COWS IS BASED ON  
 OF SINGLE (LONE) COWS AND CALVES.

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
MEAN TOTAL #OBSERVED/100 HOURS	5	0.55	0.91	0.0121
CALVES / ADULT COW	5	0.02	0.32	0.3208
% OF ADULTS THAT ARE BULLS	5	1.30	0.17	0.4915
% CALVES	5	0.47	0.10	0.5956
% BARREN COWS	5	-1.20	0.19	0.4622



2005 W. MTN. REGION MAIL SURVEY MOOSE OBSERVATION SUMMARY (WITH PREVIOUS 4 YEARS)  
[C:\SAS FILES\MOOSE\MOOSMS03.SAS]

YEAR	# OF HUNTER DAYS(N)	TOTAL HOURS OF EFFORT	-- # OF MOOSE OBSERVED --					80% LCL	MEAN TOTAL # OBSERVED /100 HOURS	80% UCL	CALVES			% OF ADULTS THAT ARE BULLS			80% LCL	80% UCL	% CALVES	80% LCL	80% UCL	% BARREN COWS	80% LCL	80% UCL	LONE COWS (N)
			BULL	COW	CALF	UNK.	TOTAL				80% LCL	80% /ADULT COW	80% UCL	80% LCL	80% UCL	80% LCL									
2001	1874	10142	54	80	37	12	183	1.57	1.76	1.96	0.35	0.46	0.61	34.6	40.3	46.2	18	22	26	55	64	72	61		
2002	1218	6180	46	51	19	3	119	1.72	1.99	2.27	0.25	0.37	0.54	40.5	47.4	54.4	12	16	22	61	73	82	40		
2003	1529	8271	93	71	40	13	217	2.35	2.66	2.97	0.43	0.56	0.74	51.4	56.7	61.9	16	20	24	31	42	54	38		
2004	1308	7069	66	81	35	7	189	2.17	2.46	2.74	0.33	0.43	0.57	39.4	44.9	50.5	15	19	23	51	60	68	67		
2005	1449	7666	72	106	44	20	242	3.23	3.60	3.97	0.32	0.42	0.53	35.6	40.4	45.5	16	20	24	61	69	77	72		

2005 W. MTN. REGION MAIL SURVEY MOOSE OBSERVATION SUMMARY (UNIT DETAIL)

UNIT	# OF HUNTER DAYS(N)	TOTAL HOURS OF EFFORT	-- # OF MOOSE OBSERVED --					80% LCL	MEAN TOTAL # OBSERVED /100 HOURS	80% UCL	CALVES			% OF ADULTS THAT ARE BULLS			80% LCL	80% UCL	% CALVES	80% LCL	80% UCL	% BARREN COWS	80% LCL	80% UCL	LONE COWS (N)
			BULL	COW	CALF	UNK.	TOTAL				80% LCL	80% /ADULT COW	80% UCL	80% LCL	80% UCL	80% LCL									
C1	231	1166	23	33	15	5	76	5.43	6.50	7.57	0.29	0.45	0.71	32.1	41.1	50.5	15	21	29	50	67	80	21		
D2	610	3231	23	32	16	4	75	2.22	2.74	3.27	0.32	0.50	0.77	32.7	41.8	51.4	16	23	30	52	68	81	22		
E1	124	657	7	13	3	4	27	3.32	4.54	5.77	0.08	0.23	0.59	20.7	35.0	51.8	5	13	27	51	78	94	9		
E2	103	664	5	7	0	4	16	1.38	2.19	3.00	.	0.00	0.39	21.9	41.7	63.8	.	0	17	46	100	.	3		
E3	99	488	3	6	1	0	10	1.25	2.58	3.92	0.02	0.17	0.83	12.9	33.3	59.9	1	10	34	32	75	97	4		
F	282	1461	11	15	9	3	38	2.59	3.56	4.54	0.32	0.60	1.11	28.9	42.3	56.7	16	26	38	40	62	80	13		

2005 W. MTN. REGION MAIL SURVEY MOOSE OBSERVATION TREND ANALYSIS  
OBSERVATIONS  
(BASED ON CURRENT AND PREVIOUS 4 YEARS)

NOTE: % BARREN COWS IS BASED ON  
OF SINGLE (LONE) COWS AND CALVES.

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
MEAN TOTAL #OBSERVED/100 HOURS	5	0.41	0.84	0.0286
CALVES / ADULT COW	5	-0.00	0.01	0.9010
% OF ADULTS THAT ARE BULLS	5	-0.22	0.00	0.9335
% CALVES	5	-0.08	0.00	0.9168
% BARREN COWS	5	-0.18	0.00	0.9700

2005 CENTRAL REGION MAIL SURVEY MOOSE OBSERVATION SUMMARY (WITH PREVIOUS 4 YEARS)  
[C:\SAS FILES\MOOSE\MOOSMS03.SAS]

YEAR	# OF HUNTER DAYS(N)	TOTAL HOURS OF EFFORT	-- # OF MOOSE OBSERVED --					80% LCL	MEAN TOTAL # OBSERVED /100 HOURS	80% UCL	CALVES			% OF ADULTS THAT ARE BULLS			80% LCL	% CALVES	80% UCL	80% LCL	% BARREN COWS	80% UCL	LONE COWS (N)
			BULL	COW	CALF	UNK.	TOTAL				LCL	/ADULT COW	UCL	LCL	BULLS	UCL							
2001	4696	26225	136	145	52	66	399	1.33	1.45	1.57	0.29	0.36	0.45	44.4	48.4	52.4	13	16	18	50	57	64	98
2002	4194	23487	149	164	57	54	424	1.61	1.75	1.88	0.28	0.35	0.43	43.8	47.6	51.4	13	15	18	48	55	62	96
2003	5748	32117	167	164	90	44	465	1.39	1.51	1.62	0.46	0.55	0.65	46.8	50.5	54.1	19	21	24	41	47	53	128
2004	4012	21956	120	138	70	37	365	1.57	1.71	1.86	0.42	0.51	0.62	42.4	46.5	50.7	18	21	25	51	58	65	93
2005	4858	26599	127	164	76	39	406	1.52	1.65	1.78	0.38	0.46	0.56	39.8	43.6	47.6	18	21	24	59	65	70	141

2005 CENTRAL REGION MAIL SURVEY MOOSE OBSERVATION SUMMARY (UNIT DETAIL)

UNIT	# OF HUNTER DAYS(N)	TOTAL HOURS OF EFFORT	-- # OF MOOSE OBSERVED --					80% LCL	MEAN TOTAL # OBSERVED /100 HOURS	80% UCL	CALVES			% OF ADULTS THAT ARE BULLS			80% LCL	% CALVES	80% UCL	80% LCL	% BARREN COWS	80% UCL	LONE COWS (N)
			BULL	COW	CALF	UNK.	TOTAL				LCL	/ADULT COW	UCL	LCL	BULLS	UCL							
G	738	3920	34	43	20	4	101	2.15	2.56	2.96	0.32	0.47	0.68	36.4	44.2	52.1	15	21	27	51	64	75	33
H1	766	4320	11	19	10	2	42	0.98	1.31	1.65	0.29	0.53	0.93	24.8	36.7	50.0	16	25	36	37	57	76	14
I1	662	3681	25	29	12	4	70	1.70	2.09	2.49	0.25	0.41	0.67	36.9	46.3	55.9	12	18	26	53	67	79	27
I2	584	3234	24	33	13	13	83	2.44	2.94	3.46	0.24	0.39	0.63	33.2	42.1	51.5	13	19	26	63	76	86	29
J1	477	2699	10	14	3	1	28	0.68	0.97	1.25	0.07	0.21	0.54	27.7	41.7	56.7	4	11	23	66	86	96	14
J2	1631	8743	23	26	18	15	82	0.78	0.95	1.11	0.44	0.69	1.07	37.0	46.9	57.0	20	27	35	28	42	57	24

2005 CENTRAL REGION MAIL SURVEY MOOSE OBSERVATION TREND ANALYSIS  
OBSERVATIONS  
(BASED ON CURRENT AND PREVIOUS 4 YEARS)

NOTE: % BARREN COWS IS BASED ON  
OF SINGLE (LONE) COWS AND CALVES.

