

PERFORMANCE REPORT

State: New Hampshire **Grant:** F20AF11939

Grant Type: Survey and Inventory

Grant Title: NH – WILDLIFE RESEARCH AND MANAGEMENT (W-89-R-21)

Period Covered: July 1, 2022 - June 30, 2023

Purpose/Target Name: PROJECT 2 - MOOSE RESEARCH AND MANAGEMENT

Objective Name: JOB 1 - HARVEST MORTALITY DATA COLLECTION, ENTRY AND ANALYSIS

Objective Statement: To efficiently gather biological and harvest information on harvested moose including, but not limited to, age, sex, weight, date of kill, 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 2022 moose hunting season ran from October 15th through October 23rd. Permits issued for 2022 were all either-sex and included 41 lottery allocated permits, one auction permit (issued to benefit the Wildlife Heritage Foundation of NH), and one Dream Hunt permit. Lottery permit allocation by management region was 11 permits in the Connecticut Lakes (Ct. Lakes), 17 in the North, 10 in the White Mountains, and 5 in the Southeast; permit issuance was suspended in the Central and Southwest regions because the population abundance index level fell below the permit issuance cut-off level. The auction and Dream Hunt permits could be used in any moose management region. Twenty-seven moose were taken during the 2022 season which included 22 adult bulls, one yearling bull, three adult cows, and one yearling cow, and the overall success rate was 63%.

The small annual sample size of physical condition data due to decreasing moose hunting permit issuance has led to analyzing biological data based on regional five-year rolling means. Trends are analyzed over the last five and 10 years for the five-year rolling means. Only statistically significant ($P < 0.05$) changes are noted.

Biological data for adult (2.5 yro+) cows over the last 10 years showed declining pregnancy and lactation rate, but increasing twinning rate. Calf weight declined over the last 10 years. Yearling bull (1.5 yro) weight increased over the last five and 10 years, but antler beam diameter decreased over the last 10 years. Mature bull (5.5 yro+) antler beam diameter also decreased over the last 10 years. Although some of the trends are contradictory, the most pronounced trends include declining calf weight and declining adult cow pregnancy rate over the last 10 years. This indicates the physical condition of the population declined over the last 10 years, but there are few changes over the last five years suggesting more stable physical condition in recent years. All statewide biological data indicative of physical condition are substantially lower than the first 10 years of data collection, 1988-1997, during which time the population was healthy and growing.

Chronic high winter tick parasitism is the primary factor causing decreased physical condition. Winter tick counts on harvested moose ($n=20$) indicated moderate, yet substantial, infestations in the Ct. Lakes and North regions; sample size was insufficient elsewhere.

Sixty-nine percent of harvested moose were taken in the first three days of the season and all were taken with rifle. Moose were taken in wildlife management units A1, A2, B, C1, C2, and E2.

Data pertinent to harvest, success rates, and biological information can be found in Tables 2a, 2b, 2c, and 2d and Figure 1. Additional data can be found in W89R-22, Project I, Job 4, Appendix I, entitled "2022 New Hampshire Wildlife Harvest Summary."

Target Date: June 30th annually 2021-2025.

Status of Progress: On schedule.

Significant Deviations: Due to very small annual sample sizes, annual biological data is no longer providing reliable information on regional populations. Harvested animal metrics, except the tick count, are means using the

five most recent consecutive years of data, “five-year rolling average”. In addition, the two southern regions were combined for reproductive analysis.

Objective Approach: Registration stations shall be equipped, set up and manned under this job. As required by state regulations, all harvested moose, including antlers, the intact skull, and female reproductive tracts and mammarys, must be brought to one of up to seven moose registration stations distributed throughout the state, manned by trained wildlife and other Department staff. Information gathered on harvested moose will include sex, weight, method of take, date and place of take. One or both primary incisors or canines will be removed and sectioned for aging by the 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 collected for toxicological exam. Moose may be checked for presence of internal or external parasites and samples of these parasites may be turned in to the state entomologist for identification. All data analysis and report writing on data collected under this job will be charged to this job.

Results: Statewide biological and harvest indices are strongly influenced by the three northern regions (Ct. Lakes, North, and White Mountains Regions, Figure 1 of Job 2) as there are few ($n \leq 10$) moose permits issued in southern regions. Sample sizes for both statewide and regional biological indices are becoming small as permit issuance declines, so all moose biological metrics, except the tick count, are the rolling five-year mean (i.e. the “2022 mean” is the mean of all data from 2018-2022), unless specified otherwise. Moose are managed by region, so data is interpreted first by region then statewide. The following results are listed in Table 1, 2 (a,b,& c), and 3. Table 1 provides reference information relative to select physical parameters in relationship to carrying capacity. Table 2 consists of statewide and regional analysis of hunter success and harvest data (Table 2a), adult bull biological summary data by age class (Table 2b), and adult cow and calf biological summary data by age class (Table 2c). Table 3 provides winter tick count data from yearling and adult bulls. All change is significant at $P < 0.5$ unless noted otherwise.

Connecticut Lakes Region:

Annual moose hunter success rate decline from 100% in 2021 to 82% in 2022. Hunter success rate increased over the last five years and proportion of cows and calves decreased over the last 10 years (Table 2a). Productivity data from harvested cows yielded a yearling (1.5 yro) pregnancy rate of 0%, adult (2.5+ yro) pregnancy rate of 100%, and 0% twinning. Average yearling cow weights have not exceeded 440 pounds since 2001-2005 (Table 2c). Trends in biological data are mixed with adult cows showing decline in physical condition while adult and mature bull physical condition seems stable (Table 2b and 2c). Adult cow lactation rate declined over the last five years as did corpora lutea and twinning rate over the last 10 years. Adult bulls 2.5-4.5 yro had increasing antler beam diameter and weight over the last five and 10 years, and increasing antler points and spread over the last 10 years. Mature bulls (5.5 yro+) had increasing antler points and weight over the last five years, but decreasing antler beam diameter over the last 10 years.

Winter tick abundance (pooled northern NH) on bulls (≥ 1.5 yro) was 40 ticks, which is moderate when compared with recent trends (Fig. 1).

North Region:

Hunter success declined from 87% in 2021 to 77% in 2022 (Table 2a). Productivity data from harvested cows yielded a yearling pregnancy rate of 0%, adult pregnancy rate of 100%, and adult twinning rate of 43%. Average yearling cow weights have not exceeded 440 lbs since 2011-2015 (Table 2c). Trends of bull and cow biological measurements are mixed (Table 2b and 2c). Adult cow corpora lutea counts increased over the last five and 10 years, as did twinning rate over the last 10 years, but lactation and weight decreased over the last 10 years. Calf weight increased over the last five years and decreased over the last 10 years. Yearling bulls had increasing antler spread over the last five years and increasing weight over the last five and ten years. Adult bulls 2.5-4.5 yro had decreasing antler beam diameter and total antler points over the last five years. Mature bulls (5.5 yro+) had decreasing antler beam diameter and antler spread over the last 10 years.

Winter tick abundance (pooled northern NH) on bulls (≥ 1.5 yro) was 40 ticks, which is moderate when compared with recent trends (Fig. 1). Sample sizes of biological measurements for the remaining regions are small and generally inadequate for statistical interpretation.

White Mountain Region:

Hunter success rate declined from 60% in 2021 to 40% in 2022 (Table 2a). Productivity data indicated a yearling pregnancy rate of 50%, adult pregnancy rate of 50%, and adult twinning rate of 50%. Average yearling cow weights have not exceeded 440 lbs since 2002-2006 (Table 2b and 2c).

Central Region:

Hunting permit issuance was suspended. Even though moose permits were not issued in the Central Region in 2022, harvested animal metrics are still available because these are rolling five year means. Harvested cows yielded an adult pregnancy rate of 100% and adult twinning rate of 0%; there were insufficient samples for other metrics.

South (Southwest and Southeast) Region:

Hunter success rate for the Southeast region increased from 0% in 2021 to 20% in 2022; hunting permit issuance was suspended in the Southwest region (Table 2a). Data from the two southern regions was combined due to small sample sizes. Harvested cows yielded an adult pregnancy rate of 100% and adult twinning rate of 100%; there were insufficient samples for other metrics (Table 2b and 2c).

Conclusions:

The small annual number of moose hunting permits precludes interpretation of hunter success rates due to high variation in hunter behavior.

Biological metrics of harvested moose are only providing reliable data on moose populations in northern New Hampshire (Ct. Lakes, North, and WMU C1) as there are relatively few permits issued in other parts of the state.

There are conflicting trends in physical condition parameters, likely due to small sample sizes. Overall, moose physical condition seems stable over the last five years, slightly decreasing over the last 10 years, and substantially lower than when the population was increasing (1988 – 1997). Recent research showed reduced physical condition is due to winter tick parasitism.

Winter tick counts have been substantial for all recent years and indicate chronic high parasitism. Tick counts during fall 2022 were slightly lower than 2021 and anecdotal evidence indicates winter tick impact was lower, but still substantial. The total infestations of winter ticks on moose is estimated each year using a model run by USGS researcher Dr. Alexej Siren. The model predicts the final index count (number of ticks in count areas at end of questing), which was also collected on radio-marked moose with known survival and productivity in 2014-2018, thereby providing a means to compare. The model uses tick counts on harvested moose, which indicate the infestation rate, and weather data, which indicates the length of the questing season, to predict the final index count level. Moderate winter tick impact was predicted for winter/spring 2023. This method is also used in Vermont and Maine, which had slightly lower projected tick impacts.

Mandatory moose registration coupled with the operation of biological moose check stations successfully facilitates the collection of biological data that is an important component of moose management decision-making in New Hampshire. This long-term biological dataset of moose physical condition parameters remains important as it provides the ability to compare between periods with population increase and decrease.

Custom Qualitative Indicator/Output: Biological and harvest information has been gathered, entered and analyzed. Biological samples from harvested moose for condition evaluation and periodic toxicological and pathological examination have been collected.

Recommendations: Continue this job as planned. Data should continue to be grouped together in five year rolling means and trend analysis done on groups of data, especially on parameters of biological health metrics, to minimize the influence of small annual sample sizes. New metrics that will provide additional data on population health that are not derived from harvested moose should be pursued because moose harvest is low or absent throughout the state. Cow:calf and bull:cow ratios from trail cameras may provide this data in the near future.

Submitted by:_____

Henry Jones
Moose Project Leader
July 1, 2023

Table 1. Gasaway* Reproductive Indices in Relation to K Carrying Capacity in Moose 2.5+ years of age.

Relationship to carrying capacity	PREGNANCY RATE	TWINNING RATE
BELOW	79 – 100%	23 – 90%
NEAR	76-84%	1 – 25%
ABOVE	>60-74%	0 - 3%

* - Gasaway, W.C., et al. 1992, The role of predation in limiting moose at low densities in Alaska and Yukon and implications for conservation. Wildl. Monogr. 120, 59pp.

Table 2a. HISTORICAL CT LAKE REGION HUNTER SUCCESS AND HARVEST SUMMARY

YEAR	-- HARVEST/PERMITS ISSUED/SUCCESS RATE --			-----				-----				-FOR ES PERMITS-	
	ALL PERMITS	ES PERMITS	AO PERMITS	AD. BULLS	AD. COWS	SQ.MILE) CALVES	TOTAL	% COW & CALF	AD. BULLS / COW				
1989	12/ 15/ 80.0	12/ 15/ 80.0	./ 0/ .	5 (0.01)	6 (0.01)	1 (0.00)	12 (0.02)	58.3	0.8				
1990	13/ 15/ 86.7	13/ 15/ 86.7	./ 0/ .	9 (0.02)	3 (0.01)	1 (0.00)	13 (0.02)	30.8	3.0				
1991	26/ 30/ 86.7	26/ 30/ 86.7	./ 0/ .	21 (0.04)	4 (0.01)	1 (0.00)	26 (0.05)	19.2	5.3				
1992	50/ 55/ 90.9	50/ 55/ 90.9	./ 0/ .	27 (0.05)	21 (0.04)	2 (0.00)	50 (0.09)	46.0	1.3				
1993	79/ 80/ 98.8	79/ 80/ 98.8	./ 0/ .	48 (0.09)	28 (0.05)	3 (0.01)	79 (0.14)	39.2	1.7				
1994	78/ 80/ 97.5	78/ 80/ 97.5	./ 0/ .	46 (0.08)	26 (0.05)	6 (0.01)	78 (0.14)	41.0	1.8				
1995	96/100/ 96.0	96/100/ 96.0	./ 0/ .	58 (0.10)	33 (0.06)	5 (0.01)	96 (0.17)	39.6	1.8				
1996	95/100/ 95.0	95/100/ 95.0	./ 0/ .	62 (0.11)	28 (0.05)	4 (0.01)	95 (0.17)	35.1	2.2				
1997	111/124/ 89.5	65/ 70/ 92.9	46/ 54/ 85.2	37 (0.07)	65 (0.12)	9 (0.02)	111 (0.20)	44.6	1.6				
1998	111/125/ 88.8	66/ 70/ 94.3	45/ 55/ 81.8	44 (0.08)	56 (0.10)	11 (0.02)	111 (0.20)	37.9	2.1				
1999	109/125/ 87.2	62/ 70/ 88.6	47/ 55/ 85.5	39 (0.07)	57 (0.10)	13 (0.02)	109 (0.19)	37.1	2.0				
2000	100/125/ 80.0	59/ 70/ 84.3	41/ 55/ 74.5	37 (0.07)	57 (0.10)	6 (0.01)	100 (0.18)	40.7	1.7				
2001	108/125/ 86.4	64/ 70/ 91.4	44/ 55/ 80.0	35 (0.06)	64 (0.11)	9 (0.02)	108 (0.19)	45.3	1.3				
2002	71/ 75/ 94.7	52/ 55/ 94.5	19/ 20/ 95.0	38 (0.07)	28 (0.05)	5 (0.01)	71 (0.13)	28.8	2.8				
2003	71/ 75/ 94.7	53/ 55/ 96.4	18/ 20/ 90.0	40 (0.07)	31 (0.06)	1 (0.00)	71 (0.13)	27.8	2.6				
2004	99/107/ 92.5	82/ 88/ 93.2	17/ 19/ 89.5	60 (0.11)	36 (0.06)	3 (0.01)	99 (0.18)	28.0	2.8				
2005	100/112/ 89.3	83/ 92/ 90.2	17/ 20/ 85.0	60 (0.11)	37 (0.07)	3 (0.01)	100 (0.18)	27.7	2.9				
2006	121/152/ 79.6	86/102/ 84.3	35/ 50/ 70.0	52 (0.09)	60 (0.11)	9 (0.02)	121 (0.22)	39.5	1.7				
2007	140/159/ 88.1	100/109/ 91.7	40/ 50/ 80.0	67 (0.12)	64 (0.11)	9 (0.02)	140 (0.25)	33.0	2.3				
2008	63/ 79/ 79.7	31/ 39/ 79.5	32/ 40/ 80.0	22 (0.04)	36 (0.06)	5 (0.01)	63 (0.11)	32.3	2.6				
2009	72/ 86/ 83.7	41/ 46/ 89.1	31/ 40/ 77.5	33 (0.06)	34 (0.06)	5 (0.01)	72 (0.13)	24.4	3.4				
2010	75/ 87/ 86.2	56/ 62/ 90.3	19/ 25/ 76.0	47 (0.08)	27 (0.05)	1 (0.00)	75 (0.13)	17.9	4.6				
2011	73/ 89/ 82.0	57/ 64/ 89.1	16/ 25/ 64.0	41 (0.07)	29 (0.05)	3 (0.01)	73 (0.13)	28.1	3.2				
2012	37/ 46/ 80.4	23/ 26/ 88.5	14/ 20/ 70.0	18 (0.03)	16 (0.03)	3 (0.01)	37 (0.07)	30.4	2.3				
2013	34/ 45/ 75.6	20/ 26/ 76.9	14/ 19/ 73.7	14 (0.03)	17 (0.03)	3 (0.01)	34 (0.06)	35.0	2.2				
2014	21/ 26/ 80.8	17/ 21/ 81.0	4/ 5/ 80.0	16 (0.03)	5 (0.01)	0 (0.00)	21 (0.04)	5.9	16.0				
2015	14/ 20/ 70.0	14/ 20/ 70.0	./ 0/ .	11 (0.02)	3 (0.01)	0 (0.00)	14 (0.03)	21.4	3.7				
2016	10/ 11/ 90.9	10/ 11/ 90.9	./ 0/ .	9 (0.02)	1 (0.00)	0 (0.00)	10 (0.02)	10.0	9.0				
2017	8/ 10/ 80.0	8/ 10/ 80.0	./ 0/ .	7 (0.01)	1 (0.00)	0 (0.00)	8 (0.01)	12.5	7.0				
2018	9/ 10/ 90.0	9/ 10/ 90.0	./ 0/ .	9 (0.02)	0 (0.00)	0 (0.00)	9 (0.02)	0.0	.				
2019	11/ 11/100.0	11/ 11/100.0	./ 0/ .	9 (0.02)	2 (0.00)	0 (0.00)	11 (0.02)	18.2	4.5				
2020	11/ 11/100.0	11/ 11/100.0	./ 0/ .	6 (0.01)	5 (0.01)	0 (0.00)	11 (0.02)	45.5	1.2				
2021	11/ 11/100.0	11/ 11/100.0	./ 0/ .	10 (0.02)	1 (0.00)	0 (0.00)	11 (0.02)	9.1	10.0				
2022	9/ 11/ 81.8	9/ 11/ 81.8	./ 0/ .	9 (0.02)	0 (0.00)	0 (0.00)	9 (0.02)	0.0	.				

CT LAKE REGION 5-YEAR SUCCESS AND HARVEST TREND ANALYSIS
BASED ON 2018-2022 DATA

TREND	YEARS (N)	ANNUAL TREND	R SQUARE	PROB>F
ES SUCCESS RATE	5	-1.64	0.10	0.6070
AO SUCCESS RATE	0	.	.	.
ES ADULT BULLS/COW	3	2.75	0.38	0.5754
ES % COWS & CALVES	5	-0.91	0.01	0.9030

Table 2a. HISTORICAL NORTH REGION HUNTER SUCCESS AND HARVEST SUMMARY

YEAR	-- HARVEST/PERMITS ISSUED/SUCCESS RATE --			----- HARVEST (PER SQ.MILE) -----			----- -FOR ES PERMITS- -----		
	ALL PERMITS	ES PERMITS	AO PERMITS	AD. BULLS	AD. COWS	CALVES	TOTAL	% COW & CALF	AD. BULLS / COW
1989	18/ 21/ 85.7	18/ 21/ 85.7	./ 0/ .	13 (0.02)	5 (0.01)	0 (0.00)	18 (0.02)	27.8	2.6
1990	12/ 21/ 57.1	12/ 21/ 57.1	./ 0/ .	9 (0.01)	3 (0.00)	0 (0.00)	12 (0.02)	25.0	3.0
1991	23/ 26/ 88.5	23/ 26/ 88.5	./ 0/ .	16 (0.02)	6 (0.01)	1 (0.00)	23 (0.03)	30.4	2.7
1992	40/ 42/ 95.2	40/ 42/ 95.2	./ 0/ .	30 (0.04)	10 (0.01)	0 (0.00)	40 (0.05)	25.0	3.0
1993	53/ 55/ 96.4	53/ 55/ 96.4	./ 0/ .	37 (0.05)	12 (0.02)	3 (0.00)	53 (0.07)	30.8	3.1
1994	51/ 55/ 92.7	51/ 55/ 92.7	./ 0/ .	40 (0.05)	11 (0.01)	0 (0.00)	51 (0.07)	21.6	3.6
1995	79/ 85/ 92.9	79/ 85/ 92.9	./ 0/ .	56 (0.07)	21 (0.03)	2 (0.00)	79 (0.10)	29.1	2.7
1996	75/ 84/ 89.3	75/ 84/ 89.3	./ 0/ .	50 (0.06)	23 (0.03)	2 (0.00)	75 (0.10)	33.3	2.2
1997	96/100/ 96.0	87/ 90/ 96.7	9/ 10/ 90.0	66 (0.08)	28 (0.04)	2 (0.00)	96 (0.12)	24.1	3.3
1998	92/100/ 92.0	83/ 90/ 92.2	9/ 10/ 90.0	59 (0.08)	28 (0.04)	5 (0.01)	92 (0.12)	28.9	3.0
1999	86/100/ 86.0	80/ 90/ 88.9	6/ 10/ 60.0	56 (0.07)	30 (0.04)	0 (0.00)	86 (0.11)	31.3	2.2
2000	85/100/ 85.0	77/ 90/ 85.6	8/ 10/ 80.0	56 (0.07)	26 (0.03)	3 (0.00)	85 (0.11)	27.3	3.1
2001	89/ 99/ 89.9	80/ 89/ 89.9	9/ 10/ 90.0	64 (0.08)	23 (0.03)	2 (0.00)	89 (0.11)	21.3	4.2
2002	93/100/ 93.0	65/ 70/ 92.9	28/ 30/ 93.3	47 (0.06)	40 (0.05)	6 (0.01)	93 (0.12)	27.7	2.8
2003	89/ 99/ 89.9	65/ 69/ 94.2	24/ 30/ 80.0	56 (0.07)	31 (0.04)	3 (0.00)	89 (0.11)	15.2	5.6
2004	99/110/ 90.0	99/110/ 90.0	./ 0/ .	83 (0.11)	14 (0.02)	2 (0.00)	99 (0.13)	16.2	5.9
2005	102/111/ 91.9	102/111/ 91.9	./ 0/ .	67 (0.09)	31 (0.04)	4 (0.01)	102 (0.13)	34.3	2.2
2006	132/170/ 77.6	114/136/ 83.8	18/ 34/ 52.9	81 (0.10)	47 (0.06)	4 (0.01)	132 (0.17)	28.9	2.7
2007	137/170/ 80.6	115/134/ 85.8	22/ 36/ 61.1	86 (0.11)	44 (0.06)	7 (0.01)	137 (0.17)	26.1	3.4
2008	75/ 90/ 83.3	57/ 66/ 86.4	18/ 24/ 75.0	42 (0.05)	27 (0.03)	6 (0.01)	75 (0.10)	26.3	3.2
2009	83/ 91/ 91.2	61/ 65/ 93.8	22/ 26/ 84.6	38 (0.05)	39 (0.05)	6 (0.01)	83 (0.11)	37.7	1.9
2010	86/ 96/ 89.6	74/ 81/ 91.4	12/ 15/ 80.0	59 (0.08)	24 (0.03)	3 (0.00)	86 (0.11)	20.3	3.9
2011	74/ 98/ 75.5	63/ 84/ 75.0	11/ 14/ 78.6	50 (0.06)	22 (0.03)	2 (0.00)	74 (0.09)	20.6	4.2
2012	46/ 56/ 82.1	37/ 45/ 82.2	9/ 11/ 81.8	26 (0.03)	15 (0.02)	5 (0.01)	46 (0.06)	29.7	3.3
2013	45/ 52/ 86.5	37/ 42/ 88.1	8/ 10/ 80.0	22 (0.03)	16 (0.02)	7 (0.01)	45 (0.06)	43.2	1.6
2014	26/ 33/ 78.8	19/ 23/ 82.6	7/ 10/ 70.0	14 (0.02)	11 (0.01)	1 (0.00)	26 (0.03)	31.6	2.6
2015	31/ 38/ 81.6	24/ 28/ 85.7	7/ 10/ 70.0	19 (0.02)	12 (0.02)	0 (0.00)	31 (0.04)	20.8	3.8
2016	21/ 27/ 77.8	21/ 27/ 77.8	./ 0/ .	19 (0.02)	2 (0.00)	0 (0.00)	21 (0.03)	9.5	9.5
2017	12/ 17/ 70.6	12/ 17/ 70.6	./ 0/ .	7 (0.01)	4 (0.01)	1 (0.00)	12 (0.02)	41.7	1.8
2018	15/ 17/ 88.2	15/ 17/ 88.2	./ 0/ .	11 (0.01)	3 (0.00)	1 (0.00)	15 (0.02)	26.7	3.7
2019	13/ 15/ 86.7	13/ 15/ 86.7	./ 0/ .	11 (0.01)	2 (0.00)	0 (0.00)	13 (0.02)	15.4	5.5
2020	14/ 17/ 82.4	14/ 17/ 82.4	./ 0/ .	12 (0.02)	2 (0.00)	0 (0.00)	14 (0.02)	14.3	6.0
2021	13/ 15/ 86.7	13/ 15/ 86.7	./ 0/ .	10 (0.01)	1 (0.00)	2 (0.00)	13 (0.02)	23.1	10.0
2022	13/ 17/ 76.5	13/ 17/ 76.5	./ 0/ .	11 (0.01)	2 (0.00)	0 (0.00)	13 (0.02)	15.4	5.5

NORTH REGION 5-YEAR SUCCESS AND HARVEST TREND ANALYSIS
BASED ON 2018-2022 DATA

TREND	YEARS (N)	ANNUAL TREND	R SQUARE	PROB>F
ES SUCCESS RATE	5	-2.35	0.60	0.1215
AO SUCCESS RATE	0	.	.	.
ES ADULT BULLS/COW	5	0.82	0.31	0.3343
ES % COWS & CALVES	5	-1.49	0.18	0.4782

Table 2a. HISTORICAL W. MTN. REGION HUNTER SUCCESS AND HARVEST SUMMARY

YEAR	-- HARVEST/PERMITS ISSUED/SUCCESS RATE --			AD. BULLS	HARVEST (PER SQ.MILE)		TOTAL	-FOR ES PERMITS-	
	ALL PERMITS	ES PERMITS	AO PERMITS		AD. COWS	CALVES		% COW & CALF	AD. BULLS / COW
1989	27/ 36/ 75.0	27/ 36/ 75.0	. / 0/ .	14 (0.01)	10 (0.01)	3 (0.00)	27 (0.02)	48.1	1.4
1990	26/ 36/ 72.2	26/ 36/ 72.2	. / 0/ .	19 (0.01)	5 (0.00)	2 (0.00)	26 (0.01)	26.9	3.8
1991	34/ 36/ 94.4	34/ 36/ 94.4	. / 0/ .	23 (0.01)	9 (0.01)	2 (0.00)	34 (0.02)	32.4	2.6
1992	68/ 75/ 90.7	68/ 75/ 90.7	. / 0/ .	48 (0.03)	16 (0.01)	4 (0.00)	68 (0.04)	29.4	3.0
1993	103/120/ 85.8	103/120/ 85.8	. / 0/ .	69 (0.04)	26 (0.01)	6 (0.00)	103 (0.06)	33.7	2.7
1994	93/120/ 78.3	93/120/ 78.3	. / 0/ .	62 (0.03)	26 (0.01)	4 (0.00)	93 (0.05)	33.7	2.4
1995	122/145/ 84.1	122/145/ 84.1	. / 0/ .	89 (0.05)	24 (0.01)	9 (0.01)	122 (0.07)	27.0	3.7
1996	105/144/ 72.9	105/144/ 72.9	. / 0/ .	77 (0.04)	18 (0.01)	10 (0.01)	105 (0.06)	26.7	4.3
1997	124/170/ 72.9	124/170/ 72.9	. / 0/ .	78 (0.04)	40 (0.02)	6 (0.00)	124 (0.07)	37.1	2.0
1998	106/169/ 62.7	106/169/ 62.7	. / 0/ .	64 (0.04)	30 (0.02)	12 (0.01)	106 (0.06)	39.6	2.1
1999	103/170/ 60.6	103/170/ 60.6	. / 0/ .	62 (0.03)	37 (0.02)	4 (0.00)	103 (0.06)	39.8	1.7
2000	78/129/ 60.5	78/129/ 60.5	. / 0/ .	54 (0.03)	21 (0.01)	3 (0.00)	78 (0.04)	30.8	2.6
2001	87/130/ 66.9	87/130/ 66.9	. / 0/ .	54 (0.03)	26 (0.01)	7 (0.00)	87 (0.05)	37.9	2.1
2002	71/100/ 71.0	71/100/ 71.0	. / 0/ .	46 (0.03)	21 (0.01)	4 (0.00)	71 (0.04)	35.2	2.2
2003	70/ 98/ 71.4	70/ 98/ 71.4	. / 0/ .	50 (0.03)	20 (0.01)	0 (0.00)	70 (0.04)	28.6	2.5
2004	83/115/ 72.2	83/115/ 72.2	. / 0/ .	61 (0.03)	19 (0.01)	3 (0.00)	83 (0.05)	26.5	3.2
2005	87/116/ 75.0	87/116/ 75.0	. / 0/ .	58 (0.03)	26 (0.01)	3 (0.00)	87 (0.05)	33.3	2.2
2006	80/144/ 55.6	80/144/ 55.6	. / 0/ .	58 (0.03)	15 (0.01)	7 (0.00)	80 (0.04)	27.5	3.9
2007	91/146/ 62.3	91/146/ 62.3	. / 0/ .	71 (0.04)	18 (0.01)	2 (0.00)	91 (0.05)	22.0	3.9
2008	70/150/ 46.7	46/ 95/ 48.4	24/ 55/ 43.6	30 (0.02)	33 (0.02)	7 (0.00)	70 (0.04)	39.1	1.9
2009	71/150/ 47.3	52/ 95/ 54.7	19/ 55/ 34.5	38 (0.02)	28 (0.02)	5 (0.00)	71 (0.04)	28.8	2.8
2010	48/ 67/ 71.6	44/ 62/ 71.0	4/ 5/ 80.0	38 (0.02)	8 (0.00)	2 (0.00)	48 (0.03)	13.6	9.5
2011	54/ 68/ 79.4	49/ 63/ 77.8	5/ 5/100.0	37 (0.02)	14 (0.01)	3 (0.00)	54 (0.03)	24.5	4.1
2012	35/ 55/ 63.6	29/ 45/ 64.4	6/ 10/ 60.0	24 (0.01)	11 (0.01)	0 (0.00)	35 (0.02)	17.2	4.8
2013	47/ 58/ 81.0	40/ 48/ 83.3	7/ 10/ 70.0	33 (0.02)	12 (0.01)	2 (0.00)	47 (0.03)	17.5	5.5
2014	21/ 33/ 63.6	16/ 22/ 72.7	5/ 11/ 45.5	12 (0.01)	7 (0.00)	2 (0.00)	21 (0.01)	25.0	3.0
2015	18/ 30/ 60.0	13/ 20/ 65.0	5/ 10/ 50.0	10 (0.01)	7 (0.00)	1 (0.00)	18 (0.01)	30.8	3.0
2016	13/ 19/ 68.4	13/ 19/ 68.4	. / 0/ .	11 (0.01)	2 (0.00)	0 (0.00)	13 (0.01)	15.4	5.5
2017	11/ 16/ 68.8	11/ 16/ 68.8	. / 0/ .	7 (0.00)	4 (0.00)	0 (0.00)	11 (0.01)	36.4	1.8
2018	10/ 15/ 66.7	10/ 15/ 66.7	. / 0/ .	7 (0.00)	3 (0.00)	0 (0.00)	10 (0.01)	30.0	2.3
2019	7/ 10/ 70.0	7/ 10/ 70.0	. / 0/ .	5 (0.00)	2 (0.00)	0 (0.00)	7 (0.00)	28.6	2.5
2020	6/ 10/ 60.0	6/ 10/ 60.0	. / 0/ .	4 (0.00)	2 (0.00)	0 (0.00)	6 (0.00)	33.3	2.0
2021	6/ 10/ 60.0	6/ 10/ 60.0	. / 0/ .	4 (0.00)	2 (0.00)	0 (0.00)	6 (0.00)	33.3	2.0
2022	4/ 10/ 40.0	4/ 10/ 40.0	. / 0/ .	2 (0.00)	2 (0.00)	0 (0.00)	4 (0.00)	50.0	1.0