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
MEAN TOTAL #OBSERVED/100 HOURS	5	0.04	0.19	0.4585
CALVES / ADULT COW	5	0.04	0.43	0.2318
% OF ADULTS THAT ARE BULLS	5	-1.06	0.45	0.2183
% CALVES	5	1.61	0.68	0.0869
% BARREN COWS	5	1.76	0.19	0.4597

2005 S. WEST REGION MAIL SURVEY MOOSE OBSERVATION SUMMARY (WITH PREVIOUS 4 YEARS)  
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YEAR	# OF HUNTER DAYS(N)	TOTAL HOURS OF EFFORT	-- # OF MOOSE OBSERVED --					80% LCL	# OBSERVED /100 HOURS	80% UCL	CALVES			% OF ADULTS THAT ARE BULLS			80% LCL	% CALVES	80% UCL	80% LCL	% BARREN COWS	80% UCL	LONE COWS (N)
			BULL	COW	CALF	UNK.	TOTAL				80% LCL	/ADULT COW	80% UCL	80% LCL	80% UCL	80% LCL							
2001	2557	14353	51	64	26	30	171	1.09	1.24	1.40	0.29	0.41	0.56	38.1	44.3	50.8	14	18	23	51	61	70	51
2002	2640	13988	52	56	24	8	140	0.82	0.95	1.09	0.30	0.43	0.60	41.6	48.1	54.8	14	18	23	43	56	68	32
2003	3244	17320	52	50	28	25	155	0.75	0.85	0.95	0.40	0.56	0.78	44.2	51.0	57.8	17	22	27	46	56	66	48
2004	2481	13281	43	55	27	11	136	0.93	1.07	1.20	0.35	0.49	0.68	37.1	43.9	50.9	17	22	27	45	56	67	39
2005	2653	14325	73	60	19	18	170	1.07	1.22	1.36	0.22	0.32	0.46	49.0	54.9	60.7	9	13	17	63	73	81	51

2005 S. WEST REGION MAIL SURVEY MOOSE OBSERVATION SUMMARY (UNIT DETAIL)

UNIT	# OF HUNTER DAYS(N)	TOTAL HOURS OF EFFORT	-- # OF MOOSE OBSERVED --					80% LCL	# OBSERVED /100 HOURS	80% UCL	CALVES			% OF ADULTS THAT ARE BULLS			80% LCL	% CALVES	80% UCL	80% LCL	% BARREN COWS	80% UCL	LONE COWS (N)
			BULL	COW	CALF	UNK.	TOTAL				80% LCL	/ADULT COW	80% UCL	80% LCL	80% UCL	80% LCL							
H2N	746	4169	15	16	5	1	37	0.97	1.30	1.64	0.14	0.31	0.66	35.7	48.4	61.3	7	14	24	40	62	80	13
H2S	550	2973	16	8	2	5	31	0.57	0.80	1.03	0.06	0.25	0.82	51.6	66.7	79.5	2	8	19	33	67	91	6
K	1357	7183	42	36	12	12	102	1.14	1.34	1.54	0.20	0.33	0.53	46.0	53.8	61.6	9	13	19	66	78	87	32

2005 S. WEST REGION MAIL SURVEY MOOSE OBSERVATION TREND ANALYSIS  
 OBSERVATIONS  
 (BASED ON CURRENT AND PREVIOUS 4 YEARS)

NOTE: % BARREN COWS IS BASED ON  
 OF SINGLE (LONE) COWS AND CALVES.

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
MEAN TOTAL #OBSERVED/100 HOURS	5	0.01	0.00	0.9285
CALVES / ADULT COW	5	-0.01	0.04	0.7446
% OF ADULTS THAT ARE BULLS	5	1.68	0.33	0.3113
% CALVES	5	-0.85	0.13	0.5505
% BARREN COWS	5	2.37	0.28	0.3558

2005 S. EAST REGION MAIL SURVEY MOOSE OBSERVATION SUMMARY (WITH PREVIOUS 4 YEARS)  
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YEAR	# OF HUNTER DAYS(N)	TOTAL HOURS OF EFFORT	-- # OF MOOSE OBSERVED --					MEAN TOTAL			CALVES			% OF ADULTS THAT ARE			% BARREN COWS			LONE COWS (N)			
			BULL	COW	CALF	UNK.	TOTAL	80% LCL	# OBSERVED /100 HOURS	80% UCL	80% LCL	/ADULT COW	80% UCL	80% LCL	BULLS	80% UCL	80% LCL	% CALVES	80% UCL		80% LCL	BARREN COWS	80% UCL
2001	4036	22339	22	48	28	13	111	0.48	0.55	0.63	0.42	0.58	0.81	24.1	31.4	39.6	23	29	35	38	50	62	36
2002	3431	17301	39	50	31	7	127	0.67	0.78	0.88	0.45	0.62	0.85	36.7	43.8	51.2	21	26	32	52	65	76	34
2003	4629	23582	21	37	10	12	80	0.31	0.38	0.45	0.16	0.27	0.45	27.7	36.2	45.4	9	15	22	56	70	82	27
2004	3484	17738	41	58	17	13	129	0.62	0.72	0.82	0.20	0.29	0.43	34.7	41.4	48.3	11	15	20	62	73	81	44
2005	3554	17880	9	26	8	9	52	0.30	0.38	0.46	0.17	0.31	0.55	16.2	25.7	37.5	11	19	28	60	75	86	24

2005 S. EAST REGION MAIL SURVEY MOOSE OBSERVATION SUMMARY (UNIT DETAIL)

UNIT	# OF HUNTER DAYS(N)	TOTAL HOURS OF EFFORT	-- # OF MOOSE OBSERVED --					MEAN TOTAL			CALVES			% OF ADULTS THAT ARE			% BARREN COWS			LONE COWS (N)			
			BULL	COW	CALF	UNK.	TOTAL	80% LCL	# OBSERVED /100 HOURS	80% UCL	80% LCL	/ADULT COW	80% UCL	80% LCL	BULLS	80% UCL	80% LCL	% CALVES	80% UCL		80% LCL	BARREN COWS	80% UCL
L	1570	8347	7	16	6	3	32	0.32	0.44	0.57	0.18	0.38	0.75	17.8	30.4	45.9	11	21	33	51	71	87	14
M	1984	9533	2	10	2	6	20	0.23	0.34	0.44	0.05	0.20	0.63	4.5	16.7	38.6	4	14	34	55	80	95	10

2005 S. EAST REGION MAIL SURVEY MOOSE OBSERVATION TREND ANALYSIS  
 OBSERVATIONS  
 (BASED ON CURRENT AND PREVIOUS 4 YEARS)

NOTE: % BARREN COWS IS BASED ON  
 OF SINGLE (LONE) COWS AND CALVES.

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
MEAN TOTAL #OBSERVED/100 HOURS	5	-0.04	0.12	0.5741
CALVES / ADULT COW	5	-0.09	0.66	0.0969
% OF ADULTS THAT ARE BULLS	5	-1.38	0.09	0.6273
% CALVES	5	-3.11	0.59	0.1309
% BARREN COWS	5	5.80	0.84	0.0290

2005 OVERALL MAIL SURVEY MOOSE OBSERVATION SUMMARY (WITH PREVIOUS 4 YEARS)  
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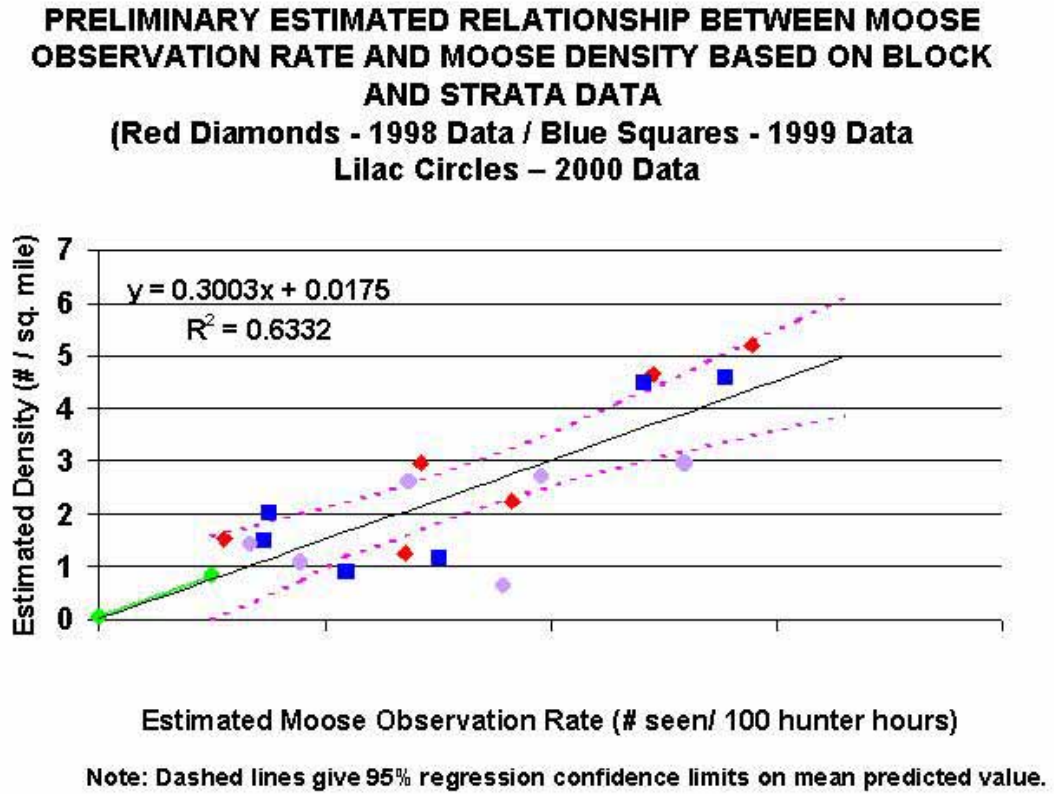
YEAR	# OF HUNTER DAYS(N)	TOTAL HOURS OF EFFORT	-- # OF MOOSE OBSERVED --					MEAN TOTAL			CALVES			% OF ADULTS THAT ARE			% BARREN COWS			LONE COWS (N)			
			BULL	COW	CALF	UNK.	TOTAL	80% LCL	# OBSERVED /100 HOURS	80% UCL	80% LCL	/ADULT COW	80% UCL	80% LCL	BULLS	80% UCL	80% LCL	% CALVES	80% UCL		80% LCL	80% UCL	
2001	14963	84029	512	723	283	177	1695	1.78	1.85	1.93	0.36	0.39	0.43	39.6	41.5	43.3	17	19	20	56	60	63	433
2002	12842	69075	475	603	272	106	1456	1.89	1.98	2.07	0.41	0.45	0.50	42.1	44.1	46.1	19	20	22	55	58	62	346
2003	16656	91051	631	710	311	157	1809	1.74	1.82	1.89	0.40	0.44	0.48	45.3	47.1	48.8	18	19	20	53	56	59	392
2004	12720	69018	487	687	294	109	1577	2.01	2.10	2.18	0.39	0.43	0.47	39.6	41.5	43.4	19	20	21	57	61	64	451
2005	13833	74463	582	724	327	142	1775	2.23	2.33	2.43	0.41	0.45	0.49	42.8	44.6	46.4	19	20	21	60	63	66	469

2005 OVERALL MAIL SURVEY MOOSE OBSERVATION TREND ANALYSIS  
 OBSERVATIONS  
 (BASED ON CURRENT AND PREVIOUS 4 YEARS)

NOTE: % BARREN COWS IS BASED ON  
 OF SINGLE (LONE) COWS AND CALVES.

TREND	YEARS USED (N)	ANNUAL TREND	R SQUARE	PROB>F
MEAN TOTAL #OBSERVED/100 HOURS	5	0.11	0.66	0.0954
CALVES / ADULT COW	5	0.01	0.39	0.2627
% OF ADULTS THAT ARE BULLS	5	0.36	0.06	0.6919
% CALVES	5	0.26	0.32	0.3168
% BARREN COWS	5	0.95	0.33	0.3131

Figure 1.



## PERFORMANCE REPORT

**State:** New Hampshire **Grant:** W-89-R-6

**Grant Type:** Survey and Inventory

**Period Covered:** July 1, 2005 – June 30, 2006

**Project II:** MOOSE RESEARCH AND MANAGEMENT

**Job 3:** Formulation of Moose Population Management Recommendations

**Job Objective:** To efficiently formulate scientifically based moose population management recommendations on an annual or biennial basis.

**Summary:** Recommendations for year 2006 can be found in Appendix 1, (rules & regs) of this job. Biennial season setting took place in 2006. Changes in regional permit numbers can be seen in Table 1. Permit numbers were changed from 2005 in several regions in order to achieve the goals outlined in Table 2. Procedures for season setting are outlined below.

**Target Date:** June 30, annually.

**Status of Progress:** On schedule.

**Significant Deviations:** None.

### **Total Cost:**

**Procedures:** Hunting seasons are established on a biennial basis through the administrative rule-making process. Information from preceding hunting seasons is evaluated in conjunction with short and long-term trends. Season recommendations are developed by the Moose Project Leader and reviewed, evaluated and modified as necessary by the Big Game Team. Input from regional biologists and law enforcement staff is considered, initial recommendations are reviewed by the Big Game Team, and a preliminary season recommendation is subsequently developed at the Wildlife Programs Committee meeting for evaluation by the Executive Director and Commission. These preliminary recommendations are presented at public hearings around the state and public comments are incorporated by the Big Game Team and a final recommendation developed for consideration by the Commission and Executive Director for formal adoption into rule. Only those costs incurred up to, and including, development for a final season recommendation will be charged to the grant.

**Results:** The regional permit levels set in 2006 are designed to bring the regional observation rates closer to the goals set during the planning process in 2005 as seen in Table 2. The proposals were designed to bring the observation rates to goal over time. If limited change was necessary goal may have been reached in two years. If large changes were necessary, they were designed to be accomplished in a gradual stepwise fashion equally distributed over the 10-year time frame of the management plan. The Ct. Lakes, North and Southwest region proposals were designed to achieve 1/3 of the desired change toward goal over a three-year period. The W. Mtn., Central and Southeast were designed to achieve goal over a 3-year period. Input received during the public hearing process caused a reduction in the permit issuance for the Ct. Lakes from 115 either sex and 70 antlerless only permits to 105 either sex and 50 antlerless only permits. There was overwhelming support for the remainder of the proposals.

**Conclusions:** Given the physical parameters of moose found in the Ct. Lakes Region, it is important to reduce the density of moose in this area. If forestry management practices do not improve current browse levels, additional permit issuance will be necessary to bring this population into balance with the habitat.

The format for public input during the season setting process was helpful in identifying areas of public support and concern with moose density levels and department management proposals.