W. MTN. REGION 5-YEAR SUCCESS AND HARVEST TREND ANALYSIS
 BASED ON 2018-2022 DATA

TREND	YEARS (N)	ANNUAL TREND	R SQUARE	PROB>F
ES SUCCESS RATE	5	-6.33	0.74	0.0615
AO SUCCESS RATE	0	.	.	.
ES ADULT BULLS/COW	5	-0.32	0.74	0.0615
ES % COWS & CALVES	5	4.48	0.67	0.0880

Table 2a. HISTORICAL CENTRAL REGION HUNTER SUCCESS AND HARVEST SUMMARY

YEAR	-- HARVEST/PERMITS ISSUED/SUCCESS RATE --								HARVEST (PER SQ.MILE)			-FOR ES PERMITS-			
	ALL PERMITS			ES PERMITS			AO PERMITS		AD. BULLS	AD. COWS	CALVES	TOTAL	% COW & CALF	AD. BULLS / COW	
1989	2/	3/	66.7	2/	3/	66.7	./	0/	.	1 (0.00)	1 (0.00)	0 (0.00)	2 (0.00)	50.0	1.0
1990	2/	3/	66.7	2/	3/	66.7	./	0/	.	2 (0.00)	0 (0.00)	0 (0.00)	2 (0.00)	0.0	.
1991	6/	8/	75.0	6/	8/	75.0	./	0/	.	4 (0.00)	1 (0.00)	1 (0.00)	6 (0.00)	33.3	4.0
1992	14/	18/	77.8	14/	18/	77.8	./	0/	.	12 (0.00)	1 (0.00)	1 (0.00)	14 (0.00)	14.3	12.0
1993	44/	62/	74.2	44/	62/	74.2	./	0/	.	32 (0.01)	10 (0.00)	2 (0.00)	44 (0.02)	27.3	3.2
1994	56/100/		61.0	56/100/		61.0	./	0/	.	39 (0.01)	13 (0.00)	4 (0.00)	56 (0.02)	30.4	3.0
1995	60/105/		62.9	60/105/		62.9	./	0/	.	36 (0.01)	21 (0.01)	3 (0.00)	60 (0.02)	40.0	1.7
1996	67/100/		67.0	67/100/		67.0	./	0/	.	45 (0.02)	20 (0.01)	2 (0.00)	67 (0.02)	32.8	2.3
1997	67/100/		67.0	67/100/		67.0	./	0/	.	51 (0.02)	11 (0.00)	5 (0.00)	67 (0.02)	23.9	4.6
1998	62/100/		62.0	62/100/		62.0	./	0/	.	47 (0.02)	13 (0.00)	2 (0.00)	62 (0.02)	24.2	3.6
1999	71/100/		71.0	71/100/		71.0	./	0/	.	45 (0.02)	21 (0.01)	5 (0.00)	71 (0.03)	36.6	2.1
2000	79/134/		59.0	79/134/		59.0	./	0/	.	57 (0.02)	21 (0.01)	1 (0.00)	79 (0.03)	27.8	2.7
2001	88/135/		65.2	88/135/		65.2	./	0/	.	65 (0.02)	18 (0.01)	5 (0.00)	88 (0.03)	26.1	3.6
2002	89/141/		63.1	89/141/		63.1	./	0/	.	58 (0.02)	29 (0.01)	2 (0.00)	89 (0.03)	34.8	2.0
2003	101/140/		72.1	101/140/		72.1	./	0/	.	71 (0.03)	28 (0.01)	2 (0.00)	101 (0.04)	29.7	2.5
2004	84/140/		60.0	84/140/		60.0	./	0/	.	62 (0.02)	20 (0.01)	2 (0.00)	84 (0.03)	26.2	3.1
2005	98/138/		71.0	98/138/		71.0	./	0/	.	70 (0.02)	25 (0.01)	3 (0.00)	98 (0.03)	28.6	2.8
2006	101/163/		62.0	101/163/		62.0	./	0/	.	66 (0.02)	32 (0.01)	3 (0.00)	101 (0.04)	34.7	2.1
2007	97/158/		61.4	97/158/		61.4	./	0/	.	75 (0.03)	19 (0.01)	3 (0.00)	97 (0.03)	22.7	3.9
2008	110/161/		68.3	110/161/		68.3	./	0/	.	75 (0.03)	32 (0.01)	3 (0.00)	110 (0.04)	31.8	2.3
2009	99/160/		61.9	99/160/		61.9	./	0/	.	69 (0.02)	24 (0.01)	6 (0.00)	99 (0.04)	30.3	2.9
2010	72/108/		66.7	72/108/		66.7	./	0/	.	48 (0.02)	23 (0.01)	1 (0.00)	72 (0.03)	33.3	2.1
2011	71/113/		62.8	71/113/		62.8	./	0/	.	52 (0.02)	19 (0.01)	0 (0.00)	71 (0.03)	26.8	2.7
2012	44/ 84/	52.4		29/ 44/	65.9		15/ 40/	37.5		23 (0.01)	19 (0.01)	2 (0.00)	44 (0.02)	20.7	3.8
2013	41/ 85/	48.2		25/ 45/	55.6		16/ 40/	40.0		16 (0.01)	22 (0.01)	3 (0.00)	41 (0.01)	36.0	2.0
2014	17/ 25/	68.0		14/ 20/	70.0		3/ 5/	60.0		11 (0.00)	6 (0.00)	0 (0.00)	17 (0.01)	21.4	3.7
2015	9/ 10/	90.0		9/ 10/	90.0		./ 0/	.		6 (0.00)	3 (0.00)	0 (0.00)	9 (0.00)	33.3	2.0
2016	3/ 6/	50.0		3/ 6/	50.0		./ 0/	.		3 (0.00)	0 (0.00)	0 (0.00)	3 (0.00)	0.0	.
2017	6/ 6/100.0			6/ 6/100.0			./ 0/	.		4 (0.00)	2 (0.00)	0 (0.00)	6 (0.00)	33.3	2.0
2018	5/ 6/	83.3		5/ 6/	83.3		./ 0/	.		5 (0.00)	0 (0.00)	0 (0.00)	5 (0.00)	0.0	.
2019	3/ 6/	50.0		3/ 6/	50.0		./ 0/	.		2 (0.00)	1 (0.00)	0 (0.00)	3 (0.00)	33.3	2.0
2020	4/ 6/	66.7		4/ 6/	66.7		./ 0/	.		4 (0.00)	0 (0.00)	0 (0.00)	4 (0.00)	0.0	.
2021	./ 0/	.		./ 0/	.		./ 0/	.		. (.)	. (.)	. (.)	. (.)	.	.
2022	./ 0/	.		./ 0/	.		./ 0/	.		. (.)	. (.)	. (.)	. (.)	.	.

Note: Harvest prior to 1996 based on old unit boundaries.

CENTRAL REGION 5-YEAR SUCCESS AND HARVEST TREND ANALYSIS
BASED ON 2018-2022 DATA

TREND	YEARS (N)	ANNUAL TREND	R SQUARE	PROB>F
ES SUCCESS RATE	3	-8.33	0.25	0.6667
AO SUCCESS RATE	0	.	.	.
ES ADULT BULLS/COW	.	.	.	.
ES % COWS & CALVES	3	0.00	0.00	1.0000

Table 2a. HISTORICAL S. WEST REGION HUNTER SUCCESS AND HARVEST SUMMARY

YEAR	-- HARVEST/PERMITS ISSUED/SUCCESS RATE --			----- HARVEST (PER SQ.MILE) -----				-FOR ES PERMITS-	
	ALL PERMITS	ES PERMITS	AO PERMITS	AD. BULLS	AD. COWS	CALVES	TOTAL	% COW & CALF	AD. BULLS / COW
1989	. / 0/ .	. / 0/ .	. / 0/ .	. (.)	. (.)	. (.)	. (.)	.	.
1990	. / 0/ .	. / 0/ .	. / 0/ .	. (.)	. (.)	. (.)	. (.)	.	.
1991	. / 0/ .	. / 0/ .	. / 0/ .	. (.)	. (.)	. (.)	. (.)	.	.
1992	. / 0/ .	. / 0/ .	. / 0/ .	. (.)	. (.)	. (.)	. (.)	.	.
1993	2/ 0/ .	2/ 0/ .	. / 0/ .	2 (0.00)	. (.)	. (.)	2 (0.00)	.	.
1994	18/ 30/ 43.3	18/ 30/ 43.3	. / 0/ .	13 (0.01)	3 (0.00)	2 (0.00)	18 (0.02)	27.8	4.3
1995	18/ 30/ 43.3	18/ 30/ 43.3	. / 0/ .	12 (0.01)	4 (0.00)	1 (0.00)	18 (0.02)	35.3	3.0
1996	21/ 35/ 60.0	21/ 35/ 60.0	. / 0/ .	16 (0.01)	4 (0.00)	1 (0.00)	21 (0.02)	23.8	4.0
1997	17/ 35/ 48.6	17/ 35/ 48.6	. / 0/ .	7 (0.01)	5 (0.00)	5 (0.00)	17 (0.01)	58.8	1.4
1998	22/ 35/ 62.9	22/ 35/ 62.9	. / 0/ .	13 (0.01)	7 (0.01)	2 (0.00)	22 (0.02)	40.9	1.9
1999	22/ 35/ 62.9	22/ 35/ 62.9	. / 0/ .	18 (0.02)	3 (0.00)	1 (0.00)	22 (0.02)	18.2	6.0
2000	17/ 35/ 48.6	17/ 35/ 48.6	. / 0/ .	12 (0.01)	5 (0.00)	0 (0.00)	17 (0.01)	29.4	2.4
2001	28/ 35/ 80.0	28/ 35/ 80.0	. / 0/ .	20 (0.02)	6 (0.01)	2 (0.00)	28 (0.02)	28.6	3.3
2002	19/ 34/ 55.9	19/ 34/ 55.9	. / 0/ .	15 (0.01)	3 (0.00)	1 (0.00)	19 (0.02)	21.1	5.0
2003	24/ 35/ 68.6	24/ 35/ 68.6	. / 0/ .	18 (0.02)	5 (0.00)	1 (0.00)	24 (0.02)	25.0	3.6
2004	14/ 30/ 46.7	14/ 30/ 46.7	. / 0/ .	11 (0.01)	3 (0.00)	0 (0.00)	14 (0.01)	21.4	3.7
2005	16/ 30/ 53.3	16/ 30/ 53.3	. / 0/ .	12 (0.01)	4 (0.00)	0 (0.00)	16 (0.01)	25.0	3.0
2006	10/ 25/ 40.0	10/ 25/ 40.0	. / 0/ .	7 (0.01)	3 (0.00)	0 (0.00)	10 (0.01)	30.0	2.3
2007	11/ 25/ 44.0	11/ 25/ 44.0	. / 0/ .	9 (0.01)	2 (0.00)	0 (0.00)	11 (0.01)	18.2	4.5
2008	9/ 20/ 45.0	9/ 20/ 45.0	. / 0/ .	8 (0.01)	1 (0.00)	0 (0.00)	9 (0.01)	11.1	8.0
2009	9/ 19/ 47.4	9/ 19/ 47.4	. / 0/ .	6 (0.01)	3 (0.00)	0 (0.00)	9 (0.01)	33.3	2.0
2010	12/ 21/ 57.1	12/ 21/ 57.1	. / 0/ .	3 (0.00)	8 (0.01)	1 (0.00)	12 (0.01)	75.0	0.4
2011	13/ 20/ 65.0	13/ 20/ 65.0	. / 0/ .	9 (0.01)	3 (0.00)	1 (0.00)	13 (0.01)	30.8	3.0
2012	10/ 20/ 50.0	10/ 20/ 50.0	. / 0/ .	6 (0.01)	4 (0.00)	0 (0.00)	10 (0.01)	40.0	1.5
2013	8/ 20/ 40.0	8/ 20/ 40.0	. / 0/ .	5 (0.00)	2 (0.00)	1 (0.00)	8 (0.01)	37.5	2.5
2014	4/ 5/ 80.0	4/ 5/ 80.0	. / 0/ .	2 (0.00)	2 (0.00)	0 (0.00)	4 (0.00)	50.0	1.0
2015	2/ 5/ 40.0	2/ 5/ 40.0	. / 0/ .	0 (0.00)	2 (0.00)	0 (0.00)	2 (0.00)	100.0	0.0
2016	3/ 5/ 60.0	3/ 5/ 60.0	. / 0/ .	1 (0.00)	2 (0.00)	0 (0.00)	3 (0.00)	66.7	0.5
2017	. / 0/ .	. / 0/ .	. / 0/ .	. (.)	. (.)	. (.)	. (.)	.	.
2018	. / 0/ .	. / 0/ .	. / 0/ .	. (.)	. (.)	. (.)	. (.)	.	.
2019	2/ 3/ 66.7	2/ 3/ 66.7	. / 0/ .	2 (0.00)	0 (0.00)	0 (0.00)	2 (0.00)	0.0	.
2020	1/ 3/ 33.3	1/ 3/ 33.3	. / 0/ .	1 (0.00)	0 (0.00)	0 (0.00)	1 (0.00)	0.0	.
2021	. / 0/ .	. / 0/ .	. / 0/ .	. (.)	. (.)	. (.)	. (.)	.	.
2022	. / 0/ .	. / 0/ .	. / 0/ .	. (.)	. (.)	. (.)	. (.)	.	.

Note: Harvest prior to 1996 based on old unit boundaries.

S. WEST REGION 5-YEAR SUCCESS AND HARVEST TREND ANALYSIS
BASED ON 2018-2022 DATA

TREND	YEARS (N)	ANNUAL TREND	R SQUARE	PROB>F
ES SUCCESS RATE	2	-33.33	1.00	.
AO SUCCESS RATE	0	.	.	.
ES ADULT BULLS/COW	.	.	.	.
ES % COWS & CALVES	.	.	.	.

Table 2a. HISTORICAL S. EAST REGION HUNTER SUCCESS AND HARVEST SUMMARY

YEAR	-- HARVEST/PERMITS ISSUED/SUCCESS RATE --			----- HARVEST (PER SQ.MILE) -----				-FOR ES PERMITS-	
	ALL PERMITS	ES PERMITS	AO PERMITS	AD. BULLS	AD. COWS	CALVES	TOTAL	% COW & CALF	AD. BULLS / COW
1989	. / 0/ .	. / 0/ .	. / 0/ .	. (.)	. (.)	. (.)	. (.)	.	.
1990	. / 0/ .	. / 0/ .	. / 0/ .	. (.)	. (.)	. (.)	. (.)	.	.
1991	. / 0/ .	. / 0/ .	. / 0/ .	. (.)	. (.)	. (.)	. (.)	.	.
1992	. / 0/ .	. / 0/ .	. / 0/ .	. (.)	. (.)	. (.)	. (.)	.	.
1993	. / 0/ .	. / 0/ .	. / 0/ .	. (.)	. (.)	. (.)	. (.)	.	.
1994	9/ 20/ 45.0	9/ 20/ 45.0	. / 0/ .	4 (0.00)	5 (0.01)	0 (0.00)	9 (0.01)	55.6	0.8
1995	9/ 30/ 26.7	9/ 30/ 26.7	. / 0/ .	5 (0.01)	2 (0.00)	2 (0.00)	9 (0.01)	44.4	2.5
1996	11/ 30/ 36.7	11/ 30/ 36.7	. / 0/ .	7 (0.01)	3 (0.00)	1 (0.00)	11 (0.01)	36.4	2.3
1997	13/ 40/ 32.5	13/ 40/ 32.5	. / 0/ .	9 (0.01)	3 (0.00)	1 (0.00)	13 (0.01)	30.8	3.0
1998	14/ 40/ 35.0	14/ 40/ 35.0	. / 0/ .	8 (0.01)	5 (0.01)	1 (0.00)	14 (0.01)	42.9	1.6
1999	15/ 40/ 37.5	15/ 40/ 37.5	. / 0/ .	7 (0.01)	7 (0.01)	1 (0.00)	15 (0.02)	53.3	1.0
2000	19/ 58/ 32.8	19/ 58/ 32.8	. / 0/ .	9 (0.01)	8 (0.01)	2 (0.00)	19 (0.02)	52.6	1.1
2001	19/ 60/ 31.7	19/ 60/ 31.7	. / 0/ .	12 (0.01)	7 (0.01)	0 (0.00)	19 (0.02)	36.8	1.7
2002	12/ 34/ 35.3	12/ 34/ 35.3	. / 0/ .	5 (0.01)	6 (0.01)	1 (0.00)	12 (0.01)	58.3	0.8
2003	7/ 35/ 20.0	7/ 35/ 20.0	. / 0/ .	3 (0.00)	3 (0.00)	1 (0.00)	7 (0.01)	57.1	1.0
2004	9/ 20/ 45.0	9/ 20/ 45.0	. / 0/ .	3 (0.00)	4 (0.00)	2 (0.00)	9 (0.01)	66.7	0.8
2005	5/ 19/ 26.3	5/ 19/ 26.3	. / 0/ .	2 (0.00)	2 (0.00)	1 (0.00)	5 (0.01)	60.0	1.0
2006	5/ 19/ 26.3	5/ 19/ 26.3	. / 0/ .	4 (0.00)	0 (0.00)	1 (0.00)	5 (0.01)	20.0	.
2007	6/ 20/ 30.0	6/ 20/ 30.0	. / 0/ .	2 (0.00)	3 (0.00)	1 (0.00)	6 (0.01)	66.7	0.7
2008	6/ 16/ 37.5	6/ 16/ 37.5	. / 0/ .	3 (0.00)	3 (0.00)	0 (0.00)	6 (0.01)	50.0	1.0
2009	7/ 15/ 46.7	7/ 15/ 46.7	. / 0/ .	4 (0.00)	2 (0.00)	1 (0.00)	7 (0.01)	42.9	2.0
2010	9/ 20/ 45.0	9/ 20/ 45.0	. / 0/ .	5 (0.01)	3 (0.00)	1 (0.00)	9 (0.01)	44.4	1.7
2011	5/ 20/ 25.0	5/ 20/ 25.0	. / 0/ .	2 (0.00)	2 (0.00)	1 (0.00)	5 (0.01)	60.0	1.0
2012	7/ 20/ 35.0	7/ 20/ 35.0	. / 0/ .	4 (0.00)	1 (0.00)	2 (0.00)	7 (0.01)	42.9	4.0
2013	5/ 20/ 25.0	5/ 20/ 25.0	. / 0/ .	1 (0.00)	4 (0.00)	0 (0.00)	5 (0.01)	80.0	0.3
2014	2/ 5/ 40.0	2/ 5/ 40.0	. / 0/ .	1 (0.00)	0 (0.00)	1 (0.00)	2 (0.00)	50.0	.
2015	. / 5/ .	. / 5/ .	. / 0/ .	0 (0.00)	0 (0.00)	0 (0.00)	. (.)	.	.
2016	2/ 4/ 50.0	2/ 4/ 50.0	. / 0/ .	2 (0.00)	0 (0.00)	0 (0.00)	2 (0.00)	0.0	.
2017	. / 5/ .	. / 5/ .	. / 0/ .	0 (0.00)	0 (0.00)	0 (0.00)	. (.)	.	.
2018	2/ 5/ 40.0	2/ 5/ 40.0	. / 0/ .	2 (0.00)	0 (0.00)	0 (0.00)	2 (0.00)	0.0	.
2019	2/ 5/ 40.0	2/ 5/ 40.0	. / 0/ .	2 (0.00)	0 (0.00)	0 (0.00)	2 (0.00)	0.0	.
2020	3/ 5/ 60.0	3/ 5/ 60.0	. / 0/ .	2 (0.00)	1 (0.00)	0 (0.00)	3 (0.00)	33.3	2.0
2021	. / 5/ .	. / 5/ .	. / 0/ .	0 (0.00)	0 (0.00)	0 (0.00)	. (.)	.	.
2022	1/ 5/ 20.0	1/ 5/ 20.0	. / 0/ .	1 (0.00)	0 (0.00)	0 (0.00)	1 (0.00)	0.0	.

Note: Harvest prior to 1996 based on old unit boundaries.

S. EAST REGION 5-YEAR SUCCESS AND HARVEST TREND ANALYSIS
BASED ON 2018-2022 DATA

TREND	YEARS (N)	ANNUAL TREND	R SQUARE	PROB>F
ES SUCCESS RATE	4	-4.57	0.23	0.5219
AO SUCCESS RATE	0	.	.	.
ES ADULT BULLS/COW	.	.	.	.
ES % COWS & CALVES	4	0.95	0.01	0.9024

Table 2a. HISTORICAL OVERALL REGION HUNTER SUCCESS AND HARVEST SUMMARY

YEAR	-- HARVEST/PERMITS ISSUED/SUCCESS RATE --			AD. BULLS	HARVEST (PER SQ.MILE)		TOTAL	-FOR ES PERMITS-	
	ALL PERMITS	ES PERMITS	AO PERMITS		AD. COWS	CALVES		% COW & CALF	AD. BULLS / COW
1989	59/ 75/ 78.7	59/ 75/ 78.7	./ 0/ .	33 (0.00)	22 (0.00)	4 (0.00)	59 (0.01)	44.1	1.5
1990	53/ 75/ 70.7	53/ 75/ 70.7	./ 0/ .	39 (0.00)	11 (0.00)	3 (0.00)	53 (0.01)	26.4	3.5
1991	89/100/ 89.0	89/100/ 89.0	./ 0/ .	64 (0.01)	20 (0.00)	5 (0.00)	89 (0.01)	28.1	3.2
1992	172/190/ 90.5	172/190/ 90.5	./ 0/ .	117 (0.01)	48 (0.01)	7 (0.00)	172 (0.02)	32.0	2.4
1993	281/317/ 88.6	281/317/ 88.6	./ 0/ .	188 (0.02)	76 (0.01)	14 (0.00)	281 (0.03)	33.5	2.5
1994	305/405/ 75.3	305/405/ 75.3	./ 0/ .	204 (0.03)	84 (0.01)	16 (0.00)	305 (0.04)	33.2	2.4
1995	384/495/ 77.6	384/495/ 77.6	./ 0/ .	256 (0.03)	105 (0.01)	22 (0.00)	384 (0.05)	33.4	2.4
1996	374/493/ 75.9	374/493/ 75.9	./ 0/ .	257 (0.03)	96 (0.01)	20 (0.00)	374 (0.05)	31.4	2.7
1997	428/569/ 75.2	373/505/ 73.9	55/ 64/ 85.9	248 (0.03)	152 (0.02)	28 (0.00)	428 (0.05)	33.8	2.4
1998	407/569/ 71.5	353/504/ 70.0	54/ 65/ 83.1	235 (0.03)	139 (0.02)	33 (0.00)	407 (0.05)	34.3	2.4
1999	406/570/ 71.2	353/505/ 69.9	53/ 65/ 81.5	227 (0.03)	155 (0.02)	24 (0.00)	406 (0.05)	36.0	2.0
2000	378/581/ 65.1	329/516/ 63.8	49/ 65/ 75.4	225 (0.03)	138 (0.02)	15 (0.00)	378 (0.05)	32.2	2.4
2001	419/584/ 71.7	366/519/ 70.5	53/ 65/ 81.5	250 (0.03)	144 (0.02)	25 (0.00)	419 (0.05)	32.0	2.5
2002	355/484/ 73.3	308/434/ 71.0	47/ 50/ 94.0	209 (0.03)	127 (0.02)	19 (0.00)	355 (0.04)	32.5	2.3
2003	362/482/ 75.1	320/432/ 74.1	42/ 50/ 84.0	238 (0.03)	118 (0.01)	8 (0.00)	362 (0.04)	26.4	2.9
2004	388/522/ 74.3	371/503/ 73.8	17/ 19/ 89.5	280 (0.03)	96 (0.01)	12 (0.00)	388 (0.05)	24.8	3.4
2005	408/526/ 77.6	391/506/ 77.3	17/ 20/ 85.0	269 (0.03)	125 (0.02)	14 (0.00)	408 (0.05)	31.2	2.5
2006	449/673/ 66.7	396/589/ 67.2	53/ 84/ 63.1	268 (0.03)	157 (0.02)	24 (0.00)	449 (0.06)	32.3	2.4
2007	482/678/ 71.1	420/592/ 70.9	62/ 86/ 72.1	310 (0.04)	150 (0.02)	22 (0.00)	482 (0.06)	26.4	3.2
2008	333/516/ 64.5	259/397/ 65.2	74/119/ 62.2	180 (0.02)	132 (0.02)	21 (0.00)	333 (0.04)	31.7	2.5
2009	341/521/ 65.5	269/400/ 67.3	72/121/ 59.5	188 (0.02)	130 (0.02)	23 (0.00)	341 (0.04)	31.2	2.6
2010	302/399/ 75.7	267/354/ 75.4	35/ 45/ 77.8	200 (0.02)	93 (0.01)	9 (0.00)	302 (0.04)	25.5	3.2
2011	290/408/ 71.1	258/364/ 70.9	32/ 44/ 72.7	191 (0.02)	89 (0.01)	10 (0.00)	290 (0.04)	26.0	3.3
2012	179/281/ 63.7	135/200/ 67.5	44/ 81/ 54.3	101 (0.01)	66 (0.01)	12 (0.00)	179 (0.02)	26.7	3.2
2013	180/280/ 64.3	135/201/ 67.2	45/ 79/ 57.0	91 (0.01)	73 (0.01)	16 (0.00)	180 (0.02)	34.1	2.3
2014	91/127/ 71.7	72/ 96/ 75.0	19/ 31/ 61.3	56 (0.01)	31 (0.00)	4 (0.00)	91 (0.01)	23.6	3.7
2015	74/108/ 68.5	62/ 88/ 70.5	12/ 20/ 60.0	46 (0.01)	27 (0.00)	1 (0.00)	74 (0.01)	27.4	2.8
2016	52/ 72/ 72.2	52/ 72/ 72.2	./ 0/ .	45 (0.01)	7 (0.00)	0 (0.00)	52 (0.01)	13.5	6.4
2017	37/ 54/ 68.5	37/ 54/ 68.5	./ 0/ .	25 (0.00)	11 (0.00)	1 (0.00)	37 (0.00)	32.4	2.3
2018	41/ 53/ 77.4	41/ 53/ 77.4	./ 0/ .	34 (0.00)	6 (0.00)	1 (0.00)	41 (0.01)	17.1	5.7
2019	38/ 50/ 76.0	38/ 50/ 76.0	./ 0/ .	31 (0.00)	7 (0.00)	0 (0.00)	38 (0.00)	18.4	4.4
2020	39/ 52/ 75.0	39/ 52/ 75.0	./ 0/ .	29 (0.00)	10 (0.00)	0 (0.00)	39 (0.00)	25.6	2.9
2021	30/ 41/ 73.2	30/ 41/ 73.2	./ 0/ .	24 (0.00)	4 (0.00)	2 (0.00)	30 (0.00)	20.0	6.0
2022	27/ 43/ 62.8	27/ 43/ 62.8	./ 0/ .	23 (0.00)	4 (0.00)	0 (0.00)	27 (0.00)	14.8	5.8

OVERALL REGION 5-YEAR SUCCESS AND HARVEST TREND ANALYSIS
BASED ON 2018-2022 DATA

TREND	YEARS (N)	ANNUAL TREND	R SQUARE	PROB>F
ES SUCCESS RATE	5	-3.20	0.75	0.0575
AO SUCCESS RATE	0	.	.	.
ES ADULT BULLS/COW	5	0.17	0.04	0.7323
ES % COWS & CALVES	5	-0.29	0.01	0.8553

Table 2b. HISTORICAL CT LAKE REGION ADULT BULL BIOLOGICAL SUMMARY BY AGE CLASS

(BASED ON ROLLING 5-YEAR BLOCKS OF HARVEST DATA)

YEARS	---ANTLER BEAM DIAMETER---						-----ANTLER SPREAD-----						-----TOTAL POINTS-----						-----WEIGHT-----						PERCENT AD. BULLS AGE 1.5
	---1.5---		-2.5-4.5		--5.5+--		---1.5---		-2.5-4.5		--5.5+--		---1.5---		-2.5-4.5		--5.5+--		---1.5---		-2.5-4.5-		---5.5+--		
	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	
1993-97	50	37.1	134	48.8	65	60.7	47	24.1	133	40.7	65	53.2	50	4.9	132	11.3	65	16.1	45	481.9	121	668.1	58	809.8	20.3
1994-98	53	38.0	132	48.5	59	60.7	49	25.0	129	40.3	58	53.6	52	5.3	132	11.3	60	17.0	48	489.0	121	661.2	54	804.1	21.9
1995-99	53	37.2	135	48.9	50	61.4	49	24.8	131	40.4	49	54.1	52	5.3	134	11.4	51	17.0	48	492.5	121	662.8	46	798.4	22.5
1996-00	49	37.3	126	48.4	43	61.3	46	24.3	122	40.3	42	54.3	48	5.7	125	11.8	44	17.7	45	492.9	112	658.0	40	787.1	22.4
1997-01	41	37.9	110	48.7	40	61.1	38	25.2	108	39.8	39	54.2	40	6.2	110	11.7	41	17.8	39	479.5	94	650.7	37	782.8	21.4
1998-02	39	36.1	109	49.0	43	62.2	38	24.4	108	39.7	42	53.9	38	6.1	110	11.9	44	17.4	35	480.3	94	657.7	41	786.7	20.2
1999-03	35	35.0	109	48.6	44	62.0	33	24.2	110	39.2	44	52.3	35	5.7	110	11.8	44	16.4	31	464.7	94	661.3	41	776.0	18.5
2000-04	37	34.3	117	49.3	54	62.0	34	23.7	118	40.1	54	52.0	37	5.2	118	12.2	54	16.5	35	461.7	102	670.0	49	775.4	18.1
2001-05	49	34.3	116	49.4	63	62.2	44	23.8	116	39.9	63	52.2	48	4.5	116	12.1	63	16.8	46	456.3	100	671.2	55	781.7	22.3
2002-06	55	34.5	120	49.6	70	62.1	50	23.3	120	40.3	68	51.6	54	4.6	120	12.0	70	16.5	51	462.5	108	673.7	61	778.5	23.2
2003-07	55	33.6	132	48.9	87	60.2	50	22.5	131	40.0	86	51.9	54	4.3	131	11.7	87	16.2	51	454.4	119	663.2	76	761.0	20.8
2004-08	53	33.9	126	48.3	76	60.0	50	22.3	125	39.9	75	52.0	52	4.4	125	11.5	76	16.2	49	457.0	113	656.6	66	753.4	21.5
2005-09	47	34.1	110	47.1	71	59.4	44	23.1	109	38.5	69	51.7	46	4.5	109	10.9	71	15.9	43	453.5	101	641.0	62	749.5	21.4
2006-10	36	34.8	109	47.5	72	59.2	35	23.7	109	38.8	70	52.0	36	4.8	109	11.0	72	15.8	33	458.9	103	634.0	66	737.5	16.7
2007-11	29	34.3	105	46.5	71	58.9	28	23.9	106	38.1	70	51.8	29	4.6	106	10.9	71	15.5	26	448.3	98	622.4	63	734.0	14.3
2008-12	25	35.0	85	46.3	47	59.3	23	24.4	86	38.1	45	50.7	25	4.7	86	11.1	47	15.7	24	442.9	80	616.5	41	728.7	16.1
2009-13	21	34.5	77	46.3	51	59.1	19	24.6	78	37.9	49	50.5	21	4.5	78	11.0	51	15.6	20	438.0	74	613.3	45	735.0	14.4
2010-14	17	35.4	68	46.2	48	58.6	16	23.8	69	37.9	47	50.6	17	4.6	69	11.1	48	15.2	15	435.3	65	613.5	43	734.4	12.5
2011-15	12	32.6	51	44.9	35	58.0	11	21.2	52	37.5	34	49.6	12	3.9	52	10.8	35	14.9	10	402.5	49	606.8	31	744.5	12.0
2012-16	10	29.3	34	45.2	23	56.9	9	18.2	34	37.9	23	50.1	10	3.1	34	11.2	23	15.6	9	395.6	32	610.6	23	752.2	14.7
2013-17	7	31.3	27	45.4	22	57.3	7	20.4	27	38.4	22	50.9	7	3.9	27	11.5	22	15.7	7	437.9	25	622.4	23	761.5	12.3
2014-18	8	30.1	28	46.0	16	57.4	8	19.8	28	39.3	16	51.6	8	3.6	28	12.3	16	15.9	8	426.9	24	619.0	16	773.4	15.4
2015-19	6	28.5	25	46.3	13	55.5	6	18.1	26	39.6	13	49.8	6	3.5	26	12.7	13	15.8	6	414.2	23	619.7	12	753.2	13.3
2016-20	4	26.3	25	46.4	10	55.8	4	17.0	26	38.8	10	50.7	4	3.3	26	12.5	10	15.7	4	421.3	23	642.3	9	757.1	10.0
2017-21	5	34.2	24	49.2	11	56.4	5	23.8	25	40.2	11	51.2	5	4.8	25	12.8	11	15.6	5	484.0	23	658.2	10	746.9	12.2
2018-22	4	33.8	26	48.7	12	55.0	4	23.1	27	39.8	12	51.4	4	4.3	27	12.0	12	15.4	4	477.5	24	658.7	9	742.1	9.3

CT LAKE REGION 5-YEAR AND 10-YEAR ADULT BULL BIOLOGICAL DATA TREND ANALYSIS

(Note: PROB>F=0.0000 indicates PROB>F that is <0.0001)

TREND	----- 5-YEAR TRENDS -----				----- 10-YEAR TRENDS -----			
	2014-18 TO 2018-22 DATA		2009-13 TO 2018-22 DATA		2009-13 TO 2018-22 DATA		2009-13 TO 2018-22 DATA	
	YEARS (N)	ANNUAL TREND	R SQUARE	PROB>F	YEARS (N)	ANNUAL TREND	R SQUARE	PROB>F
ANTLER BEAM DIAMETER AGE 1.5 --	5	1.30	0.36	0.2838	10	-0.30	0.09	0.3869
ANTLER BEAM DIAM. AGE 2.5-4.5 -	5	0.83	0.76	0.0527	10	0.33	0.50	0.0224
ANTLER BEAM DIAMETER AGE 5.5+ -	5	-0.39	0.47	0.2011	10	-0.41	0.86	0.0001
ANTLER SPREAD AGE 1.5 -----	5	1.23	0.42	0.2368	10	-0.21	0.05	0.5184
ANTLER SPREAD AGE 2.5-4.5 -----	5	0.16	0.24	0.4075	10	0.28	0.79	0.0006
ANTLER SPREAD AGE 5.5+ -----	5	0.09	0.05	0.7315	10	0.10	0.23	0.1640
TOTAL ANTLER POINTS AGE 1.5 ---	5	0.26	0.41	0.2452	10	-0.02	0.01	0.7487
TOTAL ANTLER POINTS AGE 2.5-4.5	5	-0.04	0.04	0.7330	10	0.21	0.73	0.0017
TOTAL ANTLER POINTS AGE 5.5+ --	5	-0.13	0.97	0.0025	10	0.04	0.15	0.2744
WEIGHT AGE 1.5 -----	5	17.11	0.66	0.0938	10	5.06	0.28	0.1145
WEIGHT AGE 2.5-4.5 -----	5	11.80	0.90	0.0130	10	5.60	0.76	0.0010
WEIGHT AGE 5.5+ -----	5	-6.89	0.82	0.0340	10	1.39	0.12	0.3249
PERCENT ADULT BULLS AGE 1.5 ---	5	-1.33	0.72	0.0687	10	-0.36	0.31	0.0965

Table 2b. HISTORICAL NORTH REGION ADULT BULL BIOLOGICAL SUMMARY BY AGE CLASS
(BASED ON ROLLING 5-YEAR BLOCKS OF HARVEST DATA)

YEARS	---ANTLER BEAM DIAMETER---						-----ANTLER SPREAD-----						-----TOTAL POINTS-----						-----WEIGHT-----						PERCENT AD. BULLS AGE 1.5
	---1.5--	-2.5-4.5	-5.5+--	---1.5--	-2.5-4.5	-5.5+--	---1.5--	-2.5-4.5	-5.5+--	---1.5--	-2.5-4.5	-5.5+--	---1.5--	-2.5-4.5	-5.5+--	---1.5--	-2.5-4.5	-5.5+--	---1.5--	-2.5-4.5	-5.5+--	---1.5--	-2.5-4.5	-5.5+--	
	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	
1993-97	59	33.7	132	46.7	54	58.1	59	23.2	128	38.8	53	51.2	59	4.8	134	10.8	54	15.4	50	490.8	125	663.3	47	782.2	23.7
1994-98	60	34.1	151	47.0	56	58.7	58	23.4	147	39.2	56	51.6	60	4.8	153	10.9	55	16.0	55	492.0	139	659.9	49	782.0	22.1
1995-99	74	34.0	148	47.1	61	58.8	72	22.9	144	39.2	61	52.1	73	4.7	150	11.1	59	16.4	67	486.8	135	663.5	54	784.1	25.8
1996-00	66	34.2	152	47.3	64	58.7	62	22.8	146	39.8	64	52.2	65	4.5	155	11.2	62	16.9	60	478.1	137	662.7	55	772.0	23.0
1997-01	65	34.2	162	47.4	72	58.9	60	23.3	154	39.9	72	53.2	63	4.7	163	11.4	70	17.6	60	477.9	142	658.8	65	777.6	21.6
1998-02	59	34.3	154	47.2	68	58.6	54	22.9	148	39.8	68	53.4	57	4.4	155	11.4	66	18.1	54	475.1	136	654.3	61	777.8	20.9
1999-03	58	33.3	150	47.0	69	58.3	56	22.3	145	38.8	69	53.2	56	4.3	151	11.2	68	17.9	50	472.6	132	649.3	63	783.3	21.1
2000-04	54	33.1	166	46.8	83	58.3	52	23.1	162	39.0	82	53.1	53	4.3	167	11.3	82	17.6	46	465.3	149	648.9	76	785.5	18.3
2001-05	56	33.3	172	46.6	87	58.2	56	22.9	168	38.3	86	52.8	55	4.4	172	10.8	86	17.3	49	466.6	155	649.0	82	786.6	18.3
2002-06	66	33.8	180	46.8	84	58.1	67	22.9	177	38.3	83	51.8	67	4.5	181	10.8	83	16.9	59	466.4	163	650.2	78	788.6	20.7
2003-07	68	33.4	208	46.4	92	57.8	68	22.9	204	38.1	91	52.1	69	4.4	210	10.7	91	16.9	60	458.0	194	646.1	86	779.7	19.0
2004-08	59	33.7	201	46.0	94	57.8	58	23.1	197	38.1	93	51.5	60	4.5	203	10.7	93	16.4	53	456.8	189	646.0	89	770.4	17.0
2005-09	52	33.8	177	46.1	81	57.8	51	22.6	174	38.0	81	51.4	53	4.4	179	10.7	81	16.3	49	459.9	166	646.7	77	762.6	16.9
2006-10	49	34.1	160	45.7	92	57.4	48	23.3	158	37.8	92	51.1	50	4.6	161	10.9	93	15.9	45	456.6	147	636.4	89	742.8	16.3
2007-11	33	34.3	150	44.7	88	56.8	32	23.8	148	37.2	87	50.5	33	4.8	150	10.5	89	15.5	31	447.2	140	628.8	87	740.3	12.4
2008-12	24	35.5	107	44.6	81	56.7	24	24.4	106	37.7	79	50.2	24	5.1	106	10.9	82	15.6	22	451.5	96	625.1	81	737.9	11.6
2009-13	26	35.1	88	45.1	79	56.6	24	24.4	87	38.0	77	50.4	25	4.9	87	10.9	80	16.0	23	445.0	81	627.4	78	743.1	13.8
2010-14	21	34.9	77	44.8	71	55.9	19	23.9	76	37.9	69	49.3	20	5.0	76	10.8	72	15.6	18	438.3	72	620.8	71	734.0	12.9
2011-15	15	33.0	63	45.3	52	55.8	13	23.5	63	38.1	50	49.3	14	4.9	63	11.0	52	15.9	13	431.9	62	623.7	51	754.5	12.2
2012-16	12	32.7	44	47.3	44	56.3	10	22.4	44	39.4	43	49.5	11	4.2	44	11.8	44	16.0	9	435.6	44	645.7	40	756.9	12.0
2013-17	11	33.6	33	48.1	37	56.3	9	22.8	33	39.0	37	48.6	10	4.1	33	12.0	37	15.5	9	437.8	33	651.9	32	764.6	13.6
2014-18	8	32.9	32	47.5	29	55.3	8	21.8	32	38.0	30	46.4	8	4.3	32	11.9	30	14.3	6	441.7	32	647.0	25	742.0	11.4
2015-19	7	32.4	32	47.1	27	55.7	7	21.8	32	37.5	28	48.0	7	4.0	32	11.8	28	15.6	5	474.0	32	642.8	21	759.6	10.4
2016-20	6	30.8	32	46.9	21	55.8	6	21.6	32	37.8	22	47.8	6	4.2	32	11.2	22	15.5	4	511.3	31	649.0	16	758.2	10.0
2017-21	7	34.3	24	46.1	19	55.4	7	24.3	24	37.8	20	47.6	7	5.7	24	10.8	20	15.9	5	523.0	23	634.8	15	742.7	13.7
2018-22	8	33.0	24	46.1	22	53.5	8	25.5	24	37.7	23	47.2	8	6.0	24	10.6	23	15.3	5	513.0	22	632.7	16	748.1	14.5

NORTH REGION 5-YEAR AND 10-YEAR ADULT BULL BIOLOGICAL DATA TREND ANALYSIS
(Note: PROB>F=0.0000 indicates PROB>F that is <0.0001)

TREND	----- 5-YEAR TRENDS -----				----- 10-YEAR TRENDS -----			
	2014-18 TO 2018-22 DATA	2014-18 TO 2018-22 DATA	2014-18 TO 2018-22 DATA	2014-18 TO 2018-22 DATA	2009-13 TO 2018-22 DATA	2009-13 TO 2018-22 DATA	2009-13 TO 2018-22 DATA	2009-13 TO 2018-22 DATA
	YEARS (N)	ANNUAL TREND	R SQUARE	PROB>F	YEARS (N)	ANNUAL TREND	R SQUARE	PROB>F
ANTLER BEAM DIAMETER AGE 1.5 --	5	0.21	0.07	0.6632	10	-0.22	0.27	0.1278
ANTLER BEAM DIAM. AGE 2.5-4.5 -	5	-0.37	0.91	0.0117	10	0.15	0.17	0.2296
ANTLER BEAM DIAMETER AGE 5.5+ -	5	-0.38	0.43	0.2263	10	-0.21	0.54	0.0160
ANTLER SPREAD AGE 1.5 -----	5	1.00	0.77	0.0490	10	0.01	0.00	0.9740
ANTLER SPREAD AGE 2.5-4.5 -----	5	-0.03	0.05	0.7064	10	-0.06	0.10	0.3736
ANTLER SPREAD AGE 5.5+ -----	5	0.12	0.08	0.6468	10	-0.33	0.67	0.0036
TOTAL ANTLER POINTS AGE 1.5 ---	5	0.52	0.75	0.0570	10	0.07	0.09	0.3956
TOTAL ANTLER POINTS AGE 2.5-4.5	5	-0.35	0.96	0.0040	10	-0.01	0.00	0.8734
TOTAL ANTLER POINTS AGE 5.5+ --	5	0.23	0.35	0.2910	10	-0.06	0.11	0.3511
WEIGHT AGE 1.5 -----	5	19.17	0.79	0.0425	10	10.43	0.73	0.0016
WEIGHT AGE 2.5-4.5 -----	5	-3.66	0.64	0.1064	10	1.57	0.18	0.2219
WEIGHT AGE 5.5+ -----	5	-0.47	0.01	0.8875	10	0.67	0.04	0.5656
PERCENT ADULT BULLS AGE 1.5 ---	5	0.95	0.56	0.1463	10	-0.03	0.00	0.8535

Table 2b. HISTORICAL W. MTN. REGION ADULT BULL BIOLOGICAL SUMMARY BY AGE CLASS
(BASED ON ROLLING 5-YEAR BLOCKS OF HARVEST DATA)

YEARS	---ANTLER BEAM DIAMETER---						-----ANTLER SPREAD-----						-----TOTAL POINTS-----						-----WEIGHT-----						PERCENT AD. BULLS AGE 1.5
	---1.5--	-2.5-4.5	---	-5.5+--	---	---	---1.5--	-2.5-4.5	---	-5.5+--	---	---	---1.5--	-2.5-4.5	---	-5.5+--	---	---	---1.5--	-2.5-4.5-	---	-5.5+--	---	---	
	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	
1993-97	86	34.2	205	47.8	78	59.4	84	25.1	203	39.5	74	52.3	86	5.2	204	11.0	78	15.6	73	467.1	168	656.0	60	783.7	23.5
1994-98	80	34.5	203	47.0	79	59.1	79	24.8	203	39.1	75	52.4	80	5.1	203	10.9	79	16.4	68	466.3	169	648.1	57	800.1	22.2
1995-99	85	33.5	195	47.1	81	58.6	83	23.8	194	39.3	77	52.5	84	4.7	196	11.1	81	16.1	70	455.7	169	648.6	59	791.0	23.5
1996-00	79	33.3	172	46.9	78	57.9	78	23.4	169	39.1	75	52.0	79	4.6	173	10.9	77	16.5	63	450.6	144	639.7	56	781.4	23.9
1997-01	76	34.1	160	46.8	70	58.3	71	23.7	157	38.9	69	51.9	74	4.7	161	10.9	70	16.6	60	450.2	140	634.4	53	785.8	24.4
1998-02	67	33.8	131	46.2	75	59.2	62	23.6	130	38.0	75	51.3	65	4.5	131	10.9	75	16.3	54	449.0	111	629.5	54	786.1	24.3
1999-03	58	33.1	127	46.0	75	58.2	53	23.1	126	37.6	76	50.5	56	4.5	126	10.6	75	15.5	47	445.6	104	633.7	57	760.5	22.2
2000-04	56	34.4	126	46.6	78	58.9	52	23.3	126	37.6	79	51.0	54	4.6	126	10.6	78	16.1	46	451.3	99	630.3	62	760.8	21.5
2001-05	55	34.9	134	47.0	75	58.7	51	23.5	134	37.7	76	50.9	52	4.6	133	10.8	76	15.6	45	450.0	106	629.2	60	758.1	20.8
2002-06	51	35.3	138	47.0	81	58.0	51	22.9	138	37.6	80	50.0	49	4.6	136	10.6	81	15.0	43	452.1	111	626.8	63	746.0	19.0
2003-07	59	34.8	159	46.7	77	57.4	57	23.4	159	37.3	76	50.2	57	4.4	158	10.6	77	15.0	50	447.5	127	615.8	62	735.2	20.1
2004-08	60	34.5	146	46.5	69	57.7	58	23.2	145	36.9	68	50.2	58	4.4	145	10.6	69	15.4	52	441.0	118	607.9	55	739.5	22.3
2005-09	53	33.8	134	45.8	65	57.0	51	23.1	132	36.3	64	49.2	52	4.3	132	10.2	65	14.6	48	434.3	112	606.4	53	743.0	21.6
2006-10	50	33.1	112	45.1	69	57.5	48	22.3	110	35.6	68	50.2	51	4.1	111	9.8	69	15.0	49	422.1	94	595.2	58	747.5	22.6
2007-11	39	31.7	107	44.7	64	57.2	37	21.5	105	35.0	64	50.0	40	3.8	107	9.7	64	15.3	39	407.1	86	591.5	55	746.5	19.6
2008-12	28	32.6	79	44.9	57	57.5	28	20.6	77	35.5	57	49.4	29	4.1	79	9.6	57	15.0	29	401.6	65	600.4	48	736.9	18.0
2009-13	24	33.3	80	45.6	64	57.2	24	21.3	79	36.7	64	49.2	25	4.2	80	10.5	64	14.7	25	405.4	66	616.4	51	738.2	14.7
2010-14	20	34.0	64	45.9	59	56.9	20	21.5	63	36.8	59	49.3	21	4.2	64	10.5	59	14.7	21	404.5	52	618.5	46	726.2	14.6
2011-15	13	35.8	56	46.5	47	56.1	13	22.2	56	37.3	47	47.6	13	4.2	56	10.9	47	14.4	13	415.8	44	630.2	38	714.2	11.2
2012-16	10	36.0	39	47.3	41	55.6	10	23.2	39	39.3	41	47.8	10	4.4	39	11.7	41	14.4	10	422.5	31	647.1	33	714.5	11.1
2013-17	6	34.3	30	46.8	37	54.2	6	22.1	30	38.9	37	47.2	6	3.8	30	11.9	37	14.4	6	419.2	24	638.3	31	727.1	8.2
2014-18	4	32.5	17	45.1	26	53.7	4	21.6	17	35.1	25	46.9	4	3.3	17	9.2	26	13.9	4	395.0	14	562.5	25	708.2	8.5
2015-19	2	27.0	18	44.4	20	53.6	2	18.5	18	36.1	19	46.4	2	2.0	18	9.4	20	14.1	2	390.0	14	564.6	19	706.8	5.0
2016-20	2	23.5	17	44.6	15	51.9	2	17.6	17	37.1	14	45.5	2	3.0	17	9.9	15	12.9	2	420.0	13	583.8	14	701.4	5.9
2017-21	2	23.5	15	43.6	10	53.7	2	17.6	15	35.6	9	44.3	2	3.0	15	8.7	10	11.5	2	420.0	11	552.7	10	678.5	7.4
2018-22	2	23.5	14	43.9	6	54.5	2	17.6	14	36.6	5	46.2	2	3.0	14	9.2	6	11.0	2	420.0	10	586.5	6	659.2	9.1

W. MTN. REGION 5-YEAR AND 10-YEAR ADULT BULL BIOLOGICAL DATA TREND ANALYSIS
(Note: PROB>F=0.0000 indicates PROB>F that is <0.0001)

TREND	----- 5-YEAR TRENDS -----				----- 10-YEAR TRENDS -----			
	2014-18 TO 2018-22 DATA	YEARS	ANNUAL	R	2009-13 TO 2018-22 DATA	YEARS	ANNUAL	R
	(N)	TREND	SQUARE	PROB>F	(N)	TREND	SQUARE	PROB>F
ANTLER BEAM DIAMETER AGE 1.5 --	5	-2.15	0.75	0.0593	10	-1.53	0.75	0.0011
ANTLER BEAM DIAM. AGE 2.5-4.5 -	5	-0.30	0.70	0.0774	10	-0.31	0.54	0.0155
ANTLER BEAM DIAMETER AGE 5.5+ -	5	0.17	0.08	0.6381	10	-0.45	0.66	0.0041
ANTLER SPREAD AGE 1.5 -----	5	-0.87	0.66	0.0957	10	-0.59	0.65	0.0048
ANTLER SPREAD AGE 2.5-4.5 -----	5	0.25	0.25	0.3921	10	-0.14	0.11	0.3471
ANTLER SPREAD AGE 5.5+ -----	5	-0.36	0.31	0.3251	10	-0.47	0.84	0.0002
TOTAL ANTLER POINTS AGE 1.5 ---	5	0.05	0.03	0.7944	10	-0.20	0.60	0.0081
TOTAL ANTLER POINTS AGE 2.5-4.5	5	-0.08	0.08	0.6457	10	-0.23	0.43	0.0408
TOTAL ANTLER POINTS AGE 5.5+ --	5	-0.84	0.91	0.0118	10	-0.39	0.76	0.0009
WEIGHT AGE 1.5 -----	5	8.00	0.70	0.0791	10	0.84	0.05	0.5449
WEIGHT AGE 2.5-4.5 -----	5	3.61	0.15	0.5140	10	-7.79	0.47	0.0277
WEIGHT AGE 5.5+ -----	5	-12.63	0.88	0.0195	10	-6.98	0.81	0.0004
PERCENT ADULT BULLS AGE 1.5 ---	5	0.36	0.11	0.5913	10	-0.88	0.65	0.0050

Table 2b. HISTORICAL CENTRAL REGION ADULT BULL BIOLOGICAL SUMMARY BY AGE CLASS
(BASED ON ROLLING 5-YEAR BLOCKS OF HARVEST DATA)

YEARS	---ANTLER BEAM DIAMETER---						-----ANTLER SPREAD-----						-----TOTAL POINTS-----						-----WEIGHT-----						PERCENT AD. BULLS AGE 1.5
	---1.5--		-2.5-4.5		--5.5+--		---1.5--		-2.5-4.5		--5.5+--		---1.5--		-2.5-4.5		--5.5+--		---1.5--		-2.5-4.5-		---5.5+--		
	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	
1993-97	49	33.9	95	45.9	54	54.8	46	24.8	95	38.9	52	47.6	48	4.6	94	10.7	54	14.4	45	456.4	93	642.8	43	731.7	26.1
1994-98	47	33.0	102	44.6	64	55.8	44	24.2	102	37.6	62	48.6	46	4.4	101	10.3	64	14.4	44	448.4	97	625.7	51	736.1	23.4
1995-99	51	33.0	101	44.9	68	55.1	48	23.7	100	38.1	66	48.3	48	4.2	100	10.5	68	13.8	49	453.7	96	631.9	56	725.6	24.1
1996-00	51	33.2	115	44.5	75	55.3	48	23.7	114	37.3	73	48.4	49	4.4	114	10.2	75	14.3	50	454.9	106	628.9	63	730.2	22.0
1997-01	45	33.4	136	44.9	82	55.7	42	23.4	134	37.1	79	48.3	45	4.2	135	10.5	82	14.0	46	453.6	126	628.8	74	733.9	17.7
1998-02	42	34.3	142	45.3	87	54.9	38	23.7	139	37.3	85	48.5	42	4.2	142	10.5	87	14.1	43	459.0	130	627.6	78	736.7	15.8
1999-03	49	34.4	156	45.9	89	54.5	45	23.6	153	37.3	87	47.9	49	4.2	155	10.7	89	13.8	50	456.3	144	634.5	81	728.6	17.2
2000-04	50	34.8	169	46.3	91	54.7	46	24.5	168	37.4	90	47.8	51	4.6	169	10.8	90	14.2	50	450.5	157	633.1	82	731.1	16.6
2001-05	54	34.8	175	46.2	94	54.9	49	25.3	172	37.0	94	48.1	54	5.0	175	10.6	94	14.0	53	459.1	160	627.5	87	729.0	16.9
2002-06	52	35.1	179	46.1	92	55.1	48	25.6	176	37.1	94	48.3	52	5.2	178	10.5	93	14.5	50	463.2	159	625.0	83	721.3	16.2
2003-07	52	34.3	192	45.7	95	55.8	49	24.8	190	36.6	96	47.8	52	4.9	192	10.3	96	14.1	49	448.6	172	619.1	88	717.3	15.4
2004-08	42	34.2	191	44.5	111	54.3	41	24.9	189	35.6	110	46.5	41	5.1	192	9.8	112	13.4	39	447.9	169	607.8	105	708.0	12.1
2005-09	43	33.9	195	44.1	113	53.9	41	24.2	192	35.3	112	46.4	42	4.6	195	9.6	115	13.3	40	442.6	169	600.7	108	703.7	12.1
2006-10	38	33.8	177	44.3	114	53.8	37	23.1	177	35.6	111	46.3	37	4.1	177	9.7	115	13.6	35	426.3	159	602.5	110	703.7	11.4
2007-11	45	33.2	164	43.5	107	53.2	44	22.1	164	34.6	102	45.6	44	3.8	165	9.3	107	13.1	40	427.8	148	600.7	103	704.9	14.1
2008-12	42	33.7	132	43.3	91	52.3	41	22.6	131	34.5	87	45.2	41	4.1	132	9.3	91	13.2	37	436.5	118	596.9	87	698.7	15.7
2009-13	39	34.2	101	44.1	66	52.6	38	22.9	100	35.1	64	45.8	39	4.2	101	9.5	66	13.9	34	437.6	91	596.7	60	702.3	18.8
2010-14	27	33.7	71	43.8	51	52.2	27	22.6	70	34.6	49	44.6	27	4.2	71	9.0	51	13.4	23	445.0	66	598.4	46	697.4	18.0
2011-15	21	33.7	54	42.8	33	49.8	21	22.6	52	34.1	32	42.8	21	4.3	54	8.9	33	12.2	17	447.6	47	594.8	28	684.6	19.4
2012-16	9	33.1	28	43.1	22	49.9	9	23.0	27	35.5	22	43.7	9	4.7	28	9.0	22	12.9	8	440.0	25	585.4	19	690.5	15.3
2013-17	3	32.0	19	43.9	18	49.8	3	22.8	19	34.4	18	43.2	3	4.7	19	8.8	18	12.4	3	416.7	17	583.8	15	690.0	7.5
2014-18	2	32.5	14	44.6	13	51.5	2	20.0	14	35.6	13	43.6	2	3.5	14	9.5	13	12.2	2	395.0	13	614.2	13	710.8	6.9
2015-19	2	32.5	9	46.2	8	52.0	2	20.0	10	38.1	8	45.1	2	3.5	10	11.2	8	12.6	2	395.0	9	662.2	7	735.7	10.0
2016-20	2	32.5	6	45.3	9	50.9	2	20.0	7	37.3	9	43.7	2	3.5	7	10.9	9	12.0	2	395.0	7	648.6	8	713.1	11.1
2017-21	1	33.0	5	45.8	8	50.9	1	18.0	6	36.6	8	43.6	1	3.0	6	11.7	8	11.8	1	340.0	6	640.0	7	710.7	6.7
2018-22	0	.	3	43.0	7	51.1	0	.	4	38.1	7	43.3	0	.	4	11.3	7	12.3	0	.	4	632.5	6	720.8	.

CENTRAL REGION 5-YEAR AND 10-YEAR ADULT BULL BIOLOGICAL DATA TREND ANALYSIS
(Note: PROB>F=0.0000 indicates PROB>F that is <0.0001)

TREND	----- 5-YEAR TRENDS -----				----- 10-YEAR TRENDS -----			
	2014-18 TO 2018-22 DATA		DATA		2009-13 TO 2018-22 DATA		DATA	
	YEARS (N)	ANNUAL TREND	R SQUARE	PROB>F	YEARS (N)	ANNUAL TREND	R SQUARE	PROB>F
ANTLER BEAM DIAMETER AGE 1.5 --	4	0.15	0.60	0.2254	9	-0.19	0.52	0.0285
ANTLER BEAM DIAM. AGE 2.5-4.5 -	5	-0.37	0.22	0.4306	10	0.17	0.18	0.2273
ANTLER BEAM DIAMETER AGE 5.5+ -	5	-0.19	0.40	0.2531	10	-0.05	0.02	0.6761
ANTLER SPREAD AGE 1.5 -----	4	-0.60	0.60	0.2254	9	-0.59	0.78	0.0016
ANTLER SPREAD AGE 2.5-4.5 -----	5	0.35	0.29	0.3489	10	0.40	0.67	0.0039
ANTLER SPREAD AGE 5.5+ -----	5	-0.21	0.23	0.4129	10	-0.12	0.16	0.2568
TOTAL ANTLER POINTS AGE 1.5 ---	4	-0.15	0.60	0.2254	9	-0.16	0.57	0.0188
TOTAL ANTLER POINTS AGE 2.5-4.5	5	0.40	0.57	0.1403	10	0.31	0.69	0.0029
TOTAL ANTLER POINTS AGE 5.5+ --	5	-0.08	0.14	0.5406	10	-0.17	0.60	0.0084
WEIGHT AGE 1.5 -----	4	-16.50	0.60	0.2254	9	-11.51	0.81	0.0010
WEIGHT AGE 2.5-4.5 -----	5	1.43	0.02	0.8397	10	6.93	0.55	0.0136
WEIGHT AGE 5.5+ -----	5	-0.49	0.01	0.9077	10	3.39	0.42	0.0415
PERCENT ADULT BULLS AGE 1.5 ---	4	0.04	0.00	0.9756	9	-1.60	0.69	0.0055

Table 2b. HISTORICAL SOUTH REGION ADULT BULL BIOLOGICAL SUMMARY BY AGE CLASS
(BASED ON ROLLING 5-YEAR BLOCKS OF HARVEST DATA)

YEARS	---ANTLER BEAM DIAMETER---						-----ANTLER SPREAD-----						-----TOTAL POINTS-----						-----WEIGHT-----						PERCENT AD. BULLS AGE 1.5
	---1.5---		-2.5-4.5		--5.5+--		---1.5---		-2.5-4.5		--5.5+--		---1.5---		-2.5-4.5		--5.5+--		---1.5---		-2.5-4.5		--5.5+--		
	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	
1994-98	17	32.6	51	44.1	22	52.5	15	23.3	51	34.2	21	45.3	14	4.6	53	8.2	21	13.7	14	441.1	46	585.2	17	746.8	20.2
1995-99	18	33.8	55	43.6	24	53.1	17	24.0	56	34.6	23	45.9	15	4.9	58	8.3	23	13.5	16	447.5	51	586.5	20	733.1	19.6
1996-00	18	33.2	60	44.1	23	52.8	17	23.3	61	35.4	22	45.8	14	5.0	63	8.8	22	13.6	18	439.7	55	592.6	20	727.6	18.9
1997-01	19	34.2	65	43.6	28	54.0	17	24.4	65	34.8	26	46.7	14	5.1	67	8.6	27	13.3	17	443.8	59	575.7	24	722.2	17.4
1998-02	15	33.9	69	44.1	32	53.0	14	25.0	70	35.1	29	45.7	12	5.0	71	8.7	31	12.3	14	454.8	64	581.8	28	706.3	13.4
1999-03	11	34.9	72	44.2	32	53.0	10	25.3	74	35.8	30	45.4	11	4.8	74	9.1	32	12.1	11	442.0	67	600.9	29	705.4	10.1
2000-04	9	34.4	68	44.4	26	52.4	8	24.0	68	35.8	24	44.9	11	4.0	69	9.0	26	12.2	10	419.2	62	600.0	23	706.5	11.1
2001-05	6	33.5	66	44.5	24	52.5	5	24.5	66	35.3	22	44.7	9	3.4	67	8.8	24	11.7	7	396.7	61	600.2	22	709.3	8.9
2002-06	5	32.8	57	45.1	14	49.9	5	23.3	57	36.0	13	43.8	8	3.5	57	9.3	14	11.1	7	408.1	52	616.7	14	691.8	10.0
2003-07	5	33.8	52	44.5	10	50.7	5	23.3	51	35.4	10	45.0	8	3.5	52	9.2	10	12.2	7	406.4	47	605.9	10	709.5	11.3
2004-08	4	34.3	45	44.9	9	50.0	4	23.9	43	35.6	9	44.9	6	3.8	45	9.0	9	10.9	5	421.0	40	600.1	9	695.6	9.8
2005-09	4	34.3	40	44.1	12	50.8	4	25.5	39	34.3	12	44.7	4	5.0	40	8.8	12	12.1	4	447.5	35	586.3	11	701.8	7.0
2006-10	4	35.3	32	43.8	13	50.1	4	27.3	32	33.5	13	42.9	4	5.3	33	8.6	13	12.0	4	447.5	29	569.8	12	686.3	7.8
2007-11	4	33.5	31	43.9	14	49.6	4	27.0	30	33.3	14	41.6	4	4.5	32	8.4	14	11.9	4	427.5	28	580.0	13	691.2	7.8
2008-12	4	32.5	30	44.4	14	50.2	4	25.9	30	34.1	14	42.1	4	4.3	31	8.9	14	12.4	4	407.5	26	586.9	12	695.4	8.0
2009-13	4	32.5	25	44.7	15	49.5	4	25.9	25	33.8	15	40.9	4	4.3	26	8.9	15	12.0	4	407.5	22	592.7	12	690.4	8.9
2010-14	3	31.3	20	45.9	13	48.2	3	24.7	20	35.3	13	39.7	4	3.3	21	9.1	13	10.7	4	351.3	18	610.8	11	666.8	10.5
2011-15	2	31.0	17	45.9	10	47.8	2	22.5	16	37.4	10	39.7	3	2.7	17	9.5	10	10.6	3	335.0	14	638.9	8	658.1	10.0
2012-16	1	30.0	13	45.8	7	48.4	1	20.5	13	39.3	7	40.6	2	2.5	13	10.5	7	10.6	2	302.5	11	650.0	5	651.0	9.1
2013-17	0	.	7	45.3	4	44.8	0	.	7	40.5	4	37.3	1	2.0	7	11.3	4	8.0	1	225.0	7	688.6	3	608.3	8.3
2014-18	0	.	5	40.4	2	48.0	0	.	5	34.5	2	41.3	1	2.0	5	9.2	2	11.5	1	225.0	5	637.0	2	635.0	12.5
2015-19	0	.	8	42.3	1	53.0	0	.	8	36.4	1	47.0	0	.	8	10.4	1	17.0	0	.	8	607.5	1	760.0	.
2016-20	1	24.0	10	41.5	1	53.0	0	.	10	34.9	1	47.0	1	1.0	10	9.7	1	17.0	0	.	10	591.0	1	760.0	8.3
2017-21	1	24.0	7	40.7	1	53.0	0	.	7	32.1	1	47.0	1	1.0	7	8.4	1	17.0	0	.	7	547.9	1	760.0	11.1
2018-22	1	24.0	8	40.4	1	53.0	0	.	8	31.5	1	47.0	1	1.0	8	8.1	1	17.0	0	.	7	547.9	1	760.0	10.0