**Recommendations:** Continue this job as planned.

**Prepared By:** \_\_\_\_\_

Kristine M. Rines  
Moose Project Leader

**Date:** \_\_\_\_\_

TABLE 1. PERMIT ISSUANCE, 2005 AND PERMIT ASSIGNMENT, 2006/07

WMU	2005 PERMITS		2006/07 PERMITS	
	EITHER-SEX	ANTLERLESS	EITHER-SEX	ANTLERLESS
A1	15		30	15
A2	77	20	75	35
<b>CT. LAKES REGION</b>	<b>92</b>	<b>20</b>	<b>105</b>	<b>50</b>
B	51		65	15
C2	41		40	10
D1	19		30	10
<b>NORTH REGION</b>	<b>111</b>		<b>135</b>	<b>35</b>
C1	25		25	
D2	25		30	
E1	15		25	
E2	5		5	
E3	21		30	
F	25		30	
<b>W. MTNS</b>	<b>116</b>		<b>145</b>	
G	40		50	
H1	10		15	
I1	20		15	
I2	29		40	
J1	15		15	
J2	24		25	
<b>CENTRAL</b>	<b>138</b>		<b>160</b>	
H2N	10		5	
H2S	5		5	
K	15		15	
<b>S.WEST</b>	<b>30</b>		<b>25</b>	
L	10		10	
M	9		10	
<b>S.EAST</b>	<b>19</b>		<b>20</b>	
<b>TOTAL</b>	<b>506</b>	<b>20</b>	<b>590</b>	<b>85</b>



TABLE 2.  
**N.H. MOOSE POPULATION MANAGEMENT GOALS BY REGION**  
 Moose seen per hundred hunter hours from mail survey

<b>REGION</b>	<b>RECOMMENDED GOAL *</b>	<b>CURRENT LEVEL</b>	<b>DESIRED % CHANGE</b>
CT. LAKES	7.4	12.2	-39%
NORTH	6.0	6.9	-13%
WHITE MOUNTAINS	3.0	2.9	+3%
CENTRAL	1.5	1.6	-6%
SOUTH WEST	1.3	1.0	+30%
SOUTH EAST	0.5	0.5	0%

\* Moose seen per hundred hunter hours during the three years 2003-2005.

NOTE: Moose in New Hampshire are managed by regions rather than units (i.e. WMU's). This is because sample sizes on data collected are too small at the unit level to yield reliable information. Thus, several WMU's are consolidated into each region.

## APPENDIX 1. Moose Management Rules and Recommendations.

### Fis 301.02 Wildlife Management Units.

(a) For purposes of this chapter, the state shall be divided into wildlife management units, also referred to as WMU's, described as follows:

- (1) Wildlife management unit - A1: From Stewartstown Beecher Falls Bridge in Stewartstown east to Rte. 3 then north on Rte. 3 to the Canadian border then following the Canadian/US border west and south to the VT/NH border, Connecticut River and continuing south to the Stewartstown Beecher Falls Bridge;
- (2) Wildlife management unit - A2: From the Stewartstown/Beecher Falls Bridge in Stewartstown east to Rte. 3 in Stewartstown then north on Rte. 3 to the Canadian/US border northeast to the ME/NH border then following this south to Rte. 16 in Wentworth's Location, south on Rte. 16 to Rte. 26 in Errol, west on Rte. 26 in Errol to Colebrook, west on Lemington Rd. to the Colebrook-Lemington Bridge, then north along the NH/VT state line to the Stewartstown/Beecher Falls Bridge;
- (3) Wildlife management unit - B: From the junction of the Connecticut River and the Upper Ammonoosuc River in Northumberland, north along the NH/VT state line to the Colebrook/Lemington bridge in Colebrook, east on Lemington Rd. to Rte. 3 in Colebrook, south on Rte. 3 to Rte. 26 in Colebrook, east on Rte. 26 to Rte. 16 in Errol, south on Rte. 16 to Rte. 110-A in Dummer, west on 110-A to Rte. 110 in West Milan, west on Rte. 110 to Rte. 3 in Groveton, north on Rte. 3 in Groveton to the Upper Ammonoosuc Bridge, west along the Upper Ammonoosuc River to its junction with the Connecticut River;
- (4) Wildlife management unit - C1: From the junction of the Lost Nation Rd. in Northumberland and Rte. 110, east on Rte. 110 to Rte. 16 in Berlin, south on Rte. 16 to Rte. 2 in Gorham, west on Rte. 2 to North Rd. in Jefferson, north along North Rd. to Grange Rd., north on Grange Rd. to Lost Nation Rd., north on Lost Nation Rd. to the junction of Lost Nation Rd. and Rte. 110 in Northumberland;
- (5) Wildlife management unit - C2: From the junction of Rte. 16 in Wentworth's Location and the ME/NH line, south on Rte. 16 to Rte. 110-A in Dummer, west on 110-A to Rte. 110 in Milan, south on 110 to Rte. 16 in Berlin, south on Rte. 16 to Rte. 2 in Gorham, east on Rte. 2 to the NH/ME state line, north on the NH/ME state line to its junction with Rte. 16 in Wentworth's Location;
- (6) Wildlife management unit - D1: From the junction of the Lost Nation Rd. in Northumberland and Rte. 110, south along Lost Nation Rd. to Grange Rd., south on Grange Rd. to North Rd., south on North Rd. to Rte. 2 in Jefferson, east on Rte. 2 to Rte. 115 in Jefferson, south on Rte. 115 to Rte. 3 in Carroll, south on Rte. 3 to I-93 in Franconia, north on I-93 to the NH/VT state line, north on the NH/VT state line, to the junction of the Connecticut and Upper Ammonoosuc River in Northumberland, east along the Upper Ammonoosuc River to the Groveton/Rte. 3 bridge, south along Rte. 3 in Groveton, east on Rte. 110 to the junction of Rte. 110 and the Lost Nation Rd.;
- (7) Wildlife management unit - D2: From the junction of Rte. I-93 and the Vermont border in Littleton, south on I-93 to Rte. 118 in Woodstock, south west on Rte. 118 to Rte. 25 in Warren, south on Rte. 25 to Rte. 25-A in Wentworth, west on Rte. 25-A to Rte. 10 in Orford, north on Rte. 10 to Rte. 25-A, west on Rte. 25-A to the VT/NH border, north on the VT/NH border to its intersection with Rte. I-93 in Littleton;
- (8) Wildlife management unit - E1: From the junction of Rte. 2 and Rte. 115 in Jefferson east on Rte. 2 to Rte. 16 in Gorham, south on Rte. 16 to Rte. 302 in Glen, north on Rte. 302 to Rte. 3 in Twin Mountain, north on Rte. 3 to Rte. 115 in Carroll, north on Rte. 115 to its junction with Rte. 2 in Jefferson;
- (9) Wildlife management unit - E2: From the junction of Rte. 2 and Rte. 16 in Gorham, south on Rte. 16 to Rte. 302 in Conway, east on Rte. 302 to the NH/ME state line, then north along the state line to its junction with Rte. 2;
- (10) Wildlife management unit - E3: From the junction of Rte. 302 and Rte. 3 in Twin Mountain, south on Rte. 3 to I-93, south on I-93 to Rte. 112 in Lincoln, east on Rte. 112 to Rte. 16 in Conway, north on Rte. 16 to Rte. 302 in Glen, north on Rte. 302 to its junction with Rte. 3 in Twin Mountain;
- (11) Wildlife management unit - F: From the junction of Rte. 25-A and Rte. 25 in Wentworth, north on Rte. 25 to Rte. 118 in Warren, north on Rte. 118 to Rte. 112 in Woodstock, east on Rte. 112 to Rte. 16 in Conway, south on Rte. 16 to Rte. 113 in Chocorua, west on Rte. 113 to Rte. 113-A in Tamworth, west

on Rte. 113-A in Tamworth to Rte. 113 in Sandwich, west on Rte. 113 to Rte. 3 in Holderness, west on Rte. 3 to Exit 24 of I-93 in Ashland, north on I-93 to Rte. 25, exit 26 in Plymouth, west on Rte. 25 to the junction with Rte. 25-A; (12) Wildlife management unit - G: From the junction of Rte. 25-A and the VT/NH border in Orford, east on Rte. 25-A to Rte. 10 in Orford, south on Rte. 10 to Rte. 25-A in Orford, east on Rte. 25-A to Rte. 25 in Wentworth, southeast on Rte. 25 to Rte. I-93 in Plymouth, south on Rte. I-93 to Rte. 104 in New Hampton, south on Rte. 104 to Rte. 4 in Danbury, south on Rte. 4 to Rte. 11 in Andover, west on Rte. 11 to Rte. I-89 in New London, west on Rte. I-89 to the VT/NH border, north on the VT/NH border to its intersection with Rte. 25-A in Orford;

(13) Wildlife Management Unit - H<sub>1</sub>: From the junction of I-89 and the NH/VT state line in Lebanon, south on I-89 to Rte. 10 in Grantham, south on Rte. 10 to Rte. 123 in Marlow, west on Rte. 123 to its junction with the Cold River in Walpole, west on Cold River to the NH/VT border, Connecticut River, north on the NH/VT border to I-89 in Lebanon.

(14) Wildlife management unit - H<sub>2-north</sub>: From the junction of Cold River and NH/VT border Connecticut River, in Walpole, east on Cold River to Rte. 123, east on Rte. 123 to Rte. 9 in Stoddard, east on Rte. 9 to Rte. 202 in Hillsborough, south on Rte. 202 to Rte. 101 in Peterborough, west on Rte. 101 to Rte. 9 in Keene, west on Rte. 9 to the VT/NH border, north to the Cold River.

(15) Wildlife management unit - H<sub>2-south</sub>: From the junction of Rte. 9 and the NH/VT border, east on Rte. 9 to Rte. 101 in Keene, east on Rte. 101 to Rte. 202 in Peterborough, south on Rte. 202 to the NH/MA border, west on the NH/MA border to the NH/VT border (Connecticut River), north on the NH/VT border, Connecticut River to its intersection with Rte. 9.

(16) Wildlife management unit - I<sub>1</sub>: From the junction of I-89 and Rte. 11 in New London, north on Rte. 11 to Rte. 4 in Andover, north on Rte. 4 to Rte. 104 in Danbury, north on Rte. 104 to I-93 in New Hampton, south on I-93 to I-89 in Concord, north on I-89 to Rte. 11 in New London.

(17) Wildlife management unit - I<sub>2</sub>: From the junction of I-89 and Rte. 10 in Grantham, south on I-89 to Rte. 9 in Hopkinton, south on Rte. 9 to Rte. 123 in Stoddard, west on Rte. 123 to Rte. 10 in Marlow, north on Rte. 10 to I-89 in Grantham.

(18) Wildlife management unit - J<sub>1</sub>: From the junction of Rte. 113 and Rte. 3 in Holderness, north on Rte. 113 to Rte. 113-A in Sandwich, north on Rte. 113-A to Rte. 113 in Tamworth, east on Rte. 113 to Rte. 16 in Chocorua, north on Rte. 16 to Rte. 302 in Conway, east on Rte. 302 to the ME/NH line, south on ME/NH line to Rte. 109, west on Rte. 109 to Rte. 28 in Wolfeboro Center, south on Rte. 28/109 to Rte. 109 in Wolfeboro, north on Rte. 109 to Rte. 25 in Moultonboro, west on Rte. 25 to Rte. 25B in Center Harbor, along Rte. 25B to Rte. 3, north on Rte. 3 to its junction with Rte. 113 in Holderness.

(19) Wildlife management unit - J<sub>2</sub>: From the junction of Rte. I-93 and Rte. 3 in Ashland, south on Rte. 3 to Rte. 25B in Center Harbor, east on Rte. 25B to Rte. 25 in Center Harbor, east on Rte. 25 to Rte. 109 in Moultonboro, southeast on Rte. 109 to Rte. 28/109 in Wolfeboro, north on Rte. 28/109 to Rte. 109 in Wolfeboro Center, east on Rte. 109 to its intersection with the ME/NH border, south along the ME/NH border to Rte. 202 in Rochester, south on Rte. 202 to Rte. 4 in Northwood, west on Rte. 4 to I-393 in Concord, west on I-393 to I-93 in Concord, north on I-93 to the junction of Rte. 3 in Ashland.

(20) Wildlife Management Unit - K: From the junction of Rte. 9 and Rte. 202 in Hillsborough, south on Rte. 202 to the NH/MA state line, east on the NH/MA state line to Rte. 13 in Brookline, north on Rte. 13 to Rte. 101 in Milford, north on Rte. 101 to I-293 in Manchester, north on I-293 to I-93, north on I-93 to I-89 in Concord, west on I-89 to Rte. 9 in Hopkinton, south on Rte. 9 to its junction with Rte. 202 in Hillsborough.

(21) Wildlife management unit - L: From the junction of I-93 and I-393 in Concord, east on I-393 to Rte. 4, east on Rte. 4 to Rte. 202 in Northwood, north on Rte. 202 to NH/ME state line, south along the NH/ME state line to Little Bay, south along the Rockingham/Stafford County line in Little and Great Bay to the Squamscott River, south along the Squamscott River to Rte. 101, west along Rte. 101 to I-93 in Manchester, south on I-93 to I-293, north on I-293 to I-93 to I-393 in Concord.

(22) Wildlife Management Unit - M: From the junction of Rte. 13 in Brookline and the NH/MA border, north on Rte. 13 to Rte. 101 in Milford, north on Rte. 101 to Rte. I-293 in Manchester, east on I-293 to I-93, north on I-93 to Rte. 101 in Manchester, east on Rte. 101 to its junction with the Squamscott River in Exeter, north along the Squamscott River to Great Bay, north along the Strafford/Rockingham County line in Great and Little Bay to the NH/ME state line, east along the NH/ME state line to the Atlantic Ocean, south along the NH

coast line to the NH/MA line, west along the NH/MA state line to its junction with Rte. 13 in Brookline.

(b) Whenever a wildlife management unit is referenced with only a letter, and that WMU has been divided into subwildlife management units with number, that reference shall include all of the area enclosed by those subunits. For example, WMU - J shall include WMU's J<sub>1</sub> and J<sub>2</sub>.

(c) Whenever a subwildlife management unit is referenced with a letter and number and that WMU has been further divided into smaller units, that reference shall include all of the area enclosed by those units. For example, WMU -H2 shall include H2-north and H2-south.

**Fis 301.07 Moose Season.**

(a) "Antlered moose" means a moose which has at least one antler 6 inches long measured from the tip of the main beam along the distal edge of the antler to the base of the antler burr at the skull.

(b) For purposes of this section the state shall be divided into wildlife management units, as described in Fis 301.02.

(c) The moose season shall be 9 consecutive days and shall open on the third Saturday in October.

(d) No moose shall be taken with the aid or use of dogs.

(e) No person other than the permittee and subpermittee shall participate in a joint hunt to take moose except that the permittee may employ one licensed guide. The licensed guide may direct, aid, assist, or instruct the permittee and subpermittee but shall not shoot a moose.

(f) No aircraft shall be used to locate moose or communicate the location of moose during the open moose season.

(g) No radio telemetry equipment, electronic calls, cell phones, radio transceivers, pagers or other communication devices shall be used to attract or take moose.

(h) No moose shall be taken within 300 feet of a class 1, 2, 3, 4 or 5 highway, as classified pursuant to RSA 229:5. For purposes of this section both the hunter and the moose shall be not less than 300 feet from a class 1, 2, 3, 4, or 5 highway.

(i) No moose shall be taken with .22 caliber rimfire firearms or with shotguns using shot loads including buckshot. In towns restricted to weapon types pursuant to RSA 207:3-b, 208:3, 208:3-a, 208:3-b, and 208:3-c, only shotguns loaded with a single ball, muzzle-loading rifle, or bow and arrow shall be permitted for the taking of moose.

(j) A person holding a current moose permit or subpermittee's permit may hunt moose with a muzzle loading firearm of not less than .45 caliber.

(k) No bow shall be used for hunting moose unless it will pull at least 60 pounds peak weight measured at 28 inches or less draw.

(l) No mechanically-drawn or released bow shall be used, and moose shall not be taken by a strung bow from a motor vehicle.

(m) No arrow head shall be used other than broadheads as follows:

(1) Fixed blade broadheads shall not be less than 7/8 of an inch or more than 1 1/2 inches wide;

(2) Retractable blade broadheads may be smaller than 7/8 of an inch wide in flight, but shall not be less than 7/8 of an inch wide when open;

(3) There shall be no upper size limit on retractable blade broadheads; and

(4) When arrows are used in such hunting the name and address of the person shall be plainly printed on each arrow.

(n) Only one moose shall be taken per permittee/subpermittee combination.

(o) Moose may be taken in the water.