SOUTH REGION 5-YEAR AND 10-YEAR ADULT BULL BIOLOGICAL DATA TREND ANALYSIS
(Note: PROB>F=0.0000 indicates PROB>F that is <0.0001)

TREND	----- 5-YEAR TRENDS -----				----- 10-YEAR TRENDS -----			
	2014-18 TO 2018-22 DATA	2014-18 TO 2018-22 DATA	2014-18 TO 2018-22 DATA	2014-18 TO 2018-22 DATA	2009-13 TO 2018-22 DATA	2009-13 TO 2018-22 DATA	2009-13 TO 2018-22 DATA	2009-13 TO 2018-22 DATA
	YEARS (N)	ANNUAL TREND	R SQUARE	PROB>F	YEARS (N)	ANNUAL TREND	R SQUARE	PROB>F
ANTLER BEAM DIAMETER AGE 1.5 --	0	.	.	.	7	-1.06	0.97	0.0001
ANTLER BEAM DIAM. AGE 2.5-4.5 -	5	-0.16	0.10	0.6129	10	-0.68	0.72	0.0020
ANTLER BEAM DIAMETER AGE 5.5+ -	5	1.00	0.50	0.1817	10	0.66	0.46	0.0319
ANTLER SPREAD AGE 1.5 -----	0	.	.	.	4	-1.83	0.99	0.0065
ANTLER SPREAD AGE 2.5-4.5 -----	5	-1.02	0.63	0.1078	10	-0.43	0.20	0.1975
ANTLER SPREAD AGE 5.5+ -----	5	1.15	0.50	0.1817	10	1.01	0.64	0.0056
TOTAL ANTLER POINTS AGE 1.5 ---	4	-0.26	0.77	0.1217	9	-0.34	0.92	0.0000
TOTAL ANTLER POINTS AGE 2.5-4.5	5	-0.41	0.50	0.1835	10	-0.08	0.07	0.4678
TOTAL ANTLER POINTS AGE 5.5+ --	5	1.10	0.50	0.1817	10	0.87	0.58	0.0109
WEIGHT AGE 1.5 -----	0	.	.	.	6	-37.82	0.95	0.0009
WEIGHT AGE 2.5-4.5 -----	5	-23.79	0.94	0.0057	10	-7.66	0.27	0.1212
WEIGHT AGE 5.5+ -----	5	25.00	0.50	0.1817	10	12.98	0.43	0.0387
PERCENT ADULT BULLS AGE 1.5 ---	4	-0.50	0.23	0.5155	9	0.08	0.03	0.6514

Table 2b. HISTORICAL OVERALL REGION ADULT BULL BIOLOGICAL SUMMARY BY AGE CLASS
(BASED ON ROLLING 5-YEAR BLOCKS OF HARVEST DATA)

YEARS	---ANTLER BEAM DIAMETER---						-----ANTLER SPREAD-----						-----TOTAL POINTS-----						-----WEIGHT-----						PERCENT AD. BULLS AGE 1.5
	---1.5---		-2.5-4.5		--5.5+--		---1.5---		-2.5-4.5		--5.5+--		---1.5---		-2.5-4.5		--5.5+--		---1.5---		-2.5-4.5-		---5.5+---		
	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	
1993-97	256	34.5	607	47.3	270	58.1	246	24.3	600	39.2	263	50.8	254	4.9	607	10.8	270	15.3	222	472.0	544	655.0	223	777.5	22.9
1994-98	257	34.7	639	46.7	280	58.1	245	24.3	632	38.8	272	51.1	252	4.9	642	10.7	279	15.8	229	472.2	572	644.9	228	778.9	22.2
1995-99	281	34.3	634	46.8	284	57.9	269	23.7	625	38.9	276	51.1	272	4.7	638	10.8	282	15.6	250	470.2	572	646.8	235	770.3	23.6
1996-00	263	34.3	625	46.6	283	57.5	251	23.5	612	38.8	276	50.9	255	4.8	630	10.8	280	16.0	236	465.7	554	642.3	234	761.8	22.6
1997-01	246	34.6	633	46.6	292	57.7	228	23.9	618	38.5	285	51.1	236	4.9	636	10.9	290	16.0	222	463.0	561	635.9	253	762.1	21.0
1998-02	222	34.5	605	46.5	305	57.6	206	23.7	595	38.2	299	50.8	214	4.7	609	10.8	303	15.8	200	464.1	535	634.6	262	761.0	19.6
1999-03	211	33.9	614	46.5	309	57.2	197	23.3	608	37.9	306	50.1	207	4.6	616	10.8	308	15.3	189	458.5	541	638.5	271	752.7	18.8
2000-04	206	34.1	646	46.8	332	57.6	192	23.6	642	38.2	329	50.4	206	4.6	649	11.0	330	15.7	187	454.8	569	639.8	292	757.1	17.9
2001-05	220	34.3	663	46.8	343	57.8	205	23.8	656	37.8	341	50.4	218	4.6	663	10.8	343	15.5	200	456.1	582	638.2	306	758.2	18.5
2002-06	229	34.6	674	47.0	341	57.8	221	23.6	668	38.0	338	50.0	230	4.7	672	10.8	341	15.5	210	459.8	593	640.4	299	754.3	19.0
2003-07	239	34.0	743	46.6	361	57.6	229	23.4	735	37.7	359	50.3	240	4.5	743	10.6	361	15.4	217	450.9	659	633.4	322	747.5	18.3
2004-08	218	34.1	709	46.0	359	57.0	211	23.3	699	37.3	355	49.7	217	4.6	710	10.5	359	15.1	198	450.0	629	627.6	324	739.4	17.4
2005-09	199	33.9	656	45.5	342	56.4	191	23.3	646	36.7	338	49.2	197	4.5	655	10.2	344	14.8	184	447.7	583	621.0	311	734.0	16.9
2006-10	177	33.9	590	45.4	360	56.4	172	23.1	586	36.7	354	49.3	178	4.4	591	10.2	362	14.8	166	440.3	532	614.9	335	727.7	15.9
2007-11	150	33.3	557	44.6	344	55.9	145	22.8	553	36.0	337	48.8	150	4.2	560	10.0	345	14.6	140	430.1	500	610.1	321	726.8	14.5
2008-12	123	34.0	433	44.6	290	55.6	120	23.0	430	36.2	282	48.2	123	4.4	434	10.1	291	14.6	116	430.9	385	607.9	269	721.7	14.8
2009-13	114	34.2	371	45.1	275	55.9	109	23.3	369	36.6	269	48.5	114	4.4	372	10.3	276	14.9	106	430.6	334	611.5	246	728.1	15.2
2010-14	88	34.3	300	45.2	242	55.5	85	22.9	298	36.7	237	48.1	89	4.4	301	10.3	243	14.6	81	426.6	273	612.5	217	721.3	14.2
2011-15	63	33.7	241	45.0	177	54.7	60	22.4	239	36.9	173	47.2	63	4.3	242	10.4	177	14.3	56	422.5	216	615.9	156	725.2	13.4
2012-16	42	32.7	158	46.0	137	54.8	39	21.8	157	38.4	136	47.7	42	4.0	158	11.1	137	14.7	38	416.6	143	628.0	120	729.4	12.7
2013-17	27	33.0	116	46.3	118	54.5	25	21.9	116	38.2	118	47.4	27	4.0	116	11.3	118	14.5	26	422.9	106	633.4	104	737.5	10.6
2014-18	22	31.8	96	45.8	86	54.5	22	20.9	96	37.3	86	47.0	23	3.7	96	11.1	87	14.1	21	412.4	88	620.5	81	730.1	11.2
2015-19	17	30.4	92	45.8	69	54.6	17	19.9	94	37.8	69	47.6	17	3.5	94	11.4	70	14.9	15	428.3	86	622.7	60	738.8	9.4
2016-20	15	28.4	90	45.7	56	53.9	14	19.5	92	37.6	56	47.1	15	3.5	92	11.2	57	14.4	12	446.7	84	630.2	48	734.0	9.1
2017-21	16	32.2	75	46.1	49	54.5	15	22.8	77	37.5	49	47.2	16	4.6	77	10.9	50	14.3	13	478.1	70	621.3	43	724.0	11.2
2018-22	15	31.3	75	45.9	48	53.7	14	23.7	77	37.6	48	47.5	15	4.8	77	10.6	49	14.4	11	483.2	67	626.2	38	728.7	10.6

OVERALL REGION 5-YEAR AND 10-YEAR ADULT BULL BIOLOGICAL DATA TREND ANALYSIS
(Note: PROB>F=0.0000 indicates PROB>F that is <0.0001)

TREND	----- 5-YEAR TRENDS -----				----- 10-YEAR TRENDS -----			
	2014-18 TO 2018-22 DATA	YEARS	ANNUAL	R	2009-13 TO 2018-22 DATA	YEARS	ANNUAL	R
	(N)	TREND	SQUARE	PROB>F	(N)	TREND	SQUARE	PROB>F
ANTLER BEAM DIAMETER AGE 1.5 --	5	0.09	0.01	0.8802	10	-0.46	0.57	0.0118
ANTLER BEAM DIAM. AGE 2.5-4.5 -	5	0.03	0.10	0.6126	10	0.09	0.41	0.0451
ANTLER BEAM DIAMETER AGE 5.5+ -	5	-0.17	0.44	0.2237	10	-0.19	0.79	0.0006
ANTLER SPREAD AGE 1.5 -----	5	0.86	0.55	0.1519	10	-0.11	0.05	0.5214
ANTLER SPREAD AGE 2.5-4.5 -----	5	0.03	0.11	0.5842	10	0.10	0.25	0.1421
ANTLER SPREAD AGE 5.5+ -----	5	0.08	0.19	0.4633	10	-0.10	0.38	0.0598
TOTAL ANTLER POINTS AGE 1.5 ---	5	0.33	0.67	0.0896	10	-0.00	0.00	0.9355
TOTAL ANTLER POINTS AGE 2.5-4.5	5	-0.14	0.55	0.1507	10	0.07	0.27	0.1218
TOTAL ANTLER POINTS AGE 5.5+ --	5	0.00	0.00	0.9936	10	-0.04	0.18	0.2221
WEIGHT AGE 1.5 -----	5	19.13	0.97	0.0025	10	5.94	0.52	0.0183
WEIGHT AGE 2.5-4.5 -----	5	1.02	0.16	0.5015	10	1.44	0.35	0.0725
WEIGHT AGE 5.5+ -----	5	-1.78	0.25	0.3889	10	0.54	0.08	0.4214
PERCENT ADULT BULLS AGE 1.5 ---	5	0.07	0.01	0.8470	10	-0.56	0.71	0.0023

Table 2c. HISTORICAL CT LAKE REGION ADULT COW AND CALF BIOLOGICAL SUMMARY BY AGE CLASS
(BASED ON ROLLING 5-YEAR BLOCKS OF HARVEST DATA)

YEARS	--CORPORA LUTEA--				PREGNANCY RATE (%)				-TWINNING RATE (%)				LACTATION RATE (%)				-----COW WEIGHT-----				--CALF WEIGHTS--		
	---1.5---		--2.5+--		---1.5---		--2.5+--		---1.5---		--2.5+--		---1.5---		--2.5+--		---1.5---		--2.5+--		N MEAN		%<200
	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	%<200
1993-97	36	0.42	128	1.41	36	41.7	128	94.5	15	0.0	121	46.3	37	0.0	122	66.4	35	465.7	124	585.7	25	252.6	12.0
1994-98	43	0.49	142	1.34	43	46.5	142	93.0	20	5.0	132	42.4	44	0.0	143	65.0	43	467.0	145	574.6	33	268.6	12.1
1995-99	59	0.47	152	1.28	59	45.8	152	90.8	27	3.7	138	39.1	62	0.0	156	59.6	63	457.3	156	569.7	38	271.6	10.5
1996-00	68	0.47	170	1.26	68	44.1	170	91.8	30	6.7	156	35.9	71	1.4	174	56.3	73	458.4	171	570.4	39	270.5	7.7
1997-01	85	0.51	189	1.25	85	47.1	189	91.0	40	7.5	172	36.6	90	1.1	187	52.4	90	459.7	184	568.3	44	270.9	4.5
1998-02	86	0.43	156	1.23	86	39.5	156	90.4	34	8.8	141	36.2	85	1.2	155	51.6	87	462.5	146	567.6	40	265.9	10.0
1999-03	87	0.38	136	1.18	87	35.6	136	90.4	31	6.5	123	30.9	88	2.3	131	46.6	87	455.9	121	568.9	31	253.5	9.7
2000-04	72	0.35	135	1.20	72	31.9	135	91.1	23	8.7	123	30.9	72	2.8	123	47.2	71	451.9	116	569.6	23	239.1	17.4
2001-05	71	0.28	114	1.14	71	26.8	114	88.6	19	5.3	101	27.7	71	2.8	103	44.7	69	445.7	99	566.2	20	233.0	25.0
2002-06	59	0.14	117	1.09	59	13.6	117	88.0	8	0.0	103	22.3	62	3.2	115	40.9	62	428.5	102	554.9	19	243.9	21.1
2003-07	62	0.18	150	1.08	62	17.7	150	87.3	11	0.0	131	22.1	67	4.5	147	44.9	65	422.2	127	555.6	23	249.3	13.0
2004-08	63	0.14	151	1.07	63	14.3	151	85.4	9	0.0	129	23.3	65	3.1	151	44.4	63	422.0	134	554.7	26	246.7	15.4
2005-09	66	0.21	145	1.01	66	19.7	145	83.4	13	7.7	121	19.8	64	3.1	149	45.0	66	425.9	134	554.4	28	254.1	14.3
2006-10	60	0.27	142	1.02	60	25.0	142	84.5	15	6.7	120	20.0	59	1.7	146	44.5	61	425.6	132	551.4	26	255.6	11.5
2007-11	53	0.26	126	0.98	53	24.5	126	81.0	13	7.7	102	19.6	48	2.1	125	50.4	50	415.9	117	555.1	22	250.7	13.6
2008-12	45	0.29	87	0.95	45	26.7	87	80.5	12	8.3	70	18.6	40	0.0	87	48.3	43	411.9	87	551.4	15	245.7	20.0
2009-13	39	0.33	78	0.95	39	30.8	78	79.5	12	8.3	62	19.4	35	0.0	74	50.0	40	400.5	72	546.1	14	251.1	14.3
2010-14	29	0.28	61	1.02	29	27.6	61	83.6	8	0.0	51	21.6	28	0.0	57	47.4	29	382.8	54	547.1	9	243.9	11.1
2011-15	23	0.22	45	0.91	23	21.7	45	77.8	5	0.0	35	17.1	21	0.0	39	51.3	24	367.9	36	542.4	8	243.1	12.5
2012-16	17	0.29	23	0.96	17	29.4	23	78.3	5	0.0	18	22.2	16	0.0	19	52.6	18	389.7	17	524.7	5	230.0	20.0
2013-17	12	0.25	15	0.93	12	25.0	15	73.3	3	0.0	11	27.3	10	0.0	11	45.5	11	375.9	11	506.8	3	248.3	0.0
2014-18	4	0.25	6	1.00	4	25.0	6	83.3	1	0.0	5	20.0	3	0.0	4	75.0	3	365.0	5	539.0	0	.	.
2015-19	3	0.33	4	0.75	3	33.3	4	75.0	1	0.0	3	0.0	2	0.0	3	66.7	2	400.0	3	540.0	0	.	.
2016-20	3	0.33	6	0.67	3	33.3	6	66.7	1	0.0	4	0.0	3	0.0	6	50.0	2	400.0	6	505.0	0	.	.
2017-21	3	0.33	6	0.83	3	33.3	6	83.3	1	0.0	5	0.0	3	0.0	6	33.3	2	400.0	6	527.5	0	.	.
2018-22	2	0.00	6	0.83	2	0.0	6	83.3	0	.	5	0.0	2	0.0	6	33.3	2	400.0	6	527.5	0	.	.

CT LAKE REGION 5-YEAR AND 10-YEAR ADULT COW AND CALF BIOLOGICAL DATA TREND ANALYSIS
(Note: PROB>F=0.0000 indicates PROB>F that is <0.0001)

TREND	----- 5-YEAR TRENDS -----				----- 10-YEAR TRENDS -----			
	2014-18 TO 2018-22		DATA		2009-13 TO 2018-22		DATA	
	YEARS (N)	ANNUAL TREND	R SQUARE	PROB>F	YEARS (N)	ANNUAL TREND	R SQUARE	PROB>F
CORPORA LUTEA AGE 1.5	5	-0.05	0.30	0.3393	10	-0.01	0.12	0.3305
CORPORA LUTEA AGE 2.5+	5	-0.02	0.10	0.5999	10	-0.02	0.45	0.0348
PREGNANCY RATE AGE 1.5	5	-5.00	0.30	0.3393	10	-1.01	0.09	0.3877
PREGNANCY RATE AGE 2.5+	5	0.83	0.03	0.7761	10	-0.14	0.01	0.8370
TWINNING RATE AGE 2.5+	5	-4.00	0.50	0.1817	10	-2.94	0.62	0.0067
LACTATION RATE AGE 2.5+	5	-11.67	0.94	0.0060	10	-1.11	0.07	0.4667
WEIGHT AGE 1.5	5	7.00	0.50	0.1817	10	1.80	0.14	0.2781
WEIGHT AGE 2.5+	5	-3.55	0.16	0.5066	10	-2.51	0.25	0.1424
WEIGHT CALVES	0	.	.	.	5	-1.94	0.14	0.5309
% CALF WEIGHTS <200	0	22.33	.	.	5	-3.87	0.18	0.4744

Table 2c. HISTORICAL NORTH REGION ADULT COW AND CALF BIOLOGICAL SUMMARY BY AGE CLASS

(BASED ON ROLLING 5-YEAR BLOCKS OF HARVEST DATA)

YEARS	--CORPORA LUTEA--				PREGNANCY RATE (%)				-TWINNING RATE (%)				LACTATION RATE (%)				-----COW WEIGHT-----				--CALF WEIGHTS--		
	---1.5---		---2.5+---		---1.5---		---2.5+---		---1.5---		---2.5+---		---1.5---		---2.5+---		---1.5---		---2.5+---		N MEAN		%<200
	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	%<200
1993-97	26	0.46	59	1.37	26	46.2	59	88.1	12	0.0	52	48.1	25	8.0	61	52.5	23	474.8	50	575.8	8	243.1	12.5
1994-98	29	0.55	68	1.40	29	48.3	68	91.2	14	7.1	62	46.8	31	3.2	70	58.6	26	469.0	60	584.0	11	264.1	0.0
1995-99	25	0.52	85	1.39	25	44.0	85	91.8	11	9.1	78	46.2	30	3.3	91	59.3	28	465.4	82	587.6	11	264.1	0.0
1996-00	26	0.54	88	1.35	26	46.2	88	93.2	12	8.3	82	41.5	28	7.1	98	55.1	27	463.0	88	585.4	12	267.9	0.0
1997-01	25	0.60	89	1.33	25	48.0	89	94.4	12	16.7	84	40.5	28	3.6	101	51.5	26	453.8	93	590.6	12	266.3	0.0
1998-02	26	0.62	104	1.19	26	50.0	104	90.4	13	15.4	94	31.9	29	3.4	113	51.3	26	465.2	104	593.1	16	260.9	6.3
1999-03	30	0.47	105	1.19	30	43.3	105	89.5	13	7.7	94	33.0	31	3.2	113	46.0	31	462.7	105	593.0	13	250.8	7.7
2000-04	30	0.47	94	1.20	30	43.3	94	90.4	13	7.7	85	32.9	29	3.4	96	47.9	29	458.1	89	593.9	15	242.3	13.3
2001-05	35	0.40	97	1.22	35	37.1	97	91.8	13	7.7	89	32.6	35	0.0	94	53.2	33	455.0	88	595.4	15	239.7	13.3
2002-06	47	0.28	108	1.21	47	27.7	108	89.8	13	0.0	97	35.1	46	0.0	105	50.5	43	443.7	98	590.1	17	239.7	11.8
2003-07	51	0.29	106	1.24	51	29.4	106	89.6	15	0.0	95	36.8	49	0.0	103	48.5	45	436.4	96	583.3	18	244.7	11.1
2004-08	45	0.24	108	1.15	45	24.4	108	88.9	11	0.0	96	28.1	43	0.0	106	48.1	39	432.1	96	569.8	22	242.0	13.6
2005-09	51	0.22	126	1.08	51	21.6	126	87.3	11	0.0	110	22.7	49	0.0	126	44.4	45	435.6	119	572.1	25	257.2	8.0
2006-10	48	0.21	122	1.03	48	20.8	122	82.8	10	0.0	101	23.8	45	0.0	120	43.3	44	431.0	120	567.1	25	257.4	8.0
2007-11	35	0.20	112	0.98	35	20.0	112	83.9	7	0.0	94	16.0	32	0.0	109	46.8	34	434.3	108	567.1	22	255.9	9.1
2008-12	27	0.11	91	0.97	27	11.1	91	84.6	3	0.0	77	14.3	26	0.0	88	47.7	30	439.7	89	566.2	20	244.8	5.0
2009-13	26	0.12	83	1.00	26	11.5	83	84.3	3	0.0	70	18.6	24	0.0	78	52.6	27	443.9	84	571.8	21	254.0	0.0
2010-14	19	0.11	63	1.03	19	10.5	63	82.5	2	0.0	52	25.0	18	0.0	55	54.5	20	437.0	62	560.0	16	240.9	0.0
2011-15	13	0.08	57	1.05	13	7.7	57	87.7	1	0.0	50	20.0	13	0.0	53	60.4	14	441.4	56	560.3	13	241.5	0.0
2012-16	8	0.13	42	1.00	8	12.5	42	81.0	1	0.0	34	23.5	9	0.0	36	58.3	9	446.1	43	545.7	12	239.6	0.0
2013-17	8	0.38	35	1.06	8	25.0	35	82.9	2	50.0	29	27.6	8	0.0	27	63.0	7	430.0	35	543.0	8	233.8	12.5
2014-18	5	0.40	25	1.00	5	20.0	25	80.0	1	100.0	20	25.0	6	0.0	19	52.6	5	408.0	25	536.4	2	132.5	100.0
2015-19	3	0.67	19	1.00	3	33.3	19	84.2	1	100.0	16	18.8	3	0.0	16	62.5	3	420.0	19	531.1	2	132.5	100.0
2016-20	3	0.67	10	1.20	3	33.3	10	80.0	1	100.0	8	50.0	3	0.0	6	33.3	3	436.7	10	528.0	2	132.5	100.0
2017-21	3	0.67	9	1.33	3	33.3	9	88.9	1	100.0	8	50.0	3	0.0	6	33.3	3	436.7	9	544.4	4	172.5	75.0
2018-22	2	0.00	7	1.43	2	0.0	7	100.0	0	.	7	42.9	2	0.0	7	28.6	2	417.5	8	553.8	3	200.0	66.7

NORTH REGION 5-YEAR AND 10-YEAR ADULT COW AND CALF BIOLOGICAL DATA TREND ANALYSIS

(Note: PROB>F=0.0000 indicates PROB>F that is <0.0001)

TREND	----- 5-YEAR TRENDS -----				----- 10-YEAR TRENDS -----			
	2014-18 TO 2018-22 DATA		2009-13 TO 2018-22 DATA		2014-18 TO 2018-22 DATA		2009-13 TO 2018-22 DATA	
	YEARS (N)	ANNUAL TREND	R SQUARE	PROB>F	YEARS (N)	ANNUAL TREND	R SQUARE	PROB>F
CORPORA LUTEA AGE 1.5	5	-0.08	0.19	0.4664	10	0.05	0.26	0.1334
CORPORA LUTEA AGE 2.5+	5	0.12	0.95	0.0053	10	0.04	0.61	0.0078
PREGNANCY RATE AGE 1.5	5	-4.00	0.19	0.4664	10	1.46	0.13	0.2966
PREGNANCY RATE AGE 2.5+	5	4.47	0.72	0.0695	10	0.93	0.22	0.1714
TWINNING RATE AGE 2.5+	5	6.70	0.53	0.1642	10	3.19	0.59	0.0093
LACTATION RATE AGE 2.5+	5	-7.73	0.69	0.0808	10	-3.01	0.48	0.0255
WEIGHT AGE 1.5	5	3.57	0.20	0.4497	10	-2.21	0.28	0.1154
WEIGHT AGE 2.5+	5	4.81	0.53	0.1642	10	-2.93	0.40	0.0486
WEIGHT CALVES	5	17.50	0.80	0.0416	10	-11.72	0.48	0.0255
% CALF WEIGHTS <200	5	-5.39	0.80	0.0418	10	-7.06	0.63	0.0064

Table 2c. HISTORICAL W. MTN. REGION ADULT COW AND CALF BIOLOGICAL SUMMARY BY AGE CLASS
(BASED ON ROLLING 5-YEAR BLOCKS OF HARVEST DATA)

YEARS	--CORPORA LUTEA--				PREGNANCY RATE (%)				-TWINNING RATE (%)				LACTATION RATE (%)				-----COW WEIGHT-----				--CALF WEIGHTS--		
	---1.5---		---2.5+---		---1.5---		---2.5+---		---1.5---		---2.5+---		---1.5---		---2.5+---		---1.5---		---2.5+---		N MEAN		%<200
	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	%<200
1993-97	40	0.68	77	1.29	40	55.0	77	92.2	22	22.7	71	36.6	40	17.5	82	68.3	33	476.1	78	561.0	29	237.8	17.2
1994-98	40	0.65	82	1.27	40	52.5	82	91.5	21	23.8	75	34.7	39	10.3	89	65.2	31	470.2	78	571.0	37	257.2	10.8
1995-99	41	0.66	91	1.26	41	53.7	91	93.4	22	22.7	85	32.9	38	5.3	97	64.9	33	456.2	82	569.1	38	255.5	10.5
1996-00	37	0.68	97	1.24	37	54.1	97	93.8	20	25.0	91	29.7	34	5.9	96	58.3	30	452.3	79	564.2	31	257.1	6.5
1997-01	38	0.63	101	1.27	38	50.0	101	94.1	19	26.3	95	32.6	35	5.7	103	53.4	32	450.0	84	571.1	28	256.6	7.1
1998-02	27	0.56	97	1.27	27	48.1	97	94.8	13	15.4	92	32.6	25	0.0	97	52.6	23	438.7	77	573.5	25	266.8	8.0
1999-03	26	0.42	89	1.24	26	42.3	89	93.3	11	0.0	83	32.5	25	0.0	88	50.0	22	440.7	70	572.3	15	244.6	13.3
2000-04	22	0.45	75	1.24	22	45.5	75	92.0	10	0.0	69	34.8	21	4.8	72	47.2	20	468.3	61	570.6	14	241.7	14.3
2001-05	28	0.39	72	1.24	28	39.3	72	93.1	11	0.0	67	32.8	25	8.0	74	54.1	25	453.6	65	571.5	14	238.9	21.4
2002-06	26	0.38	65	1.18	26	38.5	65	92.3	10	0.0	60	26.7	25	8.0	65	52.3	25	446.8	56	564.8	15	227.0	26.7
2003-07	25	0.36	64	1.14	25	36.0	64	90.6	9	0.0	58	24.1	23	8.7	64	51.6	25	438.8	55	562.6	14	214.3	28.6
2004-08	23	0.26	79	1.08	23	26.1	79	88.6	6	0.0	70	20.0	20	10.0	77	45.5	24	425.1	68	551.8	20	226.5	20.0
2005-09	23	0.17	90	1.03	23	17.4	90	87.8	4	0.0	79	16.5	21	4.8	89	38.2	23	412.3	74	545.1	21	229.5	23.8
2006-10	16	0.19	82	1.02	16	18.8	82	86.6	3	0.0	71	16.9	15	0.0	78	33.3	16	403.9	65	538.2	21	236.7	19.0
2007-11	15	0.20	84	0.95	15	20.0	84	84.5	3	0.0	71	12.7	12	0.0	78	37.2	14	405.9	67	538.6	17	246.5	11.8
2008-12	15	0.13	75	0.97	15	13.3	75	85.3	2	0.0	64	14.1	13	0.0	71	35.2	14	407.3	63	535.4	15	247.3	13.3
2009-13	14	0.14	57	1.00	14	14.3	57	87.7	2	0.0	50	14.0	13	0.0	52	38.5	13	413.8	48	532.8	10	240.0	20.0
2010-14	10	0.20	39	1.05	10	20.0	39	89.7	2	0.0	35	17.1	9	0.0	35	51.4	10	414.0	35	539.4	8	236.3	25.0
2011-15	9	0.11	37	1.00	9	11.1	37	86.5	1	0.0	32	15.6	9	0.0	34	50.0	10	421.5	35	547.9	7	217.1	28.6
2012-16	8	0.00	25	1.08	8	0.0	25	88.0	0	.	22	22.7	8	0.0	26	50.0	8	416.9	26	556.0	4	195.0	50.0
2013-17	5	0.00	23	1.00	5	0.0	23	82.6	0	.	19	21.1	5	0.0	21	47.6	5	433.0	21	559.0	4	195.0	50.0
2014-18	3	0.00	16	0.88	3	0.0	16	75.0	0	.	12	16.7	3	0.0	16	43.8	3	425.0	15	564.0	3	186.7	66.7
2015-19	2	0.00	12	0.58	2	0.0	12	58.3	0	.	7	0.0	3	0.0	13	30.8	2	427.5	12	565.8	1	200.0	0.0
2016-20	2	0.50	9	0.56	2	50.0	9	55.6	1	0.0	5	0.0	2	0.0	10	30.0	1	400.0	8	540.6	0	.	.
2017-21	1	1.00	11	0.64	1	100.0	11	54.5	1	0.0	6	16.7	1	0.0	10	30.0	1	400.0	7	525.0	0	.	.
2018-22	2	0.50	8	0.75	2	50.0	8	50.0	1	0.0	4	50.0	2	0.0	7	42.9	2	405.0	6	554.2	0	.	.