(p) The permittee or the subpermittee may shoot the moose, but it shall be the responsibility of the permittee to tag the moose immediately upon killing, remove the moose and transport it to the biological check station as required by Fis 301.08.

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(q) The moose tag shall contain the following:

(1) The licensee's signature;

(2) The date and time of kill;

(3) Town of kill;

(4) Specific location of kill; and

(5) The wildlife management unit in which the kill occurred.

(r) The permittee shall remain with the moose during transportation to the biological check station. If the moose is shot by the subpermittee, both the permittee and subpermittee shall go to the check station to check the moose.

(s) The permittee and subpermittee shall only hunt in the wildlife management unit to which they are assigned by the department.

(t) The subpermittee shall always be accompanied by the permittee while hunting moose. All subpermittees shall be within sight and hearing, excluding

electronic devices, when actual physical direction and control can be effected pursuant to RSA 207:1, XXX. All subpermittees under the age of 16 shall be accompanied by a permittee 18 years of age or older.

(u) The moose tag shall remain with the moose at all times until the moose is sealed at the biological check station, pursuant to RSA 208:9.

(v) Once the moose has been sealed as provided in Fis 301.07(u), a moose may be transported during the open season, and for 10 days after, if the moose is accompanied by the person who legally took the moose.

(w) If the moose carcass is placed in the custody of another person or a licensed common carrier, the moose shall, in addition to the registration tag, have a tag plainly marked with the name of the consignor, the name of the consignee, the point of shipment, and the destination.

(x) The permittee, subpermittee, or both if requested, shall return with or without fish and game department personnel to the kill site, the site of evisceration or both for purposes such as, but not limited to, verification of kill site or to obtain ovaries or other biological samples left behind.

(y) Each permittee or subpermittee shall carry a moose permit and each permittee and subpermittee 16 years of age or older shall carry a hunting license at all times when hunting for moose and registering the moose at the check station. Subpermittees under the age of 16 shall not be required to carry a hunting license.

(z) Any person leaving moose parts in the field shall place parts out of sight of roads traveled by conventional vehicles.

**Fis 301.08 Moose Registration at Biological Check Stations.**

(a) The moose shall be presented at the nearest biological check station within 24 hours of the kill.

(b) The moose shall be transported in such a manner that a portion of the moose is open to view.

(c) Biological check stations shall be open daily during the open moose hunting season. The day after the season closes moose shall be registered at any fish and game department regional office or at headquarters in Concord.

(d) The permittee shall provide the following on the moose kill report:

- (1) Date and time of kill;
- (2) Wildlife management unit, town, and locality of kill;
- (3) Weapon used;
- (4) Hunter's name, address, telephone number, date of birth, sex, and license number;

(5) Biological information on the moose including the sex, beam diameter, number of points, estimated weight, estimated age, and

(6) The hunter's signature, signed subject to the penalties for making unsworn false statements under RSA 641:3.

(e) The permittee shall bring in to the biological check station at least the following:

- (1) The lower jaw;
- (2) The intact antler rack on an antlered moose;
- (3) The skull plate on a male antlerless moose;
- (4) The female reproductive tract including the ovaries and mammary sack; and
- (5) All edible portions of the moose.

(f) A moose registration seal as provided in RSA 208:9 shall be affixed by fish and game personnel to the moose for transportation.

**Fis 301.09 Moose Season Lottery.**

(a) Application for the moose season lottery shall be made on an application described in Fis 1102.08.

(b) The applicant shall be at least 16 years of age by the application deadline.

(c) A non-refundable fee of \$10 payable to New Hampshire fish and game department by cash, check or money order shall accompany each application.

(d) Only one application per person shall be entered in the lottery. Any person who turns in an incorrect state of residency on an application shall be disqualified from the lottery process and shall not be eligible to receive a permit. State of residency for purposes of the moose lottery application process shall be the person's state of residence, pursuant to RSA 207:1, XXIII, at the deadline date for moose lottery applications.

(e) Illegible applications and incomplete applications shall be returned and not considered. Corrected applications may be resubmitted.

(f) No late entries shall be accepted.

(g) Bonus points shall be accrued in accordance with RSA 208:1-a, II-a.

(h) No person shall accrue more than one point in a given year's lottery.

(i) A person's accrued points shall be lost if:

- (1) The applicant fails to provide an eligible application for a given year's lottery;
- (2) The applicant fails to provide notification of a driver's license number or non-driver identification number change as specified in (x); or
- (3) The successful applicant has paid the permit fee and does not return the permit by October 1 as specified in (u).
- (j) All applications shall be:
  - (1) Turned in to the department headquarters by 4:00 p.m. on the last Friday in May;
  - (2) Postmarked no later than midnight on the last Friday in May; or
  - (3) Submitted on-line as long as the transaction was started prior to midnight eastern daylight time on the last Friday in May.
- (k) Applications shall be assigned a number on a first come first served basis when received at the department headquarters. Self-addressed and stamped receipts shall be returned as notification that the application has been received.
- (l) The lottery drawing shall be:
  - (1) Held after the season dates have been adopted by rules; and
  - (2) Conducted in the following manner:
    - a. Selection of winning numbers shall be done by computer selection of random numbers;
    - b. A total of 675 application numbers shall be drawn;
    - c. A total of 300 additional numbers shall be drawn as alternates;
    - d. The 675 moose permits shall be allocated as specified in Table 300.01 below:

**Table 300.01 Moose Permit Allocation Table**

Wildlife No. of Permits No. of Permits  
 Management For Either Sex Restricted To  
 Unit Moose Antlerless Moose Only

A1	30	15
A2	75	35
B	65	15
C1	25	0
C2	40	10
D1	30	10
D2	30	0
E1	25	0
E2	5	0
E3	30	0
F	30	0
G	50	0
H1	15	0
H2-north	5	0
H2- south	5	0
I1	15	0
I2	40	0
J1	15	0
J2	25	0
K	15	0
L	10	0
M	10	0

- e. Based on the order of computer selection, applicants shall be assigned a permit as follows:
  - 1. Applicants shall be assigned a permit for either sex moose in a wildlife management unit indicated on their application;
  - 2. If all permits for either sex moose in those wildlife management units are filled, applicants shall:
    - (i) Be assigned to a permit for an antlerless moose provided their application indicates they are willing to hunt antlerless moose in one of the wildlife management units having these permits available; and
    - (ii) Not be assigned a permit if their application indicates they are not willing to hunt antlerless moose; and
  - 3. Once all of the initially drawn applicants have been considered for permits:
    - (i) Alternates shall be used to fill the remaining permits; and
    - (ii) Successful applicants shall be notified by mail within 10 working days; and
- f. The percentage of nonresident numbers drawn shall not be greater than the percentage of nonresident hunting licenses sold during the previous calendar year, and nonresidents shall be randomly distributed throughout the wildlife management units.

- (m) Alternates shall be chosen if a permittee chooses not to participate in the hunt and advises the department, in writing, of this decision. Alternates shall be selected in the order in which they were originally drawn in the lottery. Chosen alternates shall then be permittees. Alternates shall be assigned to the wildlife management unit which was assigned to the original permittee. These new permittees shall be notified by mail within 7 days after being selected.
- (n) The permit fee shall be paid in full at fish and game headquarters in Concord no later than the last working day in July. Late payments received via U.S. mail shall be accepted provided they were postmarked no later than midnight on the third Friday of July. Alternates shall be chosen for applicants failing to pay the fee by the prescribed date. Alternates selected shall then pay within 14 days after being notified.
- (o) The permittee shall not be required to designate a subpermittee. However, if one is so designated, the permittee shall submit the information required in (p) below on the permittee and the subpermittee, if so designated, to the fish and game department so that it shall be received at fish and game headquarters in Concord by the last working day in July. If an alternate is chosen as a permittee, designation of subpermittee and accompanying information shall be submitted with the payment.
- (p) The information required of permittees and subpermittees shall be as follows:
- (1) Complete name and mailing address;
  - (2) Date of birth;
  - (3) Telephone number; and
  - (4) Signature.
- (q) The permittee shall obtain a permit described in Fis 1102.09. There shall be no residency requirements for the subpermittee.
- (r) Reserved.
- (s) The permittee and subpermittees shall return a signed statement that they have read and understand the current year's New Hampshire moose rules. The statement shall be received at fish and game headquarters in Concord no later than the last working day in July. Late statements received via U.S. mail shall be accepted provided they are postmarked no later than midnight on the third Friday in July.
- (t) No person shall act as a subpermittee for more than one permittee.
- (u) Once the fee for a moose permit has been paid, the permittee shall lose all accumulated points and not be eligible for the next 3 application periods, unless the permittee returns the permit prior to October 1 so that an alternate may be notified to participate in the moose hunt.
- (v) No permittee shall sell or barter the subpermittee portion of their permit.
- (w) No person shall possess more than one moose permit as a permittee.
- (x) If a person's driver's license number or non-driver identification number changes, the applicant shall notify the department on the application. If the department is not able to match the identity of the applicant with its records, the applicant shall provide their name, address, date of birth, their old identification number and new identification number.
- (y) The executive director shall waive restrictions in the moose lottery process to delay the issuance of a moose permit for 1 year due to medical problems or national emergency which prevents the permittee from participating in the moose hunt.
- (z) The executive director shall authorize permits, in addition to the permits in (1)(2) d., if the director determines that a department error resulted in the rejection of an eligible application for a permit, provided the issuance will have no significant impact on the moose population and the application would have otherwise been successful based on its random number.

## PERFORMANCE REPORT

**State:** New Hampshire **Grant: W-89-R-6**

**Grant Type:** Survey and Inventory

**Period Covered:** July 1, 2005 – June 30, 2006

**Project II:** MOOSE RESEARCH AND MANAGEMENT

**Job 4:** Professional Exchange and Dissemination of Project Information

**Job Objective:** To inform the public, legislature and Governor and Council of the biological status and management needs of the state's moose herd; to provide information regarding the performance of the moose management program and; to maintain a high level of public and governmental knowledge regarding current moose research activities and management techniques.

**Summary:** This 2005 Application for Federal Aid and the 2005 Federal Aid report were prepared and submitted in a timely manner.

The objectives contained in the New Hampshire Moose Assessment written in 2004 & 2005 were used to help set the 2006 season.

The project leader gave five presentations to the general public on the moose management program. The canned slide show was sent to schools numerous times.

Public service announcements regarding safe driving practices (Brake for Moose) were aired in the spring on both radio and television. The project leader was a member of an inter-departmental state committee to reduce moose/vehicle collisions in the North Country. The committee was composed of members of the Governor's Council, Department of Safety, Fish & Game Department, Department of Transportation and an emergency room physician from Littleton Hospital.

Three moose hunting seminars were given to moose hunting permittees.

The 2005 Harvest Summary was written and published under this job. A copy can be found in NH Federal Aid Report W-89-R-6, Project 1, Job 4, Appendix 1. In addition, the 2005 season forecast was written and published under this job.

Due to time constraints, neither the North American Moose conference nor the Northeast Moose Group was attended by the project leader this year.

**Target Date:** June 30, annually.

**Status of Progress:** On schedule.

**Significant Deviations:** None

**Total Cost:**

**Procedures:** Public education will be accomplished through the use of speaking engagements and educational seminars by biologists, radio, TV and periodical interviews; news releases, PSA's and articles produced and published by the Fish and Game Department, point displays and electronic media. A biennial report on the status of the moose management program will be distributed to the legislature and governor and council on odd numbered years. Timely preparation and submittal of annual federal Aid reports and harvest and research summaries shall be written under this job. The project leader will maintain knowledge of the most recent research and management techniques through literature review



and attendance at technical committees, seminars, meetings and routine communications with moose managers in other jurisdictions.

**Results:** Federal Aid reports were written and submitted as required. The objectives set in the New Hampshire Moose Management Plan define clear boundaries within which the department establishes management recommendations each biennium. A summary of these objectives can be found in Appendix IV of PR W-89-4, Project II. These objectives were instrumental in helping set 2006 season recommendations which can be viewed in this document under Job 3.

The results of educational efforts are difficult to assess quantitatively. They are best assessed by the level of general knowledge expressed by the general public and level of acceptance of current management and research practices. The level of acceptance appears to be high at this time.

The inter-departmental moose/vehicle committee met five times. In order to increase public awareness to the danger of moose/vehicle accidents, May 3<sup>rd</sup> was designated as Moose Awareness Day and commemorated as such by Governor Lynch. A five mile section of I-93 from Exit # 3 to Exit # 36 was identified as a high risk area and was signed with two scrolling, lighted, message signs. The signs became active on April 18<sup>th</sup>. There have been no moose/vehicle accidents in this area that resulted in human injury since that date. This group is also working on distributing 64,000 Brake for Moose bumper stickers to the general public state tourist rest areas. A driver education video is slated for production and distribution to beginning drivers.

Moose hunting seminars are no longer mandatory but were attended by a majority of permittees.

The Harvest Summary continues to be well received by the general public. The 2005 season forecast was amazingly accurate.

**Conclusions:** The work performed under this job is essential for development and maintenance of clearly defined objectives and goals, maintenance of a good working relationship with the public and public understanding and acceptance of moose and moose management. While it is difficult to determine when accidents have been prevented, the scrolling signs on I-93 seem to have reduced human injuries from moose/vehicle collisions on this stretch of road from approximately 5/year (private communication Dr. Campbell McLaren) to none.

**Recommendations:** Continue this job as planned.

**Prepared By:** \_\_\_\_\_  
Kristine M Rines  
Moose Project Leader

**Date:** \_\_\_\_\_

## PERFORMANCE REPORT

**State:** New Hampshire **Grant:** W-89-R-6

**Grant Type:** Survey and Inventory

**Period Covered:** July 1, 2005– June 30, 2006

**Project II:** MOOSE RESEARCH AND MANAGMENT

**Job 5:** An Assessment of Moose Habitat Use and Natural Mortality

**Objective:** To determine the cause and rate of natural mortality for calf and adult moose and to identify and describe important components of moose habitat, their utility and season of use.

**Summary:** A 4-year telemetry study to determine cause and rate of calf and adult moose mortality and habitat use, undertaken in conjunction with the University of New Hampshire Wildlife Unit, is now completed. The final season of fieldwork and the data analysis and report writing were all finished during this reporting period. Final reports “Seasonal Home Range, Habitat Use, and Characteristics of Neonatal Habitat in Northern New Hampshire” (D. Scarpitti, 2006) and “Characteristics and Dynamics of a Moose Population in Northern New Hampshire” (A.R. Musante, 2006) were submitted as separate files with this job report.

**Target Date:** June 31, annually.

**Status of Progress:** On schedule.

**Significant Deviations:** None

### **Total Cost:**

**Procedures:** The final year of a 4-year telemetry study (see 2004/05 project report W-89-R-II, Job 6 for a project description) to determine moose productivity and mortality, and moose habitat use and preference, was enacted under this job. The study was undertaken in conjunction with the University of New Hampshire. Over 90 moose were telemetered over the course of this study. Several of the telemetry units were GPS collars used to assess habitat use and preference. Each spring the location of cows was closely monitored to determine time and location of calf drop and to monitor subsequent survival and/or mortality.

A number of moose were still being monitored for productivity and adult and calf mortality during the first half of this report segment year. The UNH study was completed on December 31, 2005.

**Results:** Telemetry fix success rates (2D or 3D) of GPS collars was 86% overall. Fix success was highest in early winter (94%) and lowest in summer (75%). Three D fixes exhibited a similar pattern with the highest proportion of successful fixes being in early winter (50%) and the lowest in summer (31%). Analysis of the GPS data indicated that 50 locations were sufficient to provide an accurate measure of home range. GPS home ranges were 2 – 8X smaller than those calculated with VHF data. Seasonal home range and core area were highly correlated and were associated with patterns of forage availability and reproduction. Annual (24.7km<sup>2</sup>) and seasonal home range size was similar to that found in the highly productive habitats found in Maine and Minnesota. Ninety-eight percent of seasonal home ranges and 82% of core areas overlapped from 10 – 35%. There was no difference between seasonal home range size or use of maternal or barren cows. Habitat use was random in summer and fall. Moose used mixed and coniferous forest more than expected in early and late winter and cut/regeneration more than expected in late winter. In spring, northern hardwood, cut/regeneration, wetlands and coniferous habitats

were used more than expected. Most neonatal sites were located in pole and sawtimber and mixed coniferous habitats.