W. MTN. REGION 5-YEAR AND 10-YEAR ADULT COW AND CALF BIOLOGICAL DATA TREND ANALYSIS
(Note: PROB>F=0.0000 indicates PROB>F that is <0.0001)

TREND	----- 5-YEAR TRENDS -----				----- 10-YEAR TRENDS -----			
	2014-18 TO 2018-22 DATA		R		2009-13 TO 2018-22 DATA		R	
	YEARS (N)	ANNUAL TREND	SQUARE	PROB>F	YEARS (N)	ANNUAL TREND	SQUARE	PROB>F
CORPORA LUTEA AGE 1.5 -----	5	0.20	0.57	0.1393	10	0.07	0.36	0.0660
CORPORA LUTEA AGE 2.5+ -----	5	-0.02	0.06	0.7023	10	-0.05	0.65	0.0046
PREGNANCY RATE AGE 1.5 -----	5	20.00	0.57	0.1393	10	6.52	0.36	0.0660
PREGNANCY RATE AGE 2.5+ -----	5	-5.38	0.78	0.0455	10	-5.07	0.89	0.0000
TWINNING RATE AGE 2.5+ -----	5	8.33	0.42	0.2394	10	1.03	0.05	0.5316
LACTATION RATE AGE 2.5+ -----	5	-0.26	0.00	0.9282	10	-1.65	0.33	0.0816
WEIGHT AGE 1.5 -----	5	-6.75	0.61	0.1181	10	-1.58	0.18	0.2272
WEIGHT AGE 2.5+ -----	5	-6.05	0.31	0.3287	10	0.54	0.01	0.7408
WEIGHT CALVES -----	2	13.33	1.00	.	7	-8.62	0.76	0.0105
% CALF WEIGHTS <200 -----	2	-11.70	1.00	.	7	-1.24	0.02	0.7426

Table 2c. HISTORICAL CENTRAL REGION ADULT COW AND CALF BIOLOGICAL SUMMARY BY AGE CLASS

(BASED ON ROLLING 5-YEAR BLOCKS OF HARVEST DATA)

YEARS	--CORPORA LUTEA--				PREGNANCY RATE (%)				-TWINNING RATE (%)				LACTATION RATE (%)				-----COW WEIGHT-----				--CALF WEIGHTS--		
	---1.5---		--2.5+--		---1.5---		---2.5+--		---1.5---		---2.5+--		---1.5---		---2.5+--		---1.5---		---2.5+--		N MEAN		%<200
	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	%<200
1993-97	18	0.56	51	1.14	18	50.0	51	82.4	9	11.1	42	38.1	16	18.8	55	60.0	15	435.1	47	526.0	14	242.9	7.1
1994-98	17	0.47	52	1.17	17	41.2	52	82.7	7	14.3	43	41.9	15	13.3	57	61.4	14	424.8	49	525.1	14	257.9	0.0
1995-99	20	0.55	54	1.17	20	50.0	54	81.5	10	10.0	44	43.2	21	14.3	59	59.3	18	443.7	54	529.5	15	251.7	13.3
1996-00	18	0.56	51	1.12	18	50.0	51	82.4	9	11.1	42	35.7	19	10.5	58	53.4	18	438.9	53	536.5	15	243.0	20.0
1997-01	15	0.67	54	1.17	15	60.0	54	88.9	9	11.1	48	31.3	17	11.8	58	58.6	17	443.5	59	533.3	15	240.7	20.0
1998-02	19	0.58	65	1.23	19	57.9	65	90.8	11	0.0	59	35.6	25	16.0	68	61.8	24	451.9	70	545.2	12	230.8	25.0
1999-03	22	0.68	79	1.22	22	68.2	79	92.4	15	0.0	73	31.5	29	13.8	81	61.7	28	457.9	80	553.9	12	217.1	25.0
2000-04	23	0.70	79	1.23	23	69.6	79	93.7	16	0.0	74	31.1	28	14.3	82	62.2	27	452.6	79	557.6	9	225.6	11.1
2001-05	25	0.68	86	1.20	25	68.0	86	91.9	17	0.0	79	30.4	28	10.7	87	59.8	28	448.0	83	552.7	10	232.0	0.0
2002-06	28	0.61	94	1.21	28	60.7	94	91.5	17	0.0	86	31.4	30	10.0	97	51.5	32	444.2	89	558.4	11	224.5	9.1
2003-07	28	0.46	87	1.16	28	46.4	87	90.8	13	0.0	79	26.6	28	7.1	91	47.3	29	418.3	81	547.8	11	227.3	9.1
2004-08	29	0.34	86	1.16	29	34.5	86	88.4	10	0.0	76	28.9	29	6.9	93	43.0	30	410.2	84	550.5	12	239.2	16.7
2005-09	26	0.27	93	1.13	26	26.9	93	87.1	7	0.0	81	27.2	26	3.8	99	46.5	27	406.9	91	547.5	14	241.8	21.4
2006-10	24	0.25	87	1.21	24	25.0	87	89.7	6	0.0	78	32.1	25	4.0	100	44.0	25	409.6	92	553.6	13	248.1	23.1
2007-11	22	0.23	79	1.18	22	22.7	79	89.9	5	0.0	71	29.6	24	4.2	89	44.9	21	407.1	84	549.8	10	260.0	20.0
2008-12	17	0.24	85	1.21	17	23.5	85	90.6	4	0.0	77	32.5	18	5.6	95	44.2	15	428.0	90	554.5	10	263.0	20.0
2009-13	16	0.31	79	1.19	16	31.3	79	92.4	5	0.0	73	28.8	17	5.9	85	45.9	14	436.1	80	548.1	10	260.5	20.0
2010-14	12	0.33	66	1.21	12	33.3	66	93.9	4	0.0	62	29.0	13	7.7	72	40.3	11	439.5	67	549.9	6	268.3	16.7
2011-15	9	0.33	56	1.18	9	33.3	56	94.6	3	0.0	53	24.5	10	10.0	54	40.7	8	444.4	52	545.2	5	268.0	20.0
2012-16	6	0.33	41	1.24	6	33.3	41	97.6	2	0.0	40	27.5	7	14.3	40	42.5	6	440.8	38	552.6	5	268.0	20.0
2013-17	4	0.50	27	1.22	4	50.0	27	100.0	2	0.0	27	22.2	5	0.0	25	48.0	5	433.0	23	557.6	3	263.3	33.3
2014-18	0	.	11	1.18	0	.	11	100.0	0	.	11	18.2	0	.	10	40.0	0	.	10	564.5	0	.	.
2015-19	0	.	6	1.17	0	.	6	100.0	0	.	6	16.7	0	.	5	40.0	0	.	4	546.3	0	.	.
2016-20	0	.	3	1.00	0	.	3	100.0	0	.	3	0.0	0	.	3	66.7	0	.	1	540.0	0	.	.
2017-21	0	.	3	1.00	0	.	3	100.0	0	.	3	0.0	0	.	3	66.7	0	.	1	540.0	0	.	.
2018-22	0	.	1	1.00	0	.	1	100.0	0	.	1	0.0	0	.	1	100.0	0	.	0	.	0	.	.

CENTRAL REGION 5-YEAR AND 10-YEAR ADULT COW AND CALF BIOLOGICAL DATA TREND ANALYSIS

(Note: PROB>F=0.0000 indicates PROB>F that is <0.0001)

TREND	----- 5-YEAR TRENDS -----				----- 10-YEAR TRENDS -----			
	2014-18 TO 2018-22 DATA				2009-13 TO 2018-22 DATA			
	YEARS (N)	ANNUAL TREND	SQUARE	PROB>F	YEARS (N)	ANNUAL TREND	SQUARE	PROB>F
CORPORA LUTEA AGE 1.5	0	.	.	.	5	0.04	0.59	0.1309
CORPORA LUTEA AGE 2.5+	5	-0.05	0.77	0.0507	10	-0.03	0.65	0.0046
PREGNANCY RATE AGE 1.5	0	.	.	.	5	3.75	0.59	0.1309
PREGNANCY RATE AGE 2.5+	0	.	.	.	10	0.88	0.77	0.0009
TWINNING RATE AGE 2.5+	5	-5.30	0.77	0.0507	10	-3.77	0.87	0.0001
LACTATION RATE AGE 2.5+	5	14.67	0.88	0.0191	10	4.76	0.55	0.0144
WEIGHT AGE 1.5	0	.	.	.	5	-0.49	0.03	0.7782
WEIGHT AGE 2.5+	4	-7.98	0.79	0.1116	9	-0.80	0.08	0.4755
WEIGHT CALVES	0	.	.	.	5	0.53	0.06	0.6996
% CALF WEIGHTS <200	0	-1.67	.	.	5	6.91	0.53	0.1614

Table 2c. HISTORICAL SOUTH REGION ADULT COW AND CALF BIOLOGICAL SUMMARY BY AGE CLASS
(BASED ON ROLLING 5-YEAR BLOCKS OF HARVEST DATA)

YEARS	--CORPORA LUTEA--				PREGNANCY RATE (%)				-TWINNING RATE (%) -				LACTATION RATE (%)				-----COW WEIGHT-----				--CALF WEIGHTS--		
	---1.5---		---2.5+---		---1.5---		---2.5+---		---1.5---		---2.5+---		---1.5---		---2.5+---		---1.5---		---2.5+---		N MEAN		%<200
	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN			
1989-93	0	.	0	.	0	.	0	.	0	.	0	.	0	.	0	.	0	.	0	.	0	.	.
1990-94	2	0.00	6	1.17	2	0.0	6	100.0	0	.	6	16.7	2	50.0	6	66.7	2	322.5	5	516.0	2	225.0	0.0
1991-95	2	0.00	11	1.27	2	0.0	11	100.0	0	.	11	27.3	3	33.3	11	81.8	3	395.0	10	536.0	3	231.7	0.0
1992-96	2	0.00	16	1.19	2	0.0	16	93.8	0	.	15	26.7	3	33.3	15	86.7	3	395.0	15	544.0	5	212.0	40.0
1993-97	4	0.25	21	1.14	4	25.0	21	85.7	1	0.0	18	33.3	4	25.0	20	70.0	6	389.2	20	539.3	11	225.5	36.4
1994-98	4	0.25	29	1.31	4	25.0	29	89.7	1	0.0	26	46.2	4	25.0	32	65.6	6	389.2	31	525.8	14	227.1	28.6
1995-99	6	0.67	25	1.40	6	66.7	25	88.0	4	0.0	22	59.1	7	0.0	29	62.1	10	460.0	30	533.7	14	247.9	28.6
1996-00	8	0.63	31	1.32	8	62.5	31	87.1	5	0.0	27	51.9	8	0.0	35	48.6	11	451.8	33	531.4	15	246.3	26.7
1997-01	8	0.63	38	1.34	8	62.5	38	89.5	5	0.0	34	50.0	9	0.0	42	47.6	12	442.5	40	527.3	15	258.0	13.3
1998-02	8	0.50	39	1.38	8	50.0	39	94.9	4	0.0	37	45.9	10	0.0	44	56.8	10	458.5	41	532.3	11	266.4	0.0
1999-03	11	0.36	34	1.29	11	36.4	34	94.1	4	0.0	32	37.5	15	0.0	35	54.3	14	446.8	33	539.1	10	264.5	10.0
2000-04	8	0.13	37	1.22	8	12.5	37	94.6	1	0.0	35	28.6	12	0.0	37	54.1	10	397.5	34	524.4	10	235.0	10.0
2001-05	7	0.00	30	1.20	7	0.0	30	96.7	0	.	29	24.1	12	0.0	29	58.6	10	390.5	29	524.3	9	234.4	11.1
2002-06	7	0.00	19	1.16	7	0.0	19	100.0	0	.	19	15.8	11	0.0	21	52.4	9	396.1	20	520.8	8	224.0	12.5
2003-07	6	0.00	17	1.12	6	0.0	17	100.0	0	.	17	11.8	10	0.0	18	38.9	9	388.9	17	502.4	6	218.7	16.7
2004-08	3	0.00	18	1.06	3	0.0	18	100.0	0	.	18	5.6	5	0.0	19	42.1	5	366.0	18	503.1	4	224.3	0.0
2005-09	3	0.00	16	1.06	3	0.0	16	93.8	0	.	15	13.3	4	0.0	17	35.3	4	403.8	17	515.9	3	229.0	0.0
2006-10	6	0.00	17	1.24	6	0.0	17	94.1	0	.	16	31.3	6	0.0	21	42.9	6	390.8	20	512.3	4	240.5	25.0
2007-11	7	0.14	19	1.21	7	14.3	19	94.7	1	0.0	18	27.8	7	0.0	22	45.5	7	399.3	21	511.0	4	237.5	25.0
2008-12	6	0.17	20	1.10	6	16.7	20	85.0	1	0.0	17	29.4	6	0.0	23	43.5	6	405.8	21	519.0	6	223.3	33.3
2009-13	7	0.14	21	1.10	7	14.3	21	76.2	1	0.0	16	43.8	7	0.0	24	37.5	7	399.3	21	516.2	6	223.3	33.3
2010-14	7	0.29	19	1.11	7	28.6	19	78.9	2	0.0	15	40.0	7	14.3	22	45.5	7	410.0	18	512.2	5	221.0	40.0
2011-15	3	0.67	15	1.00	3	66.7	15	73.3	2	0.0	11	36.4	3	33.3	17	35.3	3	433.3	14	503.9	3	200.0	33.3
2012-16	2	0.50	14	1.07	2	50.0	14	71.4	1	0.0	10	50.0	2	50.0	15	26.7	2	425.0	12	507.1	2	195.0	50.0
2013-17	2	0.50	9	1.22	2	50.0	9	77.8	1	0.0	7	57.1	2	50.0	10	20.0	2	425.0	9	492.2	0	.	.
2014-18	1	1.00	5	1.80	1	100.0	5	100.0	1	0.0	5	60.0	1	100.0	6	16.7	1	490.0	6	509.7	0	.	.
2015-19	0	.	4	2.00	0	.	4	100.0	0	.	4	75.0	0	.	5	0.0	0	.	5	526.6	0	.	.
2016-20	0	.	4	2.00	0	.	4	100.0	0	.	4	75.0	0	.	4	25.0	0	.	4	584.5	0	.	.
2017-21	0	.	2	2.50	0	.	2	100.0	0	.	2	100.0	0	.	2	50.0	0	.	2	629.0	0	.	.
2018-22	0	.	2	2.50	0	.	2	100.0	0	.	2	100.0	0	.	2	50.0	0	.	2	629.0	0	.	.

SOUTH REGION 5-YEAR AND 10-YEAR ADULT COW AND CALF BIOLOGICAL DATA TREND ANALYSIS
(Note: PROB>F=0.0000 indicates PROB>F that is <0.0001)

TREND	----- 5-YEAR TRENDS -----				----- 10-YEAR TRENDS -----			
	2014-18 TO 2018-22 DATA		2009-13 TO 2018-22 DATA		2014-18 TO 2018-22 DATA		2009-13 TO 2018-22 DATA	
	YEARS (N)	ANNUAL TREND	SQUARE R	PROB>F	YEARS (N)	ANNUAL TREND	SQUARE R	PROB>F
CORPORA LUTEA AGE 1.5	0	.	.	.	6	0.14	0.72	0.0326
CORPORA LUTEA AGE 2.5+	5	0.19	0.88	0.0192	10	0.19	0.88	0.0001
PREGNANCY RATE AGE 1.5	0	.	.	.	6	13.61	0.72	0.0326
PREGNANCY RATE AGE 2.5+	0	.	.	.	10	3.65	0.72	0.0020
TWINNING RATE AGE 2.5+	5	10.50	0.90	0.0146	10	7.26	0.90	0.0000
LACTATION RATE AGE 2.5+	5	11.67	0.72	0.0689	10	0.06	0.00	0.9763
WEIGHT AGE 1.5	0	.	.	.	6	14.01	0.69	0.0417
WEIGHT AGE 2.5+	5	34.11	0.93	0.0083	10	14.01	0.65	0.0049
WEIGHT CALVES	0	.	.	.	4	-10.60	0.90	0.0509
% CALF WEIGHTS <200	0	24.22	.	.	4	14.54	0.50	0.2897

Table 2c. HISTORICAL OVERALL REGION ADULT COW AND CALF BIOLOGICAL SUMMARY BY AGE CLASS
(BASED ON ROLLING 5-YEAR BLOCKS OF HARVEST DATA)

YEARS	--CORPORA LUTEA--				PREGNANCY RATE (%)				-TWINNING RATE (%)				LACTATION RATE (%)				-----COW WEIGHT-----				--CALF WEIGHTS--		
	---1.5---		---2.5+---		---1.5---		---2.5+---		---1.5---		---2.5+---		---1.5---		---2.5+---		---1.5---		---2.5+---		N MEAN		%<200
	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN			
1993-97	124	0.52	336	1.32	124	47.6	336	90.5	59	10.2	304	42.4	122	10.7	340	63.5	112	462.4	319	566.4	87	241.8	16.1
1994-98	133	0.54	373	1.31	133	47.4	373	90.6	63	12.7	338	41.7	133	6.0	391	63.4	120	459.4	363	564.5	109	257.6	11.0
1995-99	151	0.55	407	1.29	151	49.0	407	90.2	74	10.8	367	40.9	158	3.8	432	60.9	152	457.1	404	565.2	116	260.2	12.1
1996-00	157	0.55	437	1.26	157	48.4	437	91.1	76	11.8	398	36.7	160	4.4	461	55.5	159	455.3	424	565.1	112	259.6	10.7
1997-01	171	0.57	471	1.27	171	49.7	471	91.9	85	12.9	433	37.0	179	3.4	491	52.7	177	454.4	460	565.3	114	261.2	7.9
1998-02	166	0.50	461	1.24	166	45.2	461	91.8	75	9.3	423	35.2	174	3.4	477	53.7	170	457.9	438	567.8	104	261.3	9.6
1999-03	176	0.44	443	1.21	176	42.0	443	91.4	74	4.1	405	32.3	188	3.7	448	50.4	182	454.8	409	570.3	81	247.4	12.3
2000-04	155	0.43	420	1.21	155	40.6	420	91.9	63	4.8	386	31.9	162	4.9	410	51.0	157	451.8	379	568.9	71	238.0	14.1
2001-05	166	0.37	399	1.19	166	36.1	399	91.5	60	3.3	365	30.1	171	4.1	387	53.0	165	445.8	364	567.8	68	235.7	16.2
2002-06	167	0.29	403	1.17	167	28.7	403	90.6	48	0.0	365	28.2	174	4.0	403	48.4	171	436.3	365	564.8	70	234.0	17.1
2003-07	172	0.28	424	1.15	172	27.9	424	89.6	48	0.0	380	26.6	177	4.0	423	47.0	173	425.9	376	559.6	72	235.4	15.3
2004-08	163	0.22	442	1.11	163	22.1	442	88.0	36	0.0	389	24.2	162	3.7	446	45.1	161	421.0	400	554.6	84	238.5	15.5
2005-09	169	0.21	470	1.06	169	20.7	470	86.4	35	2.9	406	21.2	164	2.4	480	43.5	165	423.0	435	554.7	91	246.6	15.4
2006-10	154	0.23	450	1.07	154	22.1	450	85.8	34	2.9	386	23.3	150	1.3	465	42.2	152	420.9	429	552.4	89	249.9	14.6
2007-11	132	0.23	420	1.02	132	22.0	420	84.8	29	3.4	356	19.7	123	1.6	423	45.6	126	417.3	397	552.1	75	251.8	13.3
2008-12	110	0.21	358	1.03	110	20.0	358	85.2	22	4.5	305	20.7	103	1.0	364	44.2	108	420.9	350	551.1	66	246.4	15.2
2009-13	102	0.24	318	1.04	102	22.5	318	85.2	23	4.3	271	22.1	96	1.0	313	46.6	101	418.7	305	549.5	61	249.1	13.1
2010-14	77	0.23	248	1.08	77	23.4	248	86.7	18	0.0	215	25.1	75	2.7	241	47.3	77	411.5	236	547.5	44	242.2	13.6
2011-15	57	0.21	210	1.04	57	21.1	210	86.2	12	0.0	181	21.0	56	3.6	197	49.2	59	408.1	193	546.5	36	237.4	13.9
2012-16	41	0.22	145	1.08	41	22.0	145	85.5	9	0.0	124	26.6	42	4.8	136	47.8	43	415.3	136	543.6	28	233.4	17.9
2013-17	31	0.29	109	1.08	31	25.8	109	85.3	8	12.5	93	26.9	30	3.3	94	48.9	30	410.8	99	541.2	18	232.5	22.2
2014-18	13	0.31	63	1.06	13	23.1	63	84.1	3	33.3	53	24.5	13	7.7	55	45.5	12	408.3	61	545.4	5	165.0	80.0
2015-19	8	0.38	45	0.98	8	25.0	45	80.0	2	50.0	36	19.4	8	0.0	42	42.9	7	416.4	43	542.3	3	155.0	66.7
2016-20	8	0.50	32	1.00	8	37.5	32	75.0	3	33.3	24	29.2	8	0.0	29	37.9	6	418.3	29	534.9	2	132.5	100.0
2017-21	7	0.57	31	1.03	7	42.9	31	77.4	3	33.3	24	29.2	7	0.0	27	37.0	6	418.3	25	541.5	4	172.5	75.0
2018-22	6	0.17	24	1.13	6	16.7	24	79.2	1	0.0	19	36.8	6	0.0	23	39.1	6	407.5	22	553.5	3	200.0	66.7

OVERALL REGION 5-YEAR AND 10-YEAR ADULT COW AND CALF BIOLOGICAL DATA TREND ANALYSIS
(Note: PROB>F=0.0000 indicates PROB>F that is <0.0001)

TREND	----- 5-YEAR TRENDS -----				----- 10-YEAR TRENDS -----			
	2014-18 TO 2018-22 DATA	YEARS	ANNUAL TRENDS	PROB>F	2009-13 TO 2018-22 DATA	YEARS	ANNUAL TRENDS	PROB>F
	(N)				(N)			
CORPORA LUTEA AGE 1.5	5	-0.01	0.01	0.8920	10	0.02	0.26	0.1343
CORPORA LUTEA AGE 2.5+	5	0.02	0.24	0.4059	10	-0.00	0.00	0.8554
PREGNANCY RATE AGE 1.5	5	0.50	0.01	0.9063	10	1.04	0.16	0.2576
PREGNANCY RATE AGE 2.5+	5	-1.25	0.34	0.3004	10	-1.17	0.72	0.0020
TWINNING RATE AGE 2.5+	5	3.43	0.71	0.0729	10	1.08	0.43	0.0408
LACTATION RATE AGE 2.5+	5	-1.85	0.67	0.0882	10	-1.30	0.71	0.0022
WEIGHT AGE 1.5	5	0.02	0.00	0.9912	10	-0.01	0.00	0.9924
WEIGHT AGE 2.5+	5	1.56	0.13	0.5471	10	-0.38	0.05	0.5297
WEIGHT CALVES	5	8.75	0.31	0.3258	10	-10.65	0.57	0.0111
% CALF WEIGHTS <200	5	-2.64	0.04	0.7331	10	-1.91	0.71	0.0024

Table 3. Mean number of winter ticks (n) on harvested bull moose in October. Counts are the sum of ticks visible on four 10 cm transects from 4 regions of the moose (neck, shoulder, rib, rump). NorthComb is WMUs A1, A2, B, C1, C2, and D1. * denotes fall before an epizootic.

	2008	2009	2010*	2011	2012	2013*	2014*	2015*	2016	2017*	2018*	2019	2020	2021	2022
Ct. Lakes	49 (12)	35 (13)	71 (8)	45 (8)	33 (6)	56 (6)	72 (3)	51 (11)	47 (8)	31 (7)	34 (8)	39 (7)	33 (6)	52 (10)	46 (9)
North	87 (16)	57 (9)	125 (11)	51 (18)	35 (13)	108 (10)	48 (6)	97 (16)	46 (15)	56 (5)	75 (9)	59 (8)	33 (11)	37 (7)	36 (9)
NorthComb	73 (34)	44 (28)	97 (23)	48 (29)	35 (34)	88 (22)	53 (12)	80 (29)	50 (27)	41 (13)	51 (21)	48 (16)	35 (19)	43 (19)	40 (20)
White Mtns	68 (8)	40 (7)	63 (5)	28 (5)	30 (10)	76 (8)	33 (5)	50 (9)	47 (9)	22 (7)	24 (7)	30 (2)	47 (3)	19 (3)	52 (2)
Central	62 (1)	--	--	18 (15)	40 (5)	67 (9)	21 (2)	16 (6)	25 (3)	27 (4)	9 (5)	86 (2)	23 (4)	--	--
S. West	--	--	--	3 (2)	--	31 (4)	8 (1)	--	51 (1)	--	--	22 (2)	13 (1)	--	--
S. East	--	--	--	--	4 (1)	8 (1)	--	--	6 (2)	--	7 (2)	152 (2)	0 (1)	--	--

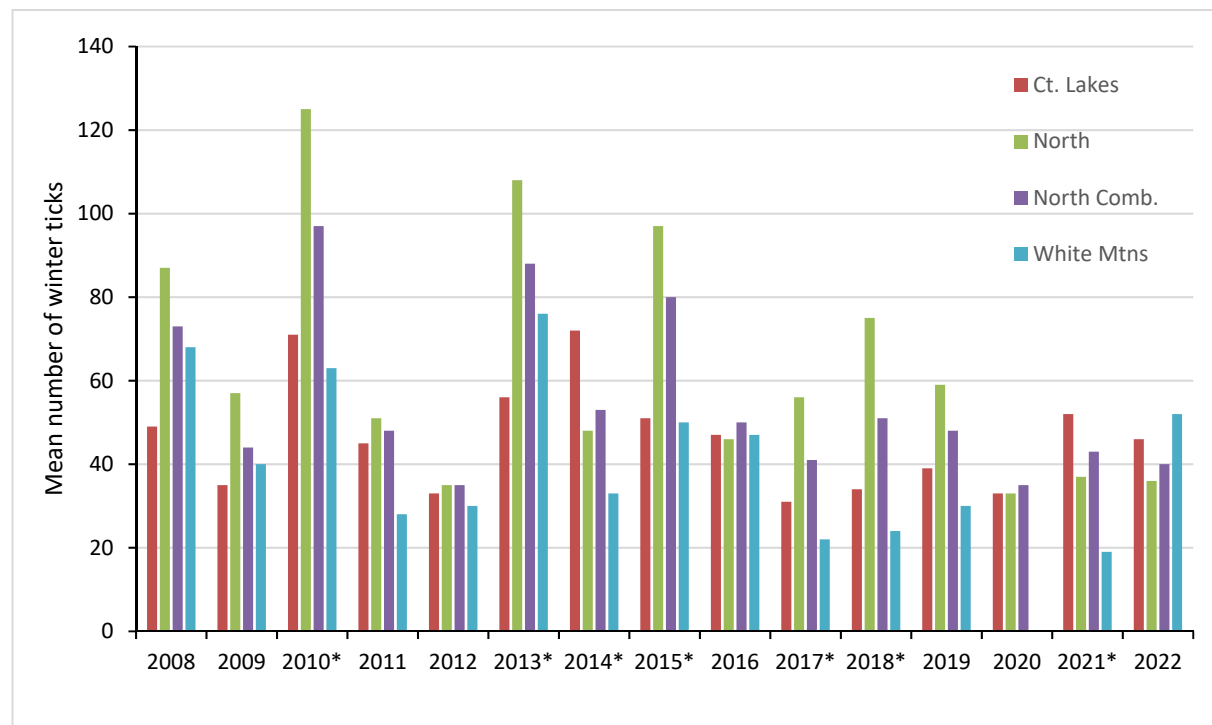


Figure 1. Mean number of winter ticks (n) on harvested bull moose in October. Counts are the sum of ticks visible on four 10 cm transects from 4 regions of the moose (neck, shoulder, rib, rump). NorthComb is A1, A2, B, C1, C2, and D1. The fall before an epizootic is denoted by *

PERFORMANCE REPORT

State: New Hampshire

Grant: F20AF11939

Grant Type: Survey and Inventory

Grant Title: NH – WILDLIFE RESEARCH AND MANAGEMENT (W-89-R-21)

Period Covered: July 1, 2022 - June 30, 2023

Purpose/Target Name: PROJECT 2 - MOOSE RESEARCH AND MANAGEMENT

Objective Name: JOB 2 - NON-HARVEST DATA COLLECTION, ENTRY AND ANALYSIS

Objective Statement: To annually determine sex, age class, cause, location, timing and level of non-harvest moose mortalities in a reliable and cost effective fashion; to monitor and evaluate the impacts of weather, environmental contaminants, parasites, and diseases on moose productivity and mortality, and if needed, develop new techniques, methods and tests to accomplish this; to annually determine regional adult sex ratios, population rate of change, fall recruitment, distribution, relative density patterns and age structure of the moose population in a cost effective and reliable manner; to determine regional moose densities as needed 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, and; to measure available browse and or browsing impacts as needed, using methods that are cost effective and reliable.

Summary: Statewide, 74 moose were reported killed by means other than legal hunting in 2022. Most (60 of 75) were vehicle kills and the majority occurred in the North, White Mountains, and Central regions; both the quantity and location of vehicle kills was similar to 2021. The next largest cause of mortality was debilitating infection with brainworm (n=9), *Parelaphostrongylus tenuis*.

Euthanized sick, fresh dead, and hunter harvested moose were tested for brainworm using a serum antibody test (CELISA) and/or histologic assessment of brain tissue for brainworm evidence (tracks, inflammation, pieces of worm, etc.). These tests are still being completed at the respective laboratories.

The statewide moose density, as estimated with the deer hunter survey, decreased from 0.24 moose/mi² in 2021 to 0.21 moose/mi² in 2022. Hunter participation in the survey was stable at 14,146 days in 2021 to 14,059 days in 2022 and this level of participation is similar to participation levels when the survey was developed.

The amount of optimal forage (heavily disturbed forest 4-16 years since disturbance) was quantified for each year since 2016 using remotely-sensed data. Optimal forage was highest in the North (18.4% of moose habitat) and Ct. Lakes (13.6%) regions and 4-6% in the other regions.

Target Date: June 30th annually 2021-2025.

Status of Progress: On schedule.

Objective Approach: Fish and Game personnel or their designees will record sex, age class, cause, location and date of all known moose mortalities. If deemed necessary, reproductive status and tick related spring hair loss patterns will also be determined. Previous research conducted under this grant has demonstrated that winter ticks can play an important role in moose population dynamics. In order to monitor for tick-induced moose mortality events, surveys of moose at salt licks may be conducted in the months of August and September and again in April and May in order to detect changes in the calf component of the herd. These changes will be assessed against corresponding levels of winter tick measurements to determine the relationship between winter tick abundance and spring calf mortality. Additional monitoring and surveillance efforts will be established when necessary to evaluate the potential impacts of other parasites and diseases on moose. Necessary training in necropsy and field diagnosis techniques will be provided to staff and arrangements made for confirmatory testing and laboratory diagnostics. When deemed necessary, biological samples may be collected from moose for toxicological, pathologic and condition evaluation. Monitoring, surveillance and testing methods will be developed as needed to effectively

assess these impacts. The Department will work through the Northeast Wildlife Disease Cooperative (NWDC) to gain access to wildlife disease and parasite diagnostics and testing, technical support with wildlife health issues and educational resources. The NWDC has shut down during the current 5-year grant period but the New Hampshire Veterinary Diagnostic Laboratory (NHVDL) has been providing similar services and expertise. Weather patterns that may influence parasite loads will also be collected from existing meteorological stations, and if deemed necessary, Department staff or citizen scientists will be trained and equipped with appropriate monitoring devices to provide data from areas where no other stations exist.

Moose hunters will be provided with diary cards 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 will be asked for similar information using a written survey format. This survey is referred to as the Deer Hunter Mail Survey. Data will be collected from deer hunters during the first 12 days of the regular firearms deer season.

Occasionally it may be necessary to obtain a moose population estimate or age-sex data 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 + 25% of the population estimate, are achievable. Information regarding New Hampshire's past work with aerial thermal infrared imagery can be found in previous grant reports (see NH W-89-R-1, Project II, Job 5). Aerial infrared surveys or other proven survey methods may be employed as necessary.

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 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 its 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:

Non-harvest Mortality

Statewide, 74 moose were reported killed by means other than legal hunting in 2022, this included 59 roadkill, nine brainworm, and six other (found dead, euthanized/died due to other causes; Table 1).

Location and demographics of moose killed in vehicle collisions were similar to previous years. Vehicle kills occurred in all management regions with 24 in the North, 18 in the White Mountains, 10 in the Central, five in the Southwest, one in the Southeast and one in the Ct. Lakes regions. Twenty-five (25) were adult (1 yro+) cows, 19 were adult bulls, six were unknown age bulls, five were unknown age cows, and three were calves.

A separate survey focused on brainworm was also completed. Biologists collected serum from hunter-harvested (n=12), euthanized sick (n=7; brainworm category on of non-harvest mortality), and roadkill (n=3; vehicle category of non-harvest mortality) moose. Serum was submitted to the University of Tennessee Veterinary Medical Center for a CELISA specific to brainworm antibodies, thereby indicating previous infection with brainworm. Euthanized sick (n=6; brainworm category), fresh dead (n=2; other category), and one roadkill also had the brain removed and submitted for histologic assessment at the NHDVL to search for evidence of infection with brainworm (tracks, inflammation, pieces of worm). Results are pending for both tests.

Deer Hunter Mail Survey

Only five and 10 year trends significant at $P < 0.05$ are reported.

Previous research (see W-89-R-1, Project 2, Job 5) allowed for the determination of the relationship between actual moose density (as determined through infrared surveys) and deer hunter observation rates (Figure 2). Applying the regression equation ($Y = 0.3003x + 0.0175(X)$, $R^2 = 0.6332$) to the average of the deer hunter observation rates (X) for each region yields a population density estimate (Y) for the regions (Table 2) and statewide. The statewide moose density, as estimated with the deer hunter survey, decreased from 0.24 moose/mi² in 2021 to 0.21 moose/mi² in 2022. Statewide moose density has been declining over the last 10 years.

See Table 2 for a summary of all Deer Hunter Mail Survey data. Of the 18,000 surveyed deer hunters, statewide hunter days were stable at 14,146 days in 2021 to 14,059 days in 2022. The mail survey recorded 485 moose observed in 68,297 hours of hunter effort for a mean total of 0.71 moose seen/hundred hunter hours. Numbers of moose seen were at least 100 in the Ct. Lakes and Central regions.

In the Ct. Lakes, the estimated moose density declined from 1.59 moose/mi² in 2021 to 1.11 moose/mi² in 2022; and density is decreasing over the last 10 years. Hunter days decreased from 620 in 2021 to 584 in 2022. The percentage of adults that are bulls is currently 47%, which is above the goal of 40%. Recruitment indices were stable with 0.35 calves/cow, as was the proportion of calves in the population, 16% calves.

In the North region, the estimated moose density increased from 0.93 moose/mi² in 2021 to 0.97 moose/mi² in 2022, but density is decreasing when examined over the last 10 years. Hunter days increased from 584 in 2021 to 627 in 2022. The percentage of adults that are bulls rose from 29% in 2021 to 46% in 2022 and is now above goal (40%). Calves/cow increased from 0.20 calves/cow in 2021 to 0.43 calves/cow in 2022 and the proportion of calves in the population increased to 19%.

The estimated moose density for the White Mtn. region declined from 0.24 moose/mi² in 2021 to 0.22 moose/mi² in 2022, and moose density is declining when examined over the last 10 years. Hunter days increased from 1,234 in 2021 to 1,362 in 2022. The adult bull sex ratio exceeds the goal (40%) at 54% bulls. Calves per cow increased from 0.10 in 2021 to 0.35 in 2022, and percentage of calves in the population increased to 14%, but both of these are still the lowest statewide.

The Central region estimated density increased from 0.16 moose/mi² in 2021 to 0.19 moose/mi² in 2022, but it is decreasing over the last 10 years. Hunter days were stable at 5,343 days. The proportion of adults which are bulls was also stable at 49%, which is above goal (40%). Calves per adult cow increased from 0.40 in 2021 to 0.45 in 2022 and subsequently percent calves in the population increased from 17% in 2021 to 19% in 2022 and it is increasing over the last five years.

The Southwest region density decreased from 0.23 moose/mi² in 2021 to 0.10 moose/mi² in 2022. Hunter days increased from 2,817 days in 2021 to 2,972 days in 2022. The proportion of adults which are bulls is 32%, below the minimum goal (40%). Calves per cow decreased from 0.62 calves/cow in 2021 to 0.41 calves/cow in 2022, as did proportion of the population which is calves going from 25% to 22%. Five year trends in both calves/cow and proportion calves in the population are increasing.

The Southeast region estimated density was nearly stable at 0.04 moose/mi² in 2021 and 0.05 moose/mi² in 2022, but moose density is decreasing over the last five and 10 years. Hunter days decreased from 3,585 days in 2021 to 3,171 days in 2022. The percentage of adult moose that are bulls was 62%, and above goal (40%). Calves per cow increased from 0.14 calves/cow in 2021 to 0.60 calves/cow in 2022 and percentage calves in the population increased from 8% to 19%.

Regional moose population status in relation to moose population goals for each region (specified in the 2016-2025 Game Management Plan) is based on the 2-year average density derived from this data. Moose permit issuance is based on moose density in this index and the 2-year average minimizes annual variation in the survey.

It is important to remember that the regression illustrated in Figure 2 is best applied to 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 density. Because the IR area is not a defined management area (the boundaries of the IR area included units A1, A2, B, C1, C2 and D1), using the regression to determine a population estimate for areas outside these units is based on unverified predicted densities. Regional differences in moose visibility or hunter behavior among other factors may affect the relationship between observation rate and density. Current research is reassessing the accuracy of this survey using aerial infrared surveys with drones and networks of trail cameras.

Moose hunter diary observations are not reported because the small sample size is not providing reliable data.

Habitat Mapping and Browse Impacts

Optimal moose foraging vegetation was calculated for each year since 2016 using remotely sensed data and is reported in Table 4. Optimal forage is forest where substantial canopy removal (>30%) occurred in the last 4-16 years and it is assumed this disturbance resulted in abundant growth of young trees in the understory providing a

large amount of browse for moose. Disturbed stands were detected using remotely sensed data including LiDAR and aerial imagery from public datasets. The specific technique used was a “harmonization” process in which multiple datasets are overlaid and only areas designated as disturbed by two or more layers are considered optimal forage. The acreage of disturbed forest was divided by the acreage of potential moose habitat (areas <2,700 ft elevation, non-developed, and shallow water >100m from development) to provide the proportion of forest in optimal forage for each region. Moderate to high moose abundance is expected when 10-30% of the forest is providing optimal forage. This dataset will be updated annually to track changes. Reporting should be expanded to include the distribution of optimal forage within each WMU.

The proportion of forest in optimal forage in the Ct. Lakes and North regions was 13.6% and 18.4%, respectively in 2022 (Table 4). Optimal forage abundance in all other regions was 4-6% and this amount of optimal forage, particularly the lowest regional proportion of 4% in the White Mountains region, may be limiting moose abundance. All regions are showing a trend of slightly increasing optimal forage abundance since 2016 and this should benefit moose in all regions that have less than 10% in optimal forage.

Conclusions:

Non-harvest mortality was primarily vehicle-killed moose and the number of vehicle kills is declining over time.

Monitoring the impact of brainworm infection on the moose population is a priority because moose populations are known to decrease or disappear due to brainworm parasitism when white-tailed deer densities are above 10 deer/mi², as they are in much of NH (Table 3). Two techniques, a CELISA for brainworm antibodies and histologic examination of brain tissue, are being investigated by sampling symptomatic, non-symptomatic, and unknown symptom history moose. Results are pending at the respective labs.

Statewide moose abundance according to the deer hunter survey is approximately 50% lower than when the survey was first implemented in 1993 and the ten-year trend reflects that decline. However, the population appears relatively stable over the last five years. Long-term decline in the Ct. Lakes and North regions is attributed to the influence of winter ticks. Habitat is considered good in these regions with sufficient optimal forage, but moderate/high localized moose densities and the lengthening fall tick questing season are sustaining continuously high winter tick abundance. The White Mountains population is likely limited by the abundance of optimal forage. Decline in the Central and Southern regions is due to a variety of factors including loss of habitat to development, isolated pockets of optimal forage, and winter tick and brainworm parasitism.

Custom Qualitative Indicator/Output: Non-harvest moose mortality data have been collected and analyzed. The impact of parasites, diseases and weather has been evaluated. Adult sex ratios, recruitment, distribution, density and population rate of change have been determined. Moose habitat has been mapped, browse impacts assessed and environmental contaminants have been evaluated in relation to moose health.

Recommendations:

Continue the non-harvest mortality reporting and brainworm exposure monitoring using serum from hunter-harvested moose. Initiate research to measure moose exposure to brainworm statewide.

The accuracy of the deer hunter survey moose abundance index should be re-assessed because 30 years have elapsed since it was last validated, moose abundance is lower than when validated, and deer hunter behavior may have changed. Novel methods to monitor moose abundance and population health should also be investigated. This is being addressed with research that started summer 2022.

The relationship of the moose population to browse-related carrying capacity should no longer be estimated based primarily on physical parameters of moose due to the impacts of winter tick. Maintaining the habitat mapping portion of this job will be important.

Submitted by: _____

Henry Jones
Moose Project Leader
July 1, 2023

Table 1. HISTORICAL CT LAKE REGION ACCIDENTAL KILL SUMMARY

NOTE: Final year's data may be incomplete. YEAR is Calendar Year, 01/01-12/31.

YEAR	-----NUMBER OF KILLS BY CAUSE-----						---REPORTED SEX AND/OR AGE-SEX----				
	BRAINWORM	TICK RELATED	WINTER	VEHICLE	OTHER	TOTAL	MALE	FEMALE	ADULT BULLS	ADULT COWS	CALVES
1988	1	0	0	14	4	19	10	8	5	1	2
1989	0	0	0	9	3	12	5	7	2	1	0
1990	0	0	0	15	5	20	11	9	2	4	1
1991	2	0	0	19	12	33	12	21	0	0	0
1992	2	0	0	20	14	36	12	22	0	0	0
1993	0	0	0	14	12	26	11	15	0	0	0
1994	0	0	0	13	7	20	10	10	0	0	0
1995	0	0	0	7	2	9	1	8	0	0	0
1996	0	0	0	17	2	19	4	14	0	0	0
1997	2	0	0	17	2	21	6	14	0	0	0
1998	2	0	0	18	0	20	9	9	0	0	0
1999	0	0	0	6	3	9	1	8	0	0	0
2000	0	0	0	13	4	17	9	7	0	0	0
2001	1	0	0	21	1	23	10	13	0	0	1
2002	2	2	0	20	4	28	11	15	7	11	8
2003	3	0	0	8	1	12	7	5	6	5	1
2004	0	0	0	10	0	10	4	6	4	5	1
2005	0	2	0	14	1	17	7	10	5	8	4
2006	0	11	0	13	0	24	12	11	11	10	2
2007	2	0	0	12	1	15	6	9	5	8	2
2008	2	2	0	6	1	11	8	3	7	3	1
2009	0	1	0	7	1	9	2	7	2	7	0
2010	0	1	4	14	1	20	9	11	9	9	2
2011	2	2	0	8	0	12	3	9	2	6	2
2012	4	6	0	11	3	24	10	14	9	10	4
2013	0	0	0	9	4	13	5	6	4	6	2
2014	0	8	1	7	8	24	13	10	6	10	6
2015	2	0	0	4	4	10	4	6	2	6	1
2016	0	1	0	3	1	5	0	5	0	5	0
2017	2	2	0	1	0	5	1	4	1	3	1
2018	3	0	0	7	0	10	2	8	2	7	1
2019	1	1	4	5	2	13	5	7	1	5	7
2020	0	0	0	6	1	7	5	2	5	2	0
2021	0	0	0	6	0	6	5	1	2	1	2
2022	1	0	0	1	0	2	0	2	0	2	0

CT LAKE REGION 5-YEAR ACCIDENTAL KILL TREND ANALYSIS
BASED ON 2017-2021 DATA

Note: Final year's data may be incomplete.

TREND	YEARS (N)	ANNUAL TREND	R- SQUARE	PROB>F
VEHICULAR KILL	5	0.90	0.37	0.2779

Table 1. HISTORICAL NORTH REGION ACCIDENTAL KILL SUMMARY

NOTE: Final year's data may be incomplete. YEAR is Calendar Year, 01/01-12/31.

YEAR	-----NUMBER OF KILLS BY CAUSE-----						---REPORTED SEX AND/OR AGE-SEX----				
	BRAINWORM	TICK RELATED	WINTER	VEHICLE	OTHER	TOTAL	MALE	FEMALE	ADULT BULLS	ADULT COWS	CALVES
1988	0	0	0	38	13	51	19	30	9	12	8
1989	1	2	0	38	8	49	22	23	15	11	1
1990	2	0	0	49	11	62	26	35	12	12	8
1991	3	0	0	44	19	66	37	29	7	7	3
1992	0	0	0	40	8	48	24	23	0	0	0
1993	1	0	0	47	8	56	24	32	0	0	0
1994	1	0	0	44	8	53	25	26	0	0	0
1995	0	0	0	50	5	55	32	23	0	0	3
1996	0	0	0	69	0	69	27	41	0	0	0
1997	0	2	0	69	3	74	29	44	0	0	0
1998	0	0	0	65	2	67	33	33	0	0	0
1999	0	0	0	51	1	52	19	33	0	0	0
2000	0	0	0	61	1	62	23	38	0	0	0
2001	1	0	0	66	2	69	27	40	0	2	0
2002	1	2	0	51	1	55	17	34	12	28	9
2003	0	0	0	48	2	50	27	22	20	18	10
2004	0	0	0	62	1	63	30	33	20	26	15
2005	0	1	0	55	0	56	26	29	19	23	9
2006	0	1	0	50	0	51	16	32	15	24	7
2007	0	0	0	54	0	54	20	33	14	22	14
2008	0	1	1	34	1	37	18	19	15	15	5
2009	0	3	0	55	0	58	29	27	27	25	1
2010	0	0	0	44	0	44	19	25	16	21	4
2011	0	8	0	40	1	49	17	31	7	20	13
2012	1	3	0	36	0	40	16	21	11	14	3
2013	1	0	1	39	0	41	17	22	12	8	7
2014	0	1	0	34	4	39	14	25	8	19	8
2015	0	0	0	34	2	36	19	17	14	14	7
2016	0	1	0	33	0	34	17	17	13	14	5
2017	0	0	0	39	0	39	15	23	13	15	5
2018	0	0	0	32	1	33	17	16	16	12	3
2019	0	0	1	17	1	19	13	6	9	4	2
2020	0	0	0	17	1	18	12	5	12	5	0
2021	0	0	0	28	0	28	14	14	13	11	4
2022	3	0	0	24	2	29	12	17	11	13	2

NORTH REGION 5-YEAR ACCIDENTAL KILL TREND ANALYSIS
BASED ON 2017-2021 DATA

Note: Final year's data may be incomplete.

TREND	YEARS (N)	ANNUAL TREND	R- SQUARE	PROB>F
VEHICULAR KILL	5	-3.70	0.37	0.2757

Table 1. HISTORICAL W. MTN. REGION ACCIDENTAL KILL SUMMARY

NOTE: Final year's data may be incomplete. YEAR is Calendar Year, 01/01-12/31.

YEAR	-----NUMBER OF KILLS BY CAUSE-----						---REPORTED SEX AND/OR AGE-SEX----				
	BRAINWORM	TICK RELATED	WINTER	VEHICLE	OTHER	TOTAL	MALE	FEMALE	ADULT BULLS	ADULT COWS	CALVES
1988	0	0	0	38	8	46	25	18	9	10	4
1989	0	1	0	55	10	66	36	28	11	13	3
1990	0	0	0	58	7	65	37	28	14	12	1
1991	1	0	0	79	21	101	58	39	16	10	5
1992	2	0	0	65	7	74	48	25	0	0	0
1993	0	1	0	81	7	89	53	36	1	0	0
1994	0	0	0	76	6	82	43	38	0	0	0
1995	2	0	0	72	2	76	31	44	0	0	3
1996	2	0	0	84	4	90	47	42	0	0	0
1997	0	1	0	85	1	87	36	51	0	0	0
1998	1	0	0	84	2	87	38	47	0	0	0
1999	0	0	0	69	4	73	39	32	0	0	0
2000	0	0	0	83	1	84	49	34	0	0	0
2001	0	0	0	56	4	60	18	42	0	0	0
2002	0	0	0	83	4	87	41	40	33	33	12
2003	1	1	0	80	1	83	35	47	26	38	14
2004	1	0	0	104	2	107	54	51	44	40	18
2005	1	2	0	91	1	95	45	48	39	42	12
2006	1	0	0	74	1	76	35	39	30	34	7
2007	1	0	0	73	2	76	42	32	37	27	10
2008	0	1	0	77	1	79	40	35	37	26	12
2009	2	0	0	55	1	58	28	30	24	23	7
2010	1	1	0	73	1	76	37	37	29	30	15
2011	0	4	0	45	2	51	23	28	16	20	11
2012	3	3	0	64	0	70	34	34	28	25	11
2013	1	0	2	47	2	52	17	33	13	22	7
2014	0	4	0	43	2	49	34	14	23	11	8
2015	0	0	0	38	2	40	10	29	5	18	11
2016	1	1	0	46	1	49	25	24	18	17	11
2017	0	0	0	37	1	38	15	22	12	20	3
2018	1	0	0	43	0	44	17	27	12	21	1
2019	0	2	0	22	0	24	9	14	8	13	3
2020	0	0	0	16	0	16	9	7	6	5	2
2021	0	0	0	19	0	19	7	12	7	7	1
2022	1	0	0	18	1	20	5	15	3	12	1

W. MTN. REGION 5-YEAR ACCIDENTAL KILL TREND ANALYSIS
BASED ON 2017-2021 DATA

Note: Final year's data may be incomplete.

TREND	YEARS (N)	ANNUAL TREND	R- SQUARE	PROB>F
VEHICULAR KILL	5	-6.30	0.70	0.0763

Table 1. HISTORICAL CENTRAL REGION ACCIDENTAL KILL SUMMARY

NOTE: Final year's data may be incomplete. YEAR is Calendar Year, 01/01-12/31.

YEAR	-----NUMBER OF KILLS BY CAUSE-----						---REPORTED SEX AND/OR AGE-SEX----				
	BRAINWORM	TICK RELATED	WINTER	VEHICLE	OTHER	TOTAL	MALE	FEMALE	ADULT BULLS	ADULT COWS	CALVES
1988	0	0	0	22	13	35	23	11	9	0	0
1989	0	0	0	16	5	21	10	11	3	0	0
1990	0	0	0	32	11	43	31	12	8	4	0
1991	2	0	0	40	18	60	33	27	8	8	2
1992	2	0	0	42	18	62	31	29	1	0	0
1993	1	2	0	44	7	54	26	26	0	1	0
1994	1	5	0	43	9	58	31	25	0	0	0
1995	2	3	0	40	10	55	30	23	0	0	1
1996	4	2	0	54	7	67	22	42	0	0	0
1997	3	3	0	51	10	67	33	27	0	0	0
1998	3	1	0	51	4	59	32	26	1	0	0
1999	2	0	0	70	6	78	36	41	0	0	0
2000	1	0	0	73	4	78	45	32	0	0	0
2001	1	1	0	72	7	81	36	42	1	0	0
2002	1	2	0	65	2	70	34	33	31	25	11
2003	2	3	0	41	4	50	28	19	23	16	8
2004	8	0	0	66	3	77	39	37	35	29	9
2005	5	1	0	58	4	68	33	33	25	22	14
2006	2	0	0	58	1	61	19	41	17	30	10
2007	4	2	0	49	2	57	23	34	18	28	8
2008	1	8	0	44	1	54	30	23	23	18	11
2009	2	4	0	46	3	55	19	34	17	26	7
2010	2	1	0	50	2	55	28	24	24	20	4
2011	5	9	0	42	3	59	25	30	21	22	10
2012	3	2	0	49	1	55	26	28	22	21	7
2013	1	0	2	35	1	39	18	18	12	13	6
2014	4	3	0	38	1	46	20	24	14	14	9
2015	1	2	0	20	2	25	13	11	7	8	7
2016	1	2	0	29	2	34	12	18	10	14	3
2017	0	1	0	22	1	24	9	12	8	8	4
2018	0	1	0	17	0	18	6	11	6	7	2
2019	1	0	0	15	0	16	8	8	6	7	2
2020	0	0	0	24	1	25	13	11	10	9	4
2021	1	0	0	12	1	14	7	6	5	4	1
2022	2	0	0	10	0	12	9	3	6	3	0

CENTRAL REGION 5-YEAR ACCIDENTAL KILL TREND ANALYSIS
BASED ON 2017-2021 DATA

Note: Final year's data may be incomplete.

TREND	YEARS (N)	ANNUAL TREND	R- SQUARE	PROB>F
VEHICULAR KILL	5	-1.30	0.17	0.4869

Table 1. HISTORICAL S. WEST REGION ACCIDENTAL KILL SUMMARY

NOTE: Final year's data may be incomplete. YEAR is Calendar Year, 01/01-12/31.

YEAR	-----NUMBER OF KILLS BY CAUSE-----						---REPORTED SEX AND/OR AGE-SEX----				
	BRAINWORM	TICK RELATED	WINTER	VEHICLE	OTHER	TOTAL	MALE	FEMALE	ADULT BULLS	ADULT COWS	CALVES
1988	0	0	0	3	5	8	4	4	0	2	0
1989	1	0	0	5	0	6	3	3	0	0	0
1990	0	0	0	5	2	7	3	4	3	2	0
1991	0	0	0	5	6	11	4	6	0	0	0
1992	1	0	0	5	6	12	6	6	0	0	0
1993	0	0	0	10	3	13	11	2	0	0	0
1994	0	1	0	6	2	9	5	3	0	0	0
1995	0	0	0	7	2	9	4	4	0	0	0
1996	0	0	0	13	3	16	9	6	0	0	0
1997	1	0	0	14	1	16	10	6	0	0	0
1998	0	0	0	10	1	11	5	6	3	2	1
1999	1	0	0	18	3	22	8	14	0	0	0
2000	4	0	0	16	0	20	7	13	0	0	0
2001	1	0	0	14	2	17	8	9	0	0	0
2002	1	1	0	26	2	30	16	14	12	10	8
2003	6	1	0	24	4	35	13	22	12	16	7
2004	4	0	0	21	2	27	11	14	9	10	5
2005	5	0	0	17	0	22	13	9	10	7	4
2006	2	1	0	17	3	23	10	12	8	9	5
2007	3	0	0	10	2	15	4	11	4	9	2
2008	2	0	0	13	1	16	6	10	5	9	2
2009	1	0	0	9	1	11	9	2	7	1	2
2010	0	0	0	18	2	20	14	6	12	5	2
2011	0	0	0	14	1	15	6	7	6	6	1
2012	0	0	0	8	1	9	2	6	1	6	1
2013	0	0	0	6	2	8	3	5	2	5	0
2014	1	0	0	10	0	11	4	7	3	3	1
2015	0	0	1	16	0	17	12	3	5	2	4
2016	3	0	0	11	0	14	9	4	9	4	0
2017	2	0	0	9	2	13	6	4	5	3	2
2018	1	0	0	7	0	8	4	3	3	2	2
2019	2	0	0	10	0	12	8	4	7	2	2
2020	0	0	0	6	0	6	2	4	2	4	0
2021	0	0	0	5	0	5	3	2	3	2	0
2022	2	0	0	5	3	10	8	2	7	2	0

S. WEST REGION 5-YEAR ACCIDENTAL KILL TREND ANALYSIS
BASED ON 2017-2021 DATA

Note: Final year's data may be incomplete.

TREND	YEARS (N)	ANNUAL TREND	R- SQUARE	PROB>F
VEHICULAR KILL	5	-0.90	0.47	0.2007

Table 1. HISTORICAL S. EAST REGION ACCIDENTAL KILL SUMMARY

NOTE: Final year's data may be incomplete. YEAR is Calendar Year, 01/01-12/31.

YEAR	-----NUMBER OF KILLS BY CAUSE-----						---REPORTED SEX AND/OR AGE-SEX----				
	BRAINWORM	TICK RELATED	WINTER	VEHICLE	OTHER	TOTAL	MALE	FEMALE	ADULT BULLS	ADULT COWS	CALVES
1988	0	0	0	2	1	3	3	0	1	0	0
1989	0	0	0	5	1	6	3	3	0	2	0
1990	0	0	0	10	5	15	7	8	4	4	3
1991	0	0	0	10	3	13	8	5	3	2	0
1992	0	0	0	6	4	10	8	2	0	0	0
1993	1	0	0	17	9	27	14	11	0	0	0
1994	0	1	0	11	2	14	7	7	0	0	0
1995	0	0	0	10	4	14	8	6	0	0	0
1996	0	0	0	16	1	17	7	10	0	0	0
1997	1	0	0	16	0	17	5	12	0	0	0
1998	0	0	0	11	0	11	2	9	0	0	0
1999	0	0	0	11	0	11	7	4	0	0	0
2000	0	0	0	16	0	16	8	8	0	0	0
2001	0	0	0	14	0	14	6	8	0	0	0
2002	0	0	0	6	0	6	2	3	2	2	2
2003	0	0	0	10	0	10	3	7	1	5	4
2004	1	0	0	4	0	5	0	5	0	4	1
2005	0	0	0	7	0	7	5	2	4	1	1
2006	0	0	0	4	2	6	3	2	3	2	0
2007	1	0	0	7	0	8	4	4	3	2	2
2008	0	0	0	7	0	7	1	5	1	3	1
2009	0	0	0	5	0	5	2	3	1	3	0
2010	0	0	0	14	0	14	6	8	5	8	1
2011	0	0	0	5	0	5	2	2	2	2	0
2012	0	0	0	3	0	3	1	2	0	2	0
2013	0	0	0	7	0	7	5	2	3	1	1
2014	0	0	0	1	0	1	0	1	0	1	0
2015	0	0	0	5	0	5	2	3	1	3	0
2016	0	0	0	3	1	4	2	2	2	1	0
2017	0	0	0	0	0	0	0	0	0	0	0
2018	0	0	0	0	1	1	0	1	0	1	0
2019	0	0	0	0	0	0	0	0	0	0	0
2020	0	0	0	3	0	3	0	3	0	1	1
2021	0	0	0	2	0	2	0	1	0	1	1
2022	0	0	0	1	0	1	1	0	1	0	0

S. EAST REGION 5-YEAR ACCIDENTAL KILL TREND ANALYSIS
BASED ON 2017-2021 DATA

Note: Final year's data may be incomplete.

TREND	YEARS (N)	ANNUAL TREND	R- SQUARE	PROB>F
VEHICULAR KILL	5	0.70	0.61	0.1176

Table 1. HISTORICAL OVERALL REGION ACCIDENTAL KILL SUMMARY

NOTE: Final year's data may be incomplete. YEAR is Calendar Year, 01/01-12/31.

YEAR	-----NUMBER OF KILLS BY CAUSE-----						---REPORTED SEX AND/OR AGE-SEX----				
	BRAINWORM	TICK RELATED	WINTER	VEHICLE	OTHER	TOTAL	MALE	FEMALE	ADULT BULLS	ADULT COWS	CALVES
1988	1	0	0	117	45	163	85	71	33	25	14
1989	2	3	0	128	28	161	79	76	31	28	4
1990	2	0	0	169	41	212	115	96	43	38	13
1991	8	0	0	197	79	284	152	127	34	27	10
1992	7	0	0	178	57	242	129	107	1	0	0
1993	3	3	0	213	46	265	139	122	1	1	0
1994	2	7	0	193	34	236	121	109	0	0	0
1995	4	3	0	186	25	218	106	108	0	0	7
1996	6	2	0	253	18	279	116	155	0	0	0
1997	7	6	0	252	17	282	119	154	0	0	0
1998	6	1	0	239	9	255	119	130	4	2	1
1999	3	0	0	225	17	245	110	132	0	0	0
2000	5	0	0	262	10	277	141	132	0	0	0
2001	4	1	0	243	16	264	105	154	1	2	1
2002	5	7	0	251	13	276	121	139	97	109	50
2003	12	5	0	211	12	240	113	122	88	98	44
2004	14	0	0	267	8	289	138	146	112	114	49
2005	11	6	0	242	6	265	129	131	102	103	44
2006	5	13	0	216	7	241	95	137	84	109	31
2007	11	2	0	205	7	225	99	123	81	96	38
2008	5	12	1	181	5	204	103	95	88	74	32
2009	5	8	0	177	6	196	89	103	78	85	17
2010	3	3	4	213	6	229	113	111	95	93	28
2011	7	23	0	154	7	191	76	107	54	76	37
2012	11	14	0	171	5	201	89	105	71	78	26
2013	3	0	5	143	9	160	65	86	46	55	23
2014	5	16	1	133	15	170	85	81	54	58	32
2015	3	2	1	117	10	133	60	69	34	51	30
2016	5	5	0	125	5	140	65	70	52	55	19
2017	4	3	0	108	4	119	46	65	39	49	15
2018	5	1	0	106	2	114	46	66	39	50	9
2019	4	3	5	69	3	84	43	39	31	31	16
2020	0	0	0	72	3	75	41	32	35	26	7
2021	1	0	0	72	1	74	36	36	30	26	9
2022	9	0	0	59	6	74	35	39	27	33	3

OVERALL REGION 5-YEAR ACCIDENTAL KILL TREND ANALYSIS
BASED ON 2017-2021 DATA

Note: Final year's data may be incomplete.