Parturition dates ranged from 8 May – 13 July with a median date of 19 May and 78% of births occurring from 13 – 27 May. Calving rates of yearling and adults averaged 30 and 85%, respectively. The twinning rate was 11%. Survival of neo-nates through 2 months of age was 0.71. Radio marked calves (7-12 months of age) had a survival rate of 0.67. During this time 88% of mortality occurred in late winter. Overall calf survival was estimated at 0.45. Survival of radio marked cows was 0.87. Vehicle collisions and hunting were the major causes of death, with late winter mortality from winter tick and unknown causes creating annual variation of >10%.

A review of New Hampshire data derived from harvested adult cows revealed that carcass weights increased from the time periods 1988-1998 to 1999-2004. The mean age of harvested cows (approximately 5 years) remained within the optimal range of productivity and ovulation rates remained >90% but corpora lutea counts/cow declined slightly from 1.44 to 1.24. During this same time period ovulation rates of yearlings declined 25% and carcass weights declined 4%.

**Conclusions:** GPS radio-collars effectively collect large amounts of precise location data during all seasons and in typical forest conditions for northern New England. The large amount of overlap between seasonal home range and core areas, the relatively small annual home range size, and the lack of difference between maternal and barren cow home range, suggest a distribution of seasonal resources favorable to moose and indirect evidence of high quality and heterogeneous habitat. The increased use of coniferous and mixed wood forests in early and late winter coupled with non-restrictive snow depths (<50cm) suggest that both energy conservation and/or thermal regulation were important to moose during this time. The increased use of northern hardwoods, cut/regeneration and wetlands in spring and cut/regeneration in late winter, suggest forage availability becomes important during these seasons. Habitat resources do not appear to be limiting moose in northern New Hampshire at this time.

The highly synchronous and annually consistent parturition dates suggest both a good adult sex ratio and a productive habitat sufficient to maintain cows in good condition. Both yearling calving rates and twinning rates are considered low while adult calving rates are considered consistent with a population well below carrying capacity. Neo-nate mortality timing is consistent with black bear predation. At 0.71 the survival rate is higher than that found in a population regulated by predation but lower than that found in populations with few to no predators. Collared calf winter survival was lower than that documented in most North American populations and similar to those areas, which experience severe winter conditions. Radio collared calf mortality was most influenced by late winter mortality (88% of mortalities) which was caused by winter tick/winter kill. Adult cow mortality was showed little variation over the years and was most influenced by winterkill and unknown causes that reduced survival by 10%

A review of carcass weights and productivity data from harvested animals suggests that habitat quality is not limiting. It is hypothesized that winter ticks may limit yearling production by reducing the winter survival and fitness of calves. These same impacts are thought to possibly increase the age of first breeding. Winter ticks do not appear to reduce adult ovulation rates or body weight but may influence productivity through reduced twinning. It has been suggested that yearling pregnancy rate and adult twinning rate may be influenced by similar factors. This theory dovetails well with carcass weight and reproductive information coupled with the mortality causes (41% caused by winter tick) and the evidence of excellent habitat. This study indicates that winter ticks are more influential on moose population growth than predation, habitat or anthropogenic factors.

Findings from this 4-year study are summarized in two electronic reports, submitted as 2 separate electronic documents, with this project report. The names of these files are:

**Recommendations:** The department should develop recommendations for foresters that ensure a mixture of mature mixed and coniferous forest combined with early successional stands to meet moose habitat requirements. An annual monitoring method for winter tick needs to be developed and implemented. Continue monitoring the remaining animals for mortality rate.

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**Date:** \_\_\_\_\_

Table 1. Mortality status of collared moose in New Hampshire as of June 8, 2006.

Collar Date	Tag #	Freq#	age	sex	Capture method	Collar type	Mortality date	Suspected Cause	Collar Drop Date	Notes
<b>2001</b>										
DEC 1	39	150.580	A	C	DRUG	VHF	4/19/02	unk		
DEC 2	12	150.690	C	C	DRUG	VHF			4/20/02	
	40	150.330	A	C	DRUG	VHF				
	24	150.360	A	C	NET	VHF				
	14	150.220	C	C	NET	VHF			6/13/02	
	35	150.610	A	C	DRUG	VHF	6/18/02	unk		
	16	150.880	C	C	NET	GPS	4/17/02	ticks		Collared as adult
	18	150.820	A	C	NET	GPS	10/19/02	hunt		
	19	150.780	A	C	NET	GPS	8/22/03	vehicle		
	37	150.530	A	C	DRUG	VHF	10/21/03	hunt		
DEC 3	2	150.200	C	C	NET	VHF	12/3/01	BROKEN NECK		
	20	150.900	A	C	NET	GPS			6/15/2004	
	15	150.099	C	B	NET	VHF			3/29/02	
	38	150.570	A	C	DRUG	VHF				
	10		C	C	NET					NO COLLAR
	32	150.670	A	C	NET	VHF	6/15/06	tick		
	33	150.710	A	C	NET	VHF				
	36	150.110	A	C	NET	VHF				
	17	150.840	A	C	NET	GPS	4/11/02	tick		
DEC 4	30	150.010	A	C	DRUG	VHF			9/11/04	
	11	150.620	C	B	NET	VHF			4/18/02	
	5	150.130	A	C	NET	VHF				
	6	150.120	C	C	DRUG	VHF			2/7/02	
	29	150.370	A	C	NET	VHF				
	31	150.550	A	C	NET	VHF				
	28	150.230	A	C	DRUG	VHF	4/19/02	tick		
DEC 5	9	150.210	C	B	NET	VHF	4/27/02	tick		
	25	150.250	A	C	DRUG	VHF				
	23	150.090	A	C	DRUG	VHF				
	45	150.460	C	B	DRUG	VHF	2/19/02	tick		
	42	150.030	C	B	NET	VHF	4/16/02	tick		
	1	150.070	A	C	NET	VHF				
	8	150.470	C	B	NET	VHF			4/12/02	
	7	150.390	C	C	NET	VHF	6/20/02	vehicle		
	27	150.700	A	C	NET	VHF	10/17/04	hunt		
	26	150.260	A	C	NET	VHF				
DEC 6	34	150.000	A	C	NET	VHF	10/23/03	hunt		
DEC 7	41	150.431	C	C	NET	VHF	3/30/02	tick		
	43	150.270	A	C	NET	VHF				
	3	150.509	C	C	DRUG	VHF			4/11/02	
	4	150.320	C	B	NET	VHF	5/23/02	vehicle	5/20/02	
	13	150.350	C	B	NET	VHF	12/13/01	myopathy		
<b>2002</b>										
JUL 5	46	150.840	A	C	DRUG	GPS	10/16/04	hunt		
JUL 7	50, 275	150.880	A	C	DRUG	GPS			6/15/04	
DEC 9	126	150.140	C	C	NET	VHF	6/13/04	vehicle		
	128	150.470	C	C	NET	VHF	6/19/03	vehicle		
	135	150.509	C	B	NET	VHF			3/11/04	
	138	150.120	A	C	NET	VHF				
	144	150.420	C	C	NET	VHF	10/09/04	vehicle		
	146	150.650	C	B	NET	VHF	4/9/03	Lungworm - starved		
DEC 10	125	150.820	A	C	NET	GPS			6/15/04	GPS
	129	150.180	C	B	NET	VHF				
	131	150.489	C	B	NET	VHF	1/10/03	vehicle		
	133	150.630	A	C	NET	VHF				
	134	150.440	C	C	NET	VHF			3/06/05	
	136	150.449	C	C	NET	VHF	4/11/03	Lungworm - starved		