TREND	YEARS (N)	ANNUAL TREND	R- SQUARE	PROB>F
VEHICULAR KILL	5	-10.60	0.72	0.0696

Table 2. HISTORICAL CT LAKE REGION DENSITY (BASED ON 1-YR OBS RATES) - NEW CERTAIN METHOD

YEAR	# OF HUNTER DAYS (N)	TOTAL HOURS OF EFFORT	-- # BULL	OF MOOSE COW	OBSERVED CALF	UNK.	TOTAL	ESTIMATED DENSITY / SQ. MILE	CALVES /ADULT COW	% OF ADULTS THAT ARE BULLS	% CALVES	% BARREN COWS
1993	339	2251	95	155	49	12	311	5.13	0.32	38.00	16.39	55.57
1994	508	3627	135	235	91	23	484	4.08	0.39	36.49	19.74	55.32
1995	400	2666	64	131	64	11	270	3.48	0.49	32.82	24.71	52.38
1996	697	4467	207	292	137	41	677	4.58	0.47	41.48	21.54	46.08
1997	754	5095	224	319	153	30	726	4.16	0.48	41.25	21.98	48.84
1998	719	4966	244	286	126	32	688	4.30	0.44	46.04	19.21	57.29
1999	735	4995	200	243	127	32	602	3.80	0.52	45.15	22.28	51.00
2000	840	5554	262	306	119	35	722	4.01	0.39	46.13	17.32	54.96
2001	602	4227	130	184	72	27	413	2.73	0.39	41.40	18.65	56.10
2002	543	3794	94	170	97	24	385	3.22	0.57	35.61	26.87	51.19
2003	621	4411	158	250	101	30	539	3.66	0.40	38.73	19.84	62.11
2004	512	3330	74	152	72	24	322	2.68	0.47	32.74	24.16	56.41
2005	481	3392	166	217	110	30	523	4.80	0.51	43.34	22.31	57.01
2006	514	3431	93	169	58	18	338	2.92	0.34	35.50	18.13	58.11
2007	329	2318	47	97	36	8	188	2.43	0.37	32.64	20.00	56.00
2008	682	4536	103	146	44	28	321	2.06	0.30	41.37	15.02	65.79
2009	821	5609	156	179	67	45	447	2.21	0.37	46.57	16.67	58.00
2010	815	5602	129	201	73	23	426	2.41	0.36	39.09	18.11	61.90
2011	900	6049	141	193	47	29	410	2.15	0.24	42.22	12.34	65.91
2012	822	5473	100	151	63	31	345	1.84	0.42	39.84	20.06	57.38
2013	772	5025	143	192	71	34	440	2.59	0.37	42.69	17.49	61.63
2014	771	5104	107	131	48	24	310	1.73	0.37	44.96	16.78	68.66
2015	753	4831	95	123	53	8	279	1.72	0.43	43.58	19.56	59.49
2016	826	5305	70	152	57	17	296	1.70	0.38	31.53	20.43	54.22
2017	831	5209	96	169	74	23	362	2.17	0.44	36.23	21.83	55.56
2018	490	3062	40	79	30	5	154	1.36	0.38	33.61	20.13	63.04
2019	602	3828	49	104	44	10	207	1.63	0.42	32.03	22.34	45.10
2020	668	4243	64	128	41	9	242	1.61	0.32	33.33	17.60	61.84
2021	620	3897	66	93	28	22	209	1.59	0.30	41.51	14.97	69.39
2022	584	3350	53	60	21	8	142	1.11	0.35	46.90	15.67	61.11

CT LAKE REGION 5-YEAR AND 10-YEAR MAIL SURVEY MOOSE OBSERVATION TREND ANALYSIS
 BASED ON ANNUAL DATA FOR LAST 5 OR 10 YEARS ENDING WITH 2022 DATA

TREND	----- YEARS (N)	5-YEAR ANNUAL TREND	TRENDS R- SQUARE	----- PROB>F	----- YEARS (N)	10-YEAR ANNUAL TREND	TRENDS R- SQUARE	----- PROB>F
MOOSE DENSITY (# / SQ. MILE) -----	5	-0.05	0.14	0.5364	10	-0.10	0.51	0.0206
CALVES / ADULT COW -----	5	-0.02	0.35	0.2924	10	-0.01	0.20	0.1975
% OF ADULTS THAT ARE BULLS -----	5	3.61	0.78	0.0474	10	-0.23	0.01	0.7404
% CALVES -----	5	-1.63	0.70	0.0780	10	-0.21	0.06	0.4841
% BARREN COWS -----	5	2.04	0.13	0.5532	10	-0.05	0.00	0.9568

Table 2. HISTORICAL NORTH REGION DENSITY (BASED ON 1-YR OBS RATES) - NEW CERTAIN METHOD

YEAR	# OF HUNTER DAYS (N)	TOTAL HOURS OF EFFORT	-- # BULL	OF MOOSE COW	OBSERVED CALF	-- UNK.	TOTAL	ESTIMATED DENSITY / SQ. MILE	CALVES /ADULT COW	% OF ADULTS THAT ARE BULLS	% CALVES	% BARREN COWS
1993	163	1005	24	37	13	0	74	2.91	0.35	39.34	17.57	66.67
1994	442	2626	63	65	30	19	177	1.90	0.46	49.22	18.99	62.22
1995	403	2203	50	59	22	6	137	2.41	0.37	45.87	16.79	56.25
1996	752	4026	101	107	48	16	272	2.22	0.45	48.56	18.75	63.33
1997	685	3645	95	102	39	21	257	2.06	0.38	48.22	16.53	63.79
1998	625	3627	76	110	40	25	251	2.19	0.36	40.86	17.70	59.09
1999	653	3608	81	87	32	5	205	1.54	0.37	48.21	16.00	67.31
2000	565	3117	51	64	30	17	162	1.67	0.47	44.35	20.69	56.10
2001	630	3504	63	89	41	14	207	1.63	0.46	41.45	21.24	53.06
2002	365	2042	54	65	22	7	148	2.17	0.34	45.38	15.60	65.63
2003	397	2351	58	43	10	13	124	1.67	0.23	57.43	9.01	72.73
2004	409	2519	56	73	26	4	159	1.95	0.36	43.41	16.77	63.46
2005	456	2329	48	67	32	14	161	2.24	0.48	41.74	21.77	52.78
2006	354	1750	31	34	12	2	79	1.46	0.35	47.69	15.58	68.18
2007	483	2589	29	48	15	4	96	1.07	0.31	37.66	16.30	72.73
2008	1032	5834	131	130	56	18	335	1.64	0.43	50.19	17.67	64.00
2009	970	5121	133	139	56	20	348	1.67	0.40	48.90	17.07	60.44
2010	855	4472	148	137	41	30	356	2.04	0.30	51.93	12.58	66.67
2011	931	4599	62	86	25	10	183	1.12	0.29	41.89	14.45	80.00
2012	782	4120	52	61	29	25	167	1.17	0.48	46.02	20.42	57.69
2013	742	3825	46	74	18	26	164	1.21	0.24	38.33	13.04	69.57
2014	807	4312	64	76	30	19	189	1.35	0.39	45.71	17.65	62.50
2015	687	3895	64	80	31	10	185	1.52	0.39	44.44	17.71	62.75
2016	707	3961	38	47	17	8	110	0.76	0.36	44.71	16.67	73.33
2017	686	3689	36	60	23	17	136	0.88	0.38	37.50	19.33	57.50
2018	567	2979	36	49	14	16	115	0.99	0.29	42.35	14.14	65.38
2019	495	2293	23	29	12	6	70	0.86	0.41	44.23	18.75	65.00
2020	631	3124	18	24	6	2	50	0.43	0.25	42.86	12.50	80.00
2021	584	2840	24	60	12	4	100	0.93	0.20	28.57	12.50	70.97
2022	627	3095	32	37	16	7	92	0.97	0.43	46.38	18.82	60.00

NORTH REGION 5-YEAR AND 10-YEAR MAIL SURVEY MOOSE OBSERVATION TREND ANALYSIS
 BASED ON ANNUAL DATA FOR LAST 5 OR 10 YEARS ENDING WITH 2022 DATA

TREND	----- YEARS (N)	5-YEAR ANNUAL TREND	TRENDS R- SQUARE	----- PROB>F	----- YEARS (N)	10-YEAR ANNUAL TREND	TRENDS R- SQUARE	----- PROB>F
MOOSE DENSITY (# / SQ. MILE) -----	5	0.00	0.00	0.9706	10	-0.06	0.36	0.0662
CALVES / ADULT COW -----	5	0.01	0.02	0.8436	10	-0.00	0.00	0.8600
% OF ADULTS THAT ARE BULLS -----	5	-0.76	0.03	0.7838	10	-0.32	0.03	0.6254
% CALVES -----	5	0.31	0.02	0.8057	10	-0.05	0.00	0.8700
% BARREN COWS -----	5	-0.48	0.01	0.8734	10	0.26	0.01	0.7529

Table 2. HISTORICAL W. MTN. REGION DENSITY (BASED ON 1-YR OBS RATES) - NEW CERTAIN METHOD

YEAR	# OF HUNTER DAYS (N)	TOTAL HOURS OF EFFORT	-- # BULL	OF MOOSE COW	OBSERVED CALF	-- UNK.	TOTAL	ESTIMATED DENSITY / SQ. MILE	CALVES /ADULT COW	% OF ADULTS THAT ARE BULLS	% CALVES	% BARREN COWS
1993	591	3103	23	14	10	12	59	0.76	0.71	62.16	21.28	50.00
1994	891	4431	25	48	17	14	104	0.97	0.35	34.25	18.89	68.57
1995	779	3838	29	36	32	6	103	0.78	0.89	44.62	32.99	27.59
1996	1348	6726	46	61	32	11	150	0.71	0.52	42.99	23.02	56.60
1997	1111	5808	52	79	57	9	197	0.95	0.72	39.69	30.32	36.17
1998	909	4998	22	41	20	5	88	0.54	0.49	34.92	24.10	60.00
1999	910	5023	42	51	16	7	116	0.90	0.31	45.16	14.68	56.67
2000	845	4599	28	32	11	9	80	0.66	0.34	46.67	15.49	66.67
2001	950	5353	22	33	15	6	76	0.41	0.45	40.00	21.43	57.69
2002	634	3185	12	16	4	2	34	0.33	0.25	42.86	12.50	84.62
2003	829	4415	30	27	17	2	76	0.56	0.63	52.63	22.97	47.06
2004	739	3827	33	34	16	4	87	0.60	0.47	49.25	19.28	56.67
2005	713	3808	27	35	19	6	87	0.81	0.54	43.55	23.46	68.00
2006	556	2853	19	37	24	5	85	1.00	0.65	33.93	30.00	42.31
2007	271	1374	6	8	3	0	17	0.33	0.38	42.86	17.65	50.00
2008	1451	7239	49	48	17	8	122	0.50	0.35	50.52	14.91	62.86
2009	1671	8601	43	91	41	19	194	0.63	0.45	32.09	23.43	62.79
2010	1590	7864	38	65	28	7	138	0.48	0.43	36.89	21.37	56.82
2011	1562	7738	22	54	26	8	110	0.41	0.48	28.95	25.49	45.65
2012	1351	7000	24	35	13	8	80	0.37	0.37	40.68	18.06	76.00
2013	1497	7551	48	45	13	10	116	0.43	0.29	51.61	12.26	66.67
2014	1457	7162	37	43	27	17	124	0.45	0.63	46.25	25.23	51.72
2015	1381	7088	26	33	11	18	88	0.42	0.33	44.07	15.71	72.41
2016	1391	6793	31	36	11	8	86	0.36	0.31	46.27	14.10	73.33
2017	1399	6918	20	30	14	5	69	0.30	0.47	40.00	21.88	57.14
2018	1362	6422	14	28	10	6	58	0.29	0.36	33.33	19.23	70.83
2019	1232	6008	21	36	17	9	83	0.43	0.47	36.84	22.97	57.69
2020	1565	7682	30	37	14	11	92	0.39	0.38	44.78	17.28	70.97
2021	1234	5888	22	20	2	7	51	0.24	0.10	52.38	4.55	100.00
2022	1362	6628	20	17	6	3	46	0.22	0.35	54.05	13.95	61.54

W. MTN. REGION 5-YEAR AND 10-YEAR MAIL SURVEY MOOSE OBSERVATION TREND ANALYSIS
 BASED ON ANNUAL DATA FOR LAST 5 OR 10 YEARS ENDING WITH 2022 DATA

TREND	----- YEARS (N)	5-YEAR ANNUAL TREND	TRENDS R- SQUARE	----- PROB>F	----- YEARS (N)	10-YEAR ANNUAL TREND	TRENDS R- SQUARE	----- PROB>F
MOOSE DENSITY (# / SQ. MILE) -----	5	-0.03	0.33	0.3136	10	-0.02	0.52	0.0187
CALVES / ADULT COW -----	5	-0.04	0.19	0.4646	10	-0.02	0.11	0.3479
% OF ADULTS THAT ARE BULLS -----	5	5.70	0.96	0.0028	10	0.20	0.01	0.8030
% CALVES -----	5	-2.90	0.43	0.2295	10	-0.59	0.09	0.4045
% BARREN COWS -----	5	2.37	0.05	0.7146	10	1.52	0.12	0.3310

Table 2. HISTORICAL CENTRAL REGION DENSITY (BASED ON 1-YR OBS RATES) - NEW CERTAIN METHOD

YEAR	# OF HUNTER DAYS (N)	TOTAL HOURS OF EFFORT	-- # BULL	OF MOOSE COW	OBSERVED CALF	UNK.	TOTAL	ESTIMATED DENSITY / SQ. MILE	CALVES /ADULT COW	% OF ADULTS THAT ARE BULLS	% CALVES	% BARREN COWS
1993	1385	7876	37	29	7	8	81	0.35	0.24	56.06	9.59	64.71
1994	5851	34381	166	198	75	44	483	0.46	0.38	45.60	17.08	64.47
1995	4804	26230	131	132	62	20	345	0.41	0.47	49.81	19.08	62.75
1996	6515	35404	156	176	91	27	450	0.40	0.52	46.99	21.51	55.88
1997	5894	32975	138	157	90	32	417	0.39	0.57	46.78	23.38	53.72
1998	4591	26757	147	146	88	31	412	0.49	0.60	50.17	23.10	48.65
1999	3733	21645	131	140	50	51	372	0.53	0.36	48.34	15.58	62.92
2000	3768	21355	116	137	66	37	356	0.56	0.48	45.85	20.69	63.16
2001	2806	15724	78	85	29	35	227	0.44	0.34	47.85	15.10	59.32
2002	2688	15089	83	89	30	31	233	0.47	0.34	48.26	14.85	55.77
2003	3498	19537	102	101	53	25	281	0.48	0.52	50.25	20.70	50.63
2004	2532	14124	81	80	36	26	223	0.52	0.45	50.31	18.27	58.82
2005	2917	15914	72	99	45	32	248	0.53	0.45	42.11	20.83	64.63
2006	2758	14707	69	78	30	20	197	0.41	0.38	46.94	16.95	64.62
2007	1271	6882	39	47	19	6	111	0.43	0.40	45.35	18.10	51.72
2008	5298	28525	120	173	76	43	412	0.44	0.44	40.96	20.60	67.36
2009	6766	36090	125	188	83	52	448	0.37	0.44	39.94	20.96	58.99
2010	6579	35323	123	182	75	35	415	0.37	0.41	40.33	19.74	60.74
2011	6630	35668	95	141	55	37	328	0.30	0.39	40.25	18.90	61.86
2012	6235	33528	83	129	67	31	310	0.28	0.52	39.15	24.01	54.21
2013	6383	33985	90	120	54	33	297	0.28	0.45	42.86	20.45	61.00
2014	6250	32545	61	107	49	25	242	0.23	0.46	36.31	22.58	63.86
2015	5640	29137	59	89	32	19	199	0.22	0.36	39.86	17.78	62.32
2016	5786	30707	71	77	17	19	184	0.20	0.22	47.97	10.30	78.46
2017	5722	29542	66	107	25	23	221	0.25	0.23	38.15	12.63	74.63
2018	5171	25320	78	81	23	12	194	0.25	0.28	49.06	12.64	70.31
2019	5044	25043	64	70	23	21	178	0.25	0.33	47.76	14.65	66.13
2020	5982	29551	43	60	25	10	138	0.16	0.42	41.75	19.53	58.18
2021	5306	26225	47	48	19	12	126	0.16	0.40	49.47	16.67	60.00
2022	5343	26571	55	58	26	8	147	0.19	0.45	48.67	18.71	59.62

CENTRAL REGION 5-YEAR AND 10-YEAR MAIL SURVEY MOOSE OBSERVATION TREND ANALYSIS
 BASED ON ANNUAL DATA FOR LAST 5 OR 10 YEARS ENDING WITH 2022 DATA

TREND	----- YEARS (N)	5-YEAR ANNUAL TREND	TRENDS R- SQUARE	----- PROB>F	----- YEARS (N)	10-YEAR ANNUAL TREND	TRENDS R- SQUARE	----- PROB>F
MOOSE DENSITY (# / SQ. MILE) -----	5	-0.02	0.58	0.1354	10	-0.01	0.42	0.0411
CALVES / ADULT COW -----	5	0.04	0.87	0.0203	10	0.00	0.00	0.9065
% OF ADULTS THAT ARE BULLS -----	5	0.09	0.00	0.9404	10	0.99	0.36	0.0644
% CALVES -----	5	1.42	0.62	0.1148	10	-0.21	0.03	0.6500
% BARREN COWS -----	5	-2.75	0.71	0.0735	10	-0.61	0.07	0.4498

Table 2. HISTORICAL S. WEST REGION DENSITY (BASED ON 1-YR OBS RATES) - NEW CERTAIN METHOD

YEAR	# OF HUNTER DAYS (N)	TOTAL HOURS OF EFFORT	-- # BULL	OF MOOSE COW	OBSERVED CALF	-- UNK.	TOTAL	ESTIMATED DENSITY / SQ. MILE	CALVES /ADULT COW	% OF ADULTS THAT ARE BULLS	% CALVES	% BARREN COWS
1993	1048	5408	17	12	11	2	42	0.41	0.92	58.62	27.50	50.00
1994	2892	16964	37	55	28	5	125	0.26	0.51	40.22	23.33	56.00
1995	2379	13113	37	36	12	14	99	0.32	0.33	50.68	14.12	76.92
1996	2959	16085	45	50	31	24	150	0.43	0.62	47.37	24.60	57.50
1997	2743	15496	37	74	25	22	158	0.35	0.34	33.33	18.38	60.34
1998	2380	13782	65	57	29	16	167	0.43	0.51	53.28	19.21	64.29
1999	1928	11046	48	52	26	11	137	0.38	0.50	48.00	20.63	60.47
2000	1999	10792	42	38	19	14	113	0.35	0.50	52.50	19.19	62.50
2001	1628	9299	35	37	18	26	116	0.43	0.49	48.61	20.00	62.86
2002	1670	8976	35	36	16	5	92	0.31	0.44	49.30	18.39	65.22
2003	1731	9504	35	26	15	10	86	0.28	0.58	57.38	19.74	54.17
2004	1512	8292	27	37	15	5	84	0.33	0.41	42.19	18.99	65.22
2005	1787	9944	57	38	12	14	121	0.32	0.32	60.00	11.21	73.53
2006	1632	8743	28	27	5	8	68	0.25	0.19	50.91	8.33	81.82
2007	853	4945	28	33	10	5	76	0.41	0.30	45.90	14.08	66.67
2008	3368	18224	53	74	32	27	186	0.32	0.43	41.73	20.13	66.15
2009	3630	19288	41	72	28	33	174	0.30	0.39	36.28	19.86	67.21
2010	3815	20338	43	55	23	18	139	0.23	0.42	43.88	19.01	64.15
2011	3814	20032	35	93	31	10	169	0.31	0.33	27.34	19.50	68.00
2012	3917	20729	56	70	28	12	166	0.26	0.40	44.44	18.18	70.37
2013	4033	21387	48	50	25	3	126	0.20	0.50	48.98	20.33	68.18
2014	3344	17179	47	54	26	6	133	0.27	0.48	46.53	20.47	61.54
2015	3465	17961	27	38	16	4	85	0.19	0.42	41.54	19.75	63.64
2016	3134	16600	30	43	20	9	102	0.21	0.47	41.10	21.51	61.54
2017	2981	14900	34	32	13	9	88	0.20	0.41	51.52	16.46	63.33
2018	2425	12188	42	42	18	9	111	0.30	0.43	50.00	17.65	73.53
2019	2505	12503	26	36	16	5	83	0.20	0.44	41.94	20.51	55.88
2020	3057	15447	29	28	14	5	76	0.16	0.50	50.88	19.72	65.22
2021	2817	14007	25	29	18	7	79	0.23	0.62	46.30	25.00	55.56
2022	2972	14623	8	17	7	9	41	0.10	0.41	32.00	21.88	53.85

S. WEST REGION 5-YEAR AND 10-YEAR MAIL SURVEY MOOSE OBSERVATION TREND ANALYSIS
 BASED ON ANNUAL DATA FOR LAST 5 OR 10 YEARS ENDING WITH 2022 DATA

TREND	----- YEARS (N)	5-YEAR ANNUAL TREND	TRENDS R- SQUARE	----- PROB>F	----- YEARS (N)	10-YEAR ANNUAL TREND	TRENDS R- SQUARE	----- PROB>F
MOOSE DENSITY (# / SQ. MILE) -----	5	-0.04	0.60	0.1239	10	-0.01	0.19	0.2021
CALVES / ADULT COW -----	5	0.01	0.07	0.6654	10	0.00	0.02	0.6719
% OF ADULTS THAT ARE BULLS -----	5	-3.16	0.42	0.2346	10	-0.65	0.11	0.3597
% CALVES -----	5	1.29	0.56	0.1453	10	0.26	0.12	0.3287
% BARREN COWS -----	5	-3.97	0.56	0.1460	10	-1.03	0.26	0.1290

Table 2. HISTORICAL S. EAST REGION DENSITY (BASED ON 1-YR OBS RATES) - NEW CERTAIN METHOD

YEAR	# OF HUNTER DAYS (N)	TOTAL HOURS OF EFFORT	-- # BULL	OF MOOSE COW	OBSERVED CALF	-- UNK.	TOTAL	ESTIMATED DENSITY / SQ. MILE	CALVES /ADULT COW	% OF ADULTS THAT ARE BULLS	% CALVES	% BARREN COWS
1993	931	4608	21	15	7	3	46	0.33	0.47	58.33	16.28	58.00
1994	3532	18777	56	83	29	16	184	0.29	0.35	40.29	17.26	58.00
1995	2946	14557	30	71	32	9	142	0.28	0.45	29.70	24.06	59.52
1996	3083	15894	40	69	34	16	159	0.35	0.49	36.70	23.78	52.50
1997	3097	15733	41	68	29	7	145	0.28	0.43	37.61	21.01	61.02
1998	3063	16253	53	63	32	23	171	0.33	0.51	45.69	21.62	54.55
1999	2953	15534	41	50	16	10	117	0.30	0.32	45.05	14.95	65.79
2000	3488	17581	26	49	26	6	107	0.19	0.53	34.67	25.74	65.12
2001	3048	16751	16	36	18	8	78	0.17	0.50	30.77	25.71	53.85
2002	2594	13089	26	34	25	4	89	0.23	0.74	43.33	29.41	54.17
2003	3609	18376	20	27	8	9	64	0.13	0.30	42.55	14.55	71.43
2004	2680	13672	29	39	10	8	86	0.21	0.26	42.65	12.82	74.19
2005	2765	13921	6	18	6	5	35	0.11	0.33	25.00	20.00	75.00
2006	2625	12475	14	36	10	2	62	0.14	0.28	28.00	16.67	81.82
2007	1003	5054	3	12	5	3	23	0.18	0.42	20.00	25.00	60.00
2008	4766	23049	38	49	30	8	125	0.19	0.61	43.68	25.64	65.22
2009	5142	25456	20	44	26	7	97	0.16	0.59	31.25	28.89	50.00
2010	5301	26162	26	40	28	13	107	0.15	0.70	39.39	29.79	52.63
2011	4917	23505	16	35	20	7	78	0.12	0.57	31.37	28.17	48.39
2012	4353	21432	22	25	11	15	73	0.12	0.44	46.81	18.97	72.00
2013	4444	21672	10	28	12	10	60	0.09	0.43	26.32	24.00	76.92
2014	4491	21401	27	33	18	7	85	0.11	0.55	45.00	23.08	48.39
2015	4172	20101	22	23	6	5	56	0.11	0.26	48.89	11.76	80.95
2016	3931	18534	16	25	12	6	59	0.11	0.48	39.02	22.64	52.17
2017	4030	18732	15	15	7	1	38	0.08	0.47	50.00	18.92	61.54
2018	3817	17318	17	26	15	5	63	0.11	0.58	39.53	25.86	50.00
2019	3336	15296	12	11	11	4	38	0.10	1.00	52.17	32.35	22.22
2020	3944	18186	7	8	0	6	21	0.06	0.00	46.67	0.00	100.00
2021	3585	16133	4	7	1	0	12	0.04	0.14	36.36	8.33	85.71
2022	3171	14030	8	5	3	1	17	0.05	0.60	61.54	18.75	100.00

S. EAST REGION 5-YEAR AND 10-YEAR MAIL SURVEY MOOSE OBSERVATION TREND ANALYSIS
 BASED ON ANNUAL DATA FOR LAST 5 OR 10 YEARS ENDING WITH 2022 DATA

TREND	----- YEARS (N)	5-YEAR ANNUAL TREND	TRENDS R- SQUARE	----- PROB>F	----- YEARS (N)	10-YEAR ANNUAL TREND	TRENDS R- SQUARE	----- PROB>F
MOOSE DENSITY (# / SQ. MILE) -----	5	-0.02	0.83	0.0311	10	-0.01	0.55	0.0138
CALVES / ADULT COW -----	5	-0.08	0.10	0.5980	10	-0.01	0.00	0.8681
% OF ADULTS THAT ARE BULLS -----	5	2.82	0.20	0.4560	10	1.66	0.27	0.1263
% CALVES -----	5	-3.82	0.21	0.4320	10	-1.05	0.11	0.3426
% BARREN COWS -----	5	16.35	0.57	0.1420	10	2.81	0.11	0.3405

Table 2. HISTORICAL OVERALL REGION DENSITY (BASED ON 1-YR OBS RATES) - NEW CERTAIN METHOD

YEAR	# OF HUNTER DAYS (N)	TOTAL HOURS OF EFFORT	-- # BULL	OF MOOSE COW	OBSERVED CALF	-- UNK.	TOTAL	ESTIMATED DENSITY / SQ. MILE	CALVES /ADULT COW	% OF ADULTS THAT ARE BULLS	% CALVES	% BARREN COWS
1993	4457	24251	217	262	97	37	613	0.87	0.37	45.30	16.84	62.79
1994	14116	80803	482	684	270	121	1557	0.58	0.39	41.34	18.80	60.80
1995	11711	62607	341	465	224	66	1096	0.56	0.48	42.31	21.75	57.14
1996	15354	82600	595	755	373	135	1858	0.70	0.49	44.07	21.65	54.52
1997	14284	78752	587	799	393	121	1900	0.68	0.49	42.35	22.09	53.60
1998	12287	70382	607	703	335	132	1777	0.75	0.48	46.34	20.36	55.84
1999	10912	61849	543	623	267	116	1549	0.75	0.43	46.57	18.63	59.66
2000	11505	62998	525	626	271	118	1540	0.73	0.43	45.61	19.06	59.89
2001	9664	54857	344	464	193	116	1117	0.57	0.42	42.57	19.28	57.04
2002	8494	46175	304	410	194	73	981	0.60	0.47	42.58	21.37	57.89
2003	10685	58594	403	474	204	89	1170	0.56	0.43	45.95	18.87	58.53
2004	8384	45763	300	415	175	71	961	0.60	0.42	41.96	19.66	61.13
2005	9119	49308	376	474	224	101	1175	0.69	0.47	44.24	20.86	62.33
2006	8439	43958	254	381	139	55	829	0.53	0.36	40.00	17.96	64.46
2007	4210	23161	152	245	88	26	511	0.59	0.36	38.29	18.14	60.67
2008	16597	87407	494	620	255	132	1501	0.49	0.41	44.34	18.63	65.67
2009	19000	100165	518	713	301	176	1708	0.47	0.42	42.08	19.65	59.79
2010	18955	99761	507	680	268	126	1581	0.45	0.39	42.71	18.42	61.19
2011	18754	97591	371	602	204	101	1278	0.39	0.34	38.13	17.33	63.52
2012	17460	92284	337	471	211	122	1141	0.36	0.45	41.71	20.71	61.11
2013	17871	93444	385	509	193	116	1203	0.36	0.38	43.06	17.76	65.06
2014	17120	87703	343	444	198	98	1083	0.35	0.45	43.58	20.10	61.64
2015	16098	83013	293	386	149	64	892	0.33	0.39	43.15	18.00	64.18
2016	15775	81899	256	380	134	67	837	0.30	0.35	40.25	17.40	65.61
2017	15649	78990	267	413	156	78	914	0.33	0.38	39.26	18.66	61.73
2018	13832	67289	227	305	110	53	695	0.29	0.36	42.67	17.13	66.98
2019	13214	64972	195	286	123	55	659	0.31	0.43	40.54	20.36	55.94
2020	15847	78231	191	285	100	43	619	0.23	0.35	40.13	17.36	65.40
2021	14146	68989	188	257	80	52	577	0.24	0.31	42.25	15.24	68.32
2022	14059	68297	176	194	79	36	485	0.21	0.41	47.57	17.59	61.11

OVERALL REGION 5-YEAR AND 10-YEAR MAIL SURVEY MOOSE OBSERVATION TREND ANALYSIS
 BASED ON ANNUAL DATA FOR LAST 5 OR 10 YEARS ENDING WITH 2022 DATA

TREND	----- YEARS (N)	5-YEAR ANNUAL TREND	TRENDS R- SQUARE	----- PROB>F	----- YEARS (N)	10-YEAR ANNUAL TREND	TRENDS R- SQUARE	----- PROB>F
MOOSE DENSITY (# / SQ. MILE) -----	5	-0.02	0.75	0.0563	10	-0.02	0.86	0.0001
CALVES / ADULT COW -----	5	-0.00	0.01	0.8904	10	-0.00	0.09	0.4010
% OF ADULTS THAT ARE BULLS -----	5	1.15	0.38	0.2711	10	0.12	0.02	0.6689
% CALVES -----	5	-0.42	0.13	0.5491	10	-0.19	0.15	0.2688
% BARREN COWS -----	5	0.06	0.00	0.9744	10	-0.04	0.00	0.9284

Table 3. Estimated bear, deer, and moose density (#/sq. mi.) by moose management region in 2022. Bear and deer abundance are calculated with sex-age-kill models.

Region	Bear/mi ²	Deer/mi ²	Moose/mi ²
Ct. Lakes	0.64	6.74	1.11
North	0.64	5.56	0.97
W. Mtn.	1.43	6.64	0.22
Central	0.55	13.90	0.19
S. West	0.48-0.60	22.74	0.10
S. East	0.17	23.47	0.05

Table 4. Percent of potential moose habitat with optimal forage (regenerating forest 4-16 years old) by management region 2016-2022.

	Ct. Lake (%)	North (%)	White Mtn. (%)	Central (%)	Southwest (%)	Southeast (%)
2016	11.5	16.2	3.4	4.6	4.0	3.5
2017	11.7	16.3	3.3	4.1	4.1	3.5
2018	12.1	16.6	3.3	4.1	4.2	3.6
2019	12.7	17.4	3.5	4.7	4.7	4.0
2020	12.9	17.5	3.5	4.9	4.9	4.1
2021	13.3	17.9	4.0	6.0	5.4	4.7
2022	13.6	18.4	4.1	6.1	5.5	4.9

**New Hampshire
Moose Management
Regions**

The map displays the state of New Hampshire divided into 18 Moose Management Regions, labeled A1, A2, B, C1, C2, D1, D2, E1, E2, F, G, H1, H2N, H2S, I1, I2, J1, J2, K, L, and M. Major roads are shown with their route numbers. The map is bordered by Canada to the north, Vermont to the west, Massachusetts to the south, and Maine to the east. Major cities and towns are labeled, including Lebanon, Claremont, Keene, Concord, Manchester, Nashua, and Portsmouth. The map is titled "New Hampshire Moose Management Regions".

**PRELIMINARY ESTIMATED RELATIONSHIP BETWEEN MOOSE
OBSERVATION RATE AND MOOSE DENSITY BASED ON BLOCK
AND STRATA DATA**

**(Red Diamonds - 1998 Data / Blue Squares - 1999 Data
Lilac Circles - 2000 Data**

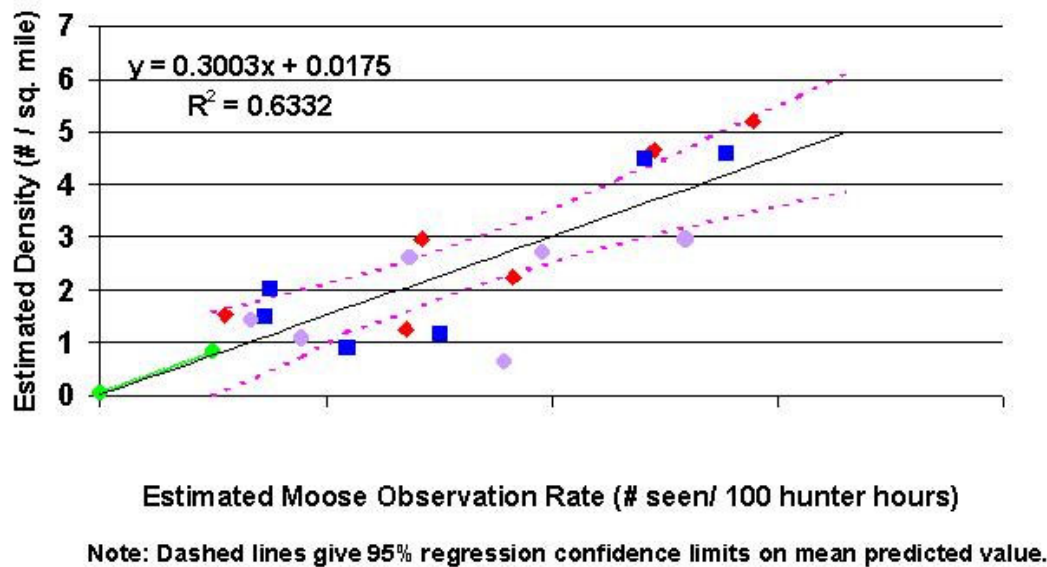


Figure 2. Preliminary estimated relationship between moose observation rate and moose density based on block and strata data.

PERFORMANCE REPORT

State: New Hampshire **Grant:** F20AF11939

Grant Type: Survey and Inventory

Grant Title: NH – WILDLIFE RESEARCH AND MANAGEMENT (W-89-R-21)

Period Covered: July 1, 2022 - June 30, 2023

Purpose/Target Name: PROJECT 2 - MOOSE RESEARCH AND MANAGEMENT

Objective Name: JOB 3 - FORMULATION OF MOOSE POPULATION MANAGEMENT RECOMMENDATIONS

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

Summary: All moose management data was reviewed and formal rule-making was conducted, which entailed review of the data collected in Job 1 and 2 to formulate hunting options, presentation of the proposed hunting season to the NH Fish and Game Commission, solicitation of public input, and three public hearings. Statewide moose hunting permit issuance for 2023 is 35 either sex permits (Table 1). Permit issuance is suspended in the Central, Southwest, and White Mountains regions because the moose density is at or below the cut-off level for permit issuance specified in the 2016-2025 Game Management Plan. Moose population goals and current population levels are listed in Table 2. Wildlife Management Unit C1 was moved from the White Mountains to the North region because moose density and habitat in C1 is more similar to the North than the White Mountains region.

Target Date: June 30th annually 2021-2025.

Status of Progress: On schedule.

Significant Deviations: None.

Objective Approach: Hunting seasons are established on a biennial basis through the administrative rulemaking 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 Game Management Team. Input from regional biologists and law enforcement staff is considered, initial recommendations are reviewed by the Game Management 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 Game Management 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 of a final season recommendation will be charged to the grant.

Results: Formal biennial rulemaking was completed in 2023. Based on analysis of data collected under Jobs 1 and 2, moose permit issuance was reduced from 42 either sex permits in 2022 to 35 either sex permits in 2023.

A summary of permit issuance for New Hampshire's 2021, 2022, and 2023 moose seasons is provided in Table 1. Of the 35 either-sex permits for the 2023 season, 33 permits were issued through the lottery and two permits were donated as follows; the Wildlife Heritage Foundation (WHF) and the NH Wildlife Federation Hunt of a Lifetime (HOL) were each issued one either-sex permit and these permits are allowed to be used wherever moose hunting is permitted in the state.

The two-year mean of the regional moose density increased in the North, remained stable in the Central and Southwest, and declined in the Ct. Lakes, Southwest, and White Mountains regions. Permit issuance was suspended in the Central, Southwest, and White Mountains regions because the estimated density remained below the permit cut-off level established in the 2016-2025 Game Management Plan which also guides that permits will be suspended until the estimated density is 13% or more above the cut-off for two consecutive years.

The overall strategy for moose hunting is conservative harvest (approx. 1% of population) while more information is gathered about the dynamic moose density/winter tick/weather relationship and the ability of southern moose populations to sustain despite limited habitat and high risk of brainworm infection from moderate deer densities.

Wildlife management Unit C1 was moved because moose density and relevant vegetation characteristics in C1 are more similar to the North than the White Mountains regions. The moose density in C1 (1.47 moose/mi²; 2-yr mean; *note: moose density at the WMU-level is extrapolation of the data*) is closer to the density in the North (0.95 moose/mi²; 2-yr mean) than the White Mountains (0.21 moose/mi²; 2-yr mean) regions. The proportion of moose habitat that is spruce/fir forest in C1 is 27%, which is also more similar to the North (30% spruce/fir) than the White Mountains (16% spruce/fir) regions. The proportion of moose habitat that is optimal forage (regenerating forest 4-16 years old) in C1 is 10%, which is in between the North (18%) and White Mountains (3%) regions. These relationships have been consistent for the last 10 years.

Conclusions: Information coming from current research regarding the impact of climate on moose mortality and productivity suggests that current permit levels and hunter harvest are not causing the changes seen in regional moose density. Changes or stasis in permit issuance is currently most influenced by public concern, the relationship of the estimated moose density to permit issuance cut-off levels, and recent permit history.

Custom Qualitative Indicator/Output: Scientifically based moose population management recommendations have been formulated on an annual or biennial basis.

Recommendations: Continue this job as planned.

Submitted by: _____

Henry Jones
Moose Project Leader
July 1, 2023

TABLE 1. Permit allocation in 2021, 2022, and 2023. Lottery permits are listed by Wildlife Management Unit and total permit issuance which includes donated permits is in parentheses. *C1 is now part of the North region.

	2021 PERMITS*	2022 PERMITS*	2023 PERMITS*
WMU/REGIONS	ES	ES	ES
A1	2	2	2
A2	8	8	8
CT. LAKES	10	10	10
B	5	5	7
C2	6	6	5
D1	4	4	3
NORTH	15	15	18
C1	3	3	3*
D2	2	2	0
E1	1	1	0
E2	1	1	0
E3	1	1	0
F	2	2	0
W. MTNS	10	10	0
G	0	0	0
H1	0	0	0
I1	0	0	0
I2	0	0	0
J1	0	0	0
J2	0	0	0
CENTRAL	0	0	0
H2N	0	0	0
H2S	0	0	0
K	0	0	0
S.WEST	3	0	0
L	3	3	3
M	2	2	2
S.EAST	5	5	5
TOTAL	39 (41)	40 (42)	33 (35)

Note: Permit issuance can vary from permit allocation due to people who may drop out or are holdovers from the previous year due to medical or military deferment. One permit was donated to the Wildlife Heritage Foundation and one permit to the Dream Hunt Program. Hunters with these permits may hunt in any unit where hunting is allowed.

TABLE 2. N.H. Moose population management goals by region

REGION	RECOMMENDED GOAL	CUT-OFF LEVEL	CURRENT LEVEL*	HARVEST STRATEGY
CT. LAKES	2.24	1.06	1.36	Light harvest
NORTH	1.28	0.68	0.95	Light harvest
WHITE MOUNTAINS	0.47	0.24	0.23	Permit suspension
CENTRAL	0.25	0.20	0.17	Permit suspension
SOUTH WEST	0.23	0.20	0.16	Permit suspension
SOUTH EAST	0.10	None	0.04	Light harvest

* Moose/mi² extrapolated from moose seen per hundred hunter hours during the two years 2021 & 2022.

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

Appendix 1. 2023 Moose Rules and Regulations.

In addition to the New Hampshire Fish and Game Department's general hunting rules, the following moose hunt regulations are strongly enforced throughout the moose hunt season.

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-west: From the junction of Rte. I-93 and the Vermont border in Littleton, south on I-93 to Rte. 142 in Franconia, south on Rte. 142 to Rte. 18, west on Rte. 18 to Rte. 116, south on Rte. 116 to Rte. 112 and Rte. 116, west on Rte. 116 to Long Pond Rd. (i.e. North/South Rd.) in Benton, south on Long Pond Rd. to High St. in Glencliff, south on High St. to Rte. 25, 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 – D2-east: From the junction of Rte. I-93 and Rte. 142 in Franconia, south on Rte. I-93 to Rte. 112 in Woodstock, south west on Rte. 112 to Rte. 118 in Woodstock, south west on Rte. 118 to Rte. 25 in Warren, north on Rte. 25 to High St., north on High St. to Long Pond Rd. (i.e. North/South Rd), north on Long Pond Rd. to Rte. 116 in Benton, north on Rte. 116 to Rte. 18 in Franconia, east on Rte. 18 to Rte. 142, north on Rte. 142 to the intersection with Rte. I-93.

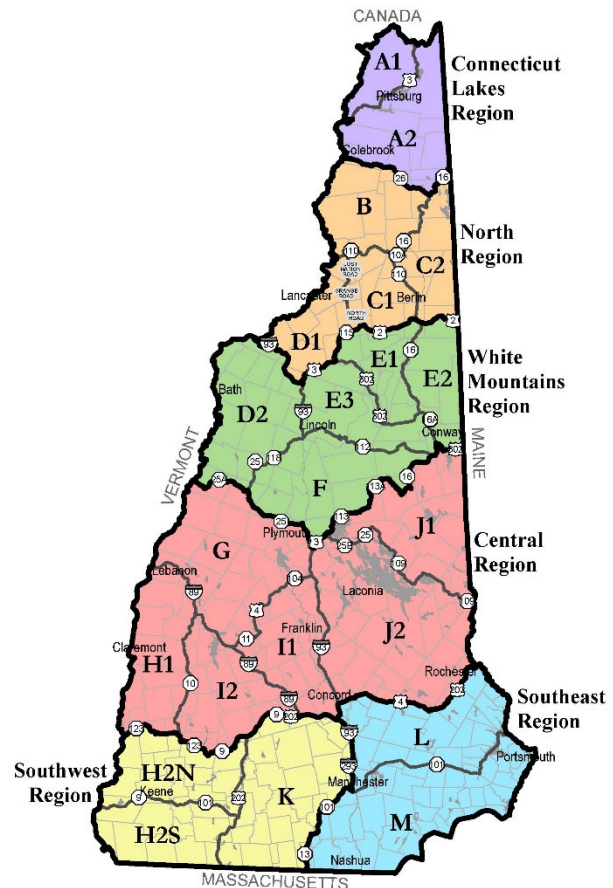
(9) Wildlife management unit – E1: From the junction of Rte. 2 and Rte. 115 in Jefferson east on Rte. 2 to Rte. 16 in Gorham, south on Rte. 16 to Rte. 302 in Glen, north on Rte. 302 to Rte. 3 in Twin Mountain, north on Rte. 3 to Rte. 115 in Carroll, north on Rte. 115 to its junction with Rte. 2 in Jefferson;

(10) 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;

(11) 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;

(12) 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;

(13) Wildlife management unit – G1: 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. 118 in Rumney, south on Rte. 118 to Rte. 4 in



Canaan, south and east 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;

(14) Wildlife management unit – G2: From the junction of Rte 118 and Rte. 25 in Rumney, southeast on Rte. 25 to Exit 26 of Rte. I-93 in Plymouth, south on Rte. I-93 to Rte. 104 in New Hampton, west on Rte. 104 to Rte. 4 in Danbury, north on Rte. 4 to Rte. 118 in Canaan, north on Rte. 118 to Rte. 25 in Rumney.

(15) Wildlife Management Unit – H1: 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;

(16) Wildlife management unit – H2-north: 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;

(17) Wildlife management unit – H2-south: 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;

(18) Wildlife management unit – I1: 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;

(19) Wildlife management unit – I2: 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;

(20) Wildlife management unit – J1: 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;

(21) Wildlife management unit J2: 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 Pembroke, west on I-393 to I-93 in Concord, north on I-93 to the junction of Rte. 3 in Ashland;

(22) 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;

(23) 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; and

(24) 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 J1 and J2.

(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 and use of dogs.

(e) No moose shall be taken with the aid and use of bait.

(f) 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.

(g) No person shall use an unmanned aerial vehicle as defined in Fis 312, or a person in any other aircraft to locate moose or communicate the location of moose to a permittee, subpermittee, or licensed guide between September 1 and December 31 of any year, or during the open moose season.

(h) No person shall use radio telemetry equipment, electronic calls, cell phones, radio transceivers, pagers, or other communication devices to collect and thereafter provide information to a permittee, subpermittee, or licensed guide for the purpose of attracting or taking moose after September 1 of any year or during the open moose season.

(i) No moose shall be taken within 300 feet of a class I, II, III, IV, or V 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 I, II, III, IV, or V highway.

(j) No moose shall be taken with 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, pistols as specified in RSA 208:3-d, crossbow or bow and arrow shall be permitted for the taking of moose, except pistols shall not be used in the town of Bow pursuant to RSA 207:3-b.

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

(l) Notwithstanding (f) above, a permittee taking moose under the provisions of RSA 208:1-aa may use additional guides to assist in carrying out such hunt as necessary for the safe and successful completion of the hunt.

(m) Only one moose shall be taken per permittee and subpermittee combination.

- (n) Moose may be taken in the water.
- (o) 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.
- (p) The moose tag shall contain the following:
 - (1) The shooter's signature;
 - (2) The date and time of kill;
 - (3) Town of kill;
 - (4) Specific location of kill
 - (5) The assigned wildlife management unit.
- (q) 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.
- (r) The permittee and subpermittee shall only hunt in the wildlife management unit to which they are assigned by the department.
- (s) 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.
- (t) 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.
- (u) Once the moose has been sealed as provided in Fis 301.08(h), a moose may be transported during the open season, and for 10 days after provided the registration seal remains firmly affixed to the moose at all times.
- (v) 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.
- (w) 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.
- (x) Any person leaving moose parts in the field shall place parts out of sight of roads traveled by conventional vehicles.

Fis 301.041 Minimum Requirements for Crossbow and Archery Equipment Used for Hunting.

- (a) Unless authorized by permit pursuant to RSA 207:10-c, a crossbow that is used for the purpose of a take shall have:
 - (1) A minimum pull of 125 pounds;
 - (2) At least one working mechanical safety;
 - (3) A total length of no less than 25 inches; and
 - (4) A rigid stock that permits only a single horizontally mounted bow with transverse limbs, a single string to be fully drawn, loaded with one bolt, maintained indefinitely in a firing position, and mechanically released. No crossbow fitted with 2 or more bows, limbs, or strings, or which permit 2 or more bolts to be released without recocking shall be permitted for the purpose of a take.
- (b) Unless authorized by permit pursuant to RSA 207:7-a, a traditional straight, recurve, or compound bow used for the purpose of a take shall:
 - (1) At 28 inches or less draw length have a minimum peak weight pull of:
 - b. If used to hunt moose, 50 pounds;
 - (2) Be drawn or released only by hand, or with a hand-held release; and
 - (3) Contain no manufactured or accessory device secured to or supported by the bow for the purpose of maintaining the bow at full draw in a firing position.
- (c) No person shall use an arrow, bolt, or quarrel tip other than a broadhead for the purpose of a take, that fails to meet the following minimum criteria:
 - (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) The hunter's name and address shall be plainly and legibly printed on each arrow, bolt, or quarrel.

Fis 301.08 Moose Registration at Biological Check Stations.

- (a) Moose taken during the open moose hunting season shall be presented at the nearest biological check station within 24 hours of the kill.
- (b) Moose taken prior to the open season on hunting adventure permits under RSA 208:1-aa shall be presented to a designated conservation officer or a designated deer registration station within 24 hours of the kill.
- (c) The moose shall be transported in such a manner that a portion of the moose is open to view.
- (d) Biological check stations shall be open for 3 to 9 days 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.
- (e) At the registration station, the permittee shall provide the fish and game department with his or her hunting license, moose permit and completed moose tag as well as the following on the "Moose Registration" form:
 - (1) Date and time of kill;
 - (2) Wildlife management unit, town, and locality of kill;
 - (3) Weapon used;
 - (4) An indication as to whether the moose was taken with the aid of a guide;
 - (5) Shooter's name, address, telephone number, date of birth, sex, and license number, if required; and
 - (6) The shooter's signature, signed subject to the penalties for making unsworn false statements under RSA 641:3.
- (e) The permittee shall allow biological information to be taken from their moose including the sex, antler beam diameter, number of points, antler spread, weight, estimated age, and estimated tick loads.
- (f) The permittee shall bring in to the biological check station at least the following:
 - (1) The lower jaw, including incisors, one of which shall be taken for aging purposes;
 - (2) The intact antler rack on an antlered moose;
 - (3) The skull plate on a male antlerless moose;
 - (4) The female reproductive tract including both of the ovaries and mammary sack; and
 - (5) All edible portions of the moose.

(g) Once all moose registration requirements are completed, a moose registration seal as provided in RSA 208:9 shall be affixed by fish and game personnel or their designated agents 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 \$15 for residents or \$25 for nonresidents, 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 and applications are non-transferable. Any person who provides 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. Proof of NH residency shall be the applicant's valid NH driver's license or NH non-driver's id card number issued by the NH department of safety, division of motor vehicles prior to the application deadline.

(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 (w);
- (3) The successful applicant has paid the permit fee and does not return the permit by October 1 as specified in (t); or
- (4) The applicant provides an incorrect state of residency as described in Fis 301.09(d).

(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 33 application numbers shall be drawn;
 - c. A total of 500 additional numbers shall be drawn as alternates;
 - d. The 33 moose permits shall be allocated as specified in Table 300.01 below:

Table 300.01 Moose Permit Allocation Table

Wildlife Management Unit	No. of Either Sex Moose Permits	No. of Antlerless Only Moose Permits
A1	2	0
A2	8	0
B	7	0
C1	3	0
C2	5	0
D1	3	0
D2	0	0
E1	0	0
E2	0	0
E3	0	0
F	0	0
G	0	0
H1	0	0
H2- north	0	0
H2-south	0	0
I1	0	0
I2	0	0
J1	0	0
J2	0	0
K	0	0
L	3	0
M	2	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 drawn for a permit 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 submit the information specified in (p) below on the permittee and the subpermittee, if a subpermittee is 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. Late information received via US mail shall be accepted provided they are postmarked not later than midnight on the third Friday 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 in (o) of permittees and subpermittees shall be as follows:
- (1) Confirmation of the permittee's intention to participate in the moose hunt signed subject to the penalties for making unsworn false statements under RSA 641:3;
 - (2) The subpermittee's:
 - a. Complete name and mailing address;
 - b. Date of birth; and
 - c. Telephone number; and
 - (3) A signed statement from the permittee and the subpermittee that neither has paid or bartered any thing for the privilege of being designated as a subpermittee and that they each have read and understand the current moose hunting rules signed subject to the penalties for making unsworn false statements under RSA 641:3.
- (q) The permittee shall obtain a permit described in Fis 1102.09. There shall be no residency requirements for the subpermittee.
- (r) No person shall act as a subpermittee for more than one permittee.
- (s) The deadline for the permittee to change the subpermittee shall be 8 days prior to the start of the moose season.
- (t) Once the fee for a moose permit has been paid, the permittee shall lose all accumulated points and not be eligible to submit an application 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.
- (u) No permittee shall sell or barter the subpermittee portion of their permit.
- (v) No person shall possess more than one moose permit as a permittee.
- (w) 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.
- (x) The executive director shall waive restrictions in the moose lottery process to delay the issuance of a moose permit for one year after being drawn due to a life-threatening illness or accident of the permittee or the permittee's active duty military service, any of which prevents the permittee from participating in the moose hunt.
- (y) In order for the permit to be deferred, the permittee shall not have participated in any portion of the current year's moose hunt and shall provide the following:
- (1) A request from the permittee to defer the permit which includes a brief explanation as to the deferment request signed subject to the penalties for making unsworn statements under RSA 641:3; and
 - (2) Either:
 - a. A statement from a physician stating that due to the permittee's medical condition the permittee is physically not able to participate in the current year's moose hunt, signed subject to the penalties for making unsworn false statements under RSA 641:3; or
 - b. In the case of active military service, federal documentation which shows that the permittee will be on active duty during the current year's moose hunt.
- (z) The permittee shall notify department headquarters no later than 4pm on the day before the hunt begins of said intent to defer the current year's permit.
- (aa) The information referenced in 301.09(y) and the permit shall be received at department headquarters no later than the second Friday of November.
- (ab) 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

Appendix 2.

CT LAKE REGION (A1 / A2)			(Proportional Permit Distribution)	
Areas	A1	151	A1	0.34
(Sq. Mi.)	A2	408	A2	0.66
	Total	559		

DEER HUNTER MAIL SURVEY DATA (2-Year)

	Regional	Unit A1	Unit A2	
Estimated Density	1.36	1.15	1.37	Mail survey data is 2 year average for each region
Calves / Adult Cow	0.32	0.47	0.28	
Adult Bulls / Cow	0.78			

ESTIMATED REGIONAL SURVIVAL RATES AND 5-YEAR KILL PER PERMIT ISSUED

Age/Sex	Winter Survival	Summer Survival	Kill / ES Permit	Kill / AO Permit	
Adult Bulls	0.88	0.88	0.81	0.00	Survival rates reflect double ES permit issuance. adult (1+ yro) bull survival is a conservative guess based on 2014-2018 research adult cow survival is 2014-2018 research rate Winter calf survival assumes high tick impacts occur every other year and summer survival is 2014-2018 research rate. kill/permit ES permit is 5 year average for this region
Adult Cows	0.93	0.93	0.15	0.60	
Calves	0.50	0.77	0.00	0.05	

ESTIMATED REGIONAL PRODUCTIVITY OF COWS (5-Year)

Age	Proportion of Pop.	Mean C.L Count	In Utero Survival	Calves Born Per Cow	
Yearling	0.21	0.17	0.90	0.15	Proportion of population is 3 yr avg. of all northern regions taken in harvest. Mean cl count is 5 yrs of all 3 regions.
2.5	0.17	1.00	0.90	0.90	
3.5+	0.62	1.00	0.90	0.90	
Weighted Total =				0.74	In utero survival is literature citation.

REGIONAL ANNUAL PERMIT ISSUANCE AND ESTIMATED UNIT ALLOCATIONS

(ROUNDED TO NEAREST 1)						(UN-ROUNDED VALUES)			
Regional	Regional	Unit	ES	AO	Total	Unit	ES	AO	Total
ES	AO	A1	2	0	2	A1	3.43	0.00	3.43
10	0	A2	8	0	8	A2	6.57	0.00	6.57
		Total	10	0	10	Total	10.00	0.00	10.00

REGIONAL POPULATION ESTIMATES

Time	Year 0	Adult Bulls	Adult Cows	Calves	Total	Adult Bulls Per Cow	Annual % Change	Cumulative % Change	Predicted Density
Initial November N		282	362	116	760	0.78	N/A	N/A	1.36

Spring (Pre-parturition) N	248	337	58	643	0.74			
Summer (Post-parturition) N	277	366	250	893	0.76			
Pre-Hunt N	244	340	193	777	0.72			
Harvest	8	2	0	10	5.40			
Year 1								
Estimated November N	236	339	193	767	0.70	0.92%	0.92%	1.37
Spring (Pre-parturition) N	208	315	96	619	0.66			
Summer (Post-parturition) N	256	363	234	853	0.70			
Pre-Hunt N	225	338	180	743	0.67			
Harvest	8	2	0	10	5.40			
Year 2								
Estimated November N	217	336	180	733	0.65	-4.42%	-3.54%	1.31
Spring (Pre-parturition) N	191	313	90	594	0.61			
Summer (Post-parturition) N	236	358	232	826	0.66			
Pre-Hunt N	208	333	179	719	0.62			
Harvest	8	2	0	10	5.40			
Year 3								
Estimated November N	200	331	179	710	0.60	-3.24%	-6.66%	1.27
Spring (Pre-parturition) N	176	308	89	573	0.57			
Summer (Post-parturition) N	220	353	229	802	0.63			
Pre-Hunt N	194	328	176	698	0.59			
Harvest	8	2	0	10	5.40			
Year 4								
Estimated November N	186	326	176	688	0.57	-2.97%	-9.44%	1.23
Spring (Pre-parturition) N	164	304	88	555	0.54			
Summer (Post-parturition) N	208	348	226	781	0.60			
Pre-Hunt N	183	323	174	680	0.57			
Harvest	8	2	0	10	5.40			
Year 5								
Estimated November N	175	322	174	670	0.54	-2.67%	-11.86%	1.20
Spring (Pre-parturition) N	154	299	87	540	0.51			
Summer (Post-parturition) N	197	343	222	762	0.58			
Pre-Hunt N	173	319	171	663	0.54			
Harvest	8	2	0	10	5.40			

NORTH REGION (B / C2 / D1)			(Proportional Permit Distribution)	
Areas	B	331	B	0.79
(Sq. Mi.)	C2	238	C2	0.15
	D1	215	D1	0.05
	Total	784		

DEER HUNTER MAIL SURVEY DATA (2-Year)

	Regional	Unit B	Unit C2	Unit D1
Estimated Density	0.95	1.52	1.08	0.12
Calves / Adult Cow	0.29	0.37	0.14	0.50
Adult Bulls / Cow	0.58			

ESTIMATED REGIONAL SURVIVAL RATES AND 5-YEAR KILL PER PERMIT ISSUED

Age/Sex	Winter Survival	Summer Survival	Kill / ES Permit	Kill / AO Permit
Adult Bulls	0.88	0.88	0.69	0.00
Adult Cows	0.93	0.93	0.13	0.00
Calves	0.50	0.77	0.04	0.00

Survival rates reflect double ES permit issuance.
adult (1+ yro) bull survival is based on 2014-2018 research adult cow
adult cow survival is 2014-2018 research rate
Winter calf survival assumes high tick impacts occur every other year
and summer survival is 2014-2018 research rate.
kill/permit ES permit is 5 year average for this region

ESTIMATED REGIONAL PRODUCTIVITY OF COWS (3-Yr Proportion, 5 Yr Prop)

Age	Proportion of Pop.	Mean C.L Count	In Utero Survival	Calves Born Per Cow
Yearling	0.21	0.17	0.90	0.15
2.5	0.17	1.00	0.90	0.90
3.5+	0.62	1.00	0.90	0.90
			Weighted Total =	0.74

Rates are from data from all three northern regions.

REGIONAL ANNUAL PERMIT ISSUANCE AND ESTIMATED UNIT ALLOCATIONS

		(ROUNDED TO NEAREST 1)				(UN-ROUNDED VALUES)			
Regional	Regional	Unit	ES	AO	Total	Unit	ES	AO	Total
ES	AO	B	12	0	12	B	11.88	0.00	11.88
15	0	C2	5	0	5	C2	2.30	0.00	2.30
		D1	5	0	5	D1	0.82	0.00	0.82
		Total	15	0	15	Total	15.00	0.00	15.00

REGIONAL POPULATION ESTIMATES

Adult	Adult	Annual	Cumulative	Predicted
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Time	Year 0	Bulls	Cows	Calves	Total	Adult Bulls Per Cow	% Change	% Change	Density
Initial November N		231	398	116	745	0.58	N/A	N/A	0.95
Spring (Pre-parturition) N		203	370	58	631	0.55			
Summer (Post-parturition) N		232	399	275	907	0.58			
Pre-Hunt N		204	371	212	788	0.55			
Harvest		10	2	1	13	5.31			
	Year 1								
Estimated November N		194	369	211	775	0.53	4.01%	4.01%	0.99
Spring (Pre-parturition) N		171	344	106	620	0.50			
Summer (Post-parturition) N		224	396	255	875	0.56			
Pre-Hunt N		197	369	197	762	0.53			
Harvest		10	2	1	13	5.31			
	Year 2								
Estimated November N		186	367	196	749	0.51	-3.32%	0.56%	0.96
Spring (Pre-parturition) N		164	341	98	603	0.48			
Summer (Post-parturition) N		213	390	253	856	0.55			
Pre-Hunt N		187	363	195	745	0.52			
Harvest		10	2	1	13	5.31			
	Year 3								
Estimated November N		177	361	195	732	0.49	-2.22%	-1.67%	0.93
Spring (Pre-parturition) N		156	335	97	589	0.46			
Summer (Post-parturition) N		204	384	249	838	0.53			
Pre-Hunt N		180	357	192	729	0.50			
Harvest		10	2	1	13	5.31			
	Year 4								
Estimated November N		170	355	191	716	0.48	-2.20%	-3.84%	0.91
Spring (Pre-parturition) N		149	330	96	575	0.45			
Summer (Post-parturition) N		197	378	246	821	0.52			
Pre-Hunt N		173	352	189	714	0.49			
Harvest		10	2	1	13	5.31			
	Year 5								
Estimated November N		163	350	188	701	0.47	-2.08%	-5.83%	0.89
Spring (Pre-parturition) N		143	325	94	563	0.44			
Summer (Post-parturition) N		191	372	242	805	0.51			
Pre-Hunt N		168	346	186	700	0.48			
Harvest		10	2	1	13	5.31			

W. MTN. REGION (C1 / D2 / E1 / E2 / E3 / F)			(Proportional Permit Distribution)	
Areas	C1	196	C1	0.81
(Sq. Mi.)	D2	425	D2	0.09
	E1	185	E1	0.00
	E2	233	E2	0.00
	E3	293	E3	0.00
	F	454	F	0.10
	Total	1786		

DEER HUNTER MAIL SURVEY DATA (3-Year)

	Regional	Unit C1	Unit D2	Unit E1	Unit E2	Unit E3	Unit F
Estimated Density	0.23	1.47	0.10	0.20	0.20	0.20	0.32
Calves / Adult Cow	0.22	0.36	0.27	0.00	0.00	0.00	0.09
Adult Bulls / Cow	1.14						

ESTIMATED REGIONAL SURVIVAL RATES AND 5-YEAR KILL PER PERMIT ISSUED

Age/Sex	Winter Survival	Summer Survival	Kill / ES Permit	Kill / AO Permit
Adult Bulls	0.88	0.88	0.42	0.00
Adult Cows	0.93	0.93	0.18	0.00
Calves	0.50	0.77	0.00	0.00

Survival rates reflect double ES permit issuance.
adult (1+ yro) bull survival is based on 2014-2018 research adult cow surv.
adult cow survival is 2014-2018 research rate
Winter calf survival assumes high tick impacts occur every other year
and summer survival is 2014-2018 research rate.
kill/permit ES permit is 5 year average for this region

ESTIMATED REGIONAL PRODUCTIVITY OF COWS (3-Year proportion, 5-year prod)

Age	Proportion of Pop.	Mean C.L Count	In Utero Survival	Calves Born Per Cow
Yearling	0.21	0.17	0.90	0.15
2.5	0.17	1.00	0.90	0.90
3.5+	0.62	1.00	0.90	0.90
			Weighted Total =	0.74

Rates are from data from all three northern regions.

REGIONAL ANNUAL PERMIT ISSUANCE AND ESTIMATED UNIT ALLOCATIONS

Regional ES	Regional AO	(ROUNDED TO NEAREST 1)				Unit	(UN-ROUNDED VALUES)		
		Unit	ES	AO	Total		ES	AO	Total
10		C1	8	0	8	C1	8.09	0.00	8.09
		D2	1	0	1	D2	0.89	0.00	0.89
		E1	0	0	0	E1	0.00	0.00	0.00
		E2	0	0	0	E2	0.00	0.00	0.00
		E3	0	0	0	E3	0.00	0.00	0.00
		F	1	0	1	F	1.02	0.00	1.02
		Total	10	0	10	Total	10.00	0.00	10.00

REGIONAL POPULATION ESTIMATES

		Adult		Adult		Adult Bulls Per Cow	Annual	Cumulative	Predicted
Time	Year 0	Bulls	Cows	Calves	Total		% Change	% Change	Density
Initial November N		198	174	38	411	1.14	N/A	N/A	0.23
Spring (Pre-parturition) N		175	162	19	356	1.08			
Summer (Post-parturition) N		184	171	120	476	1.07			
Pre-Hunt N		162	159	93	414	1.02			
Harvest		4	2	0	6	2.33			
Year 1									
Estimated November N		158	158	93	408	1.00	-0.64%	-0.64%	0.23
Spring (Pre-parturition) N		139	147	46	332	0.95			
Summer (Post-parturition) N		162	170	109	441	0.95			
Pre-Hunt N		143	158	84	384	0.90			
Harvest		4	2	0	6	2.33			
Year 2									
Estimated November N		138	156	84	378	0.89	-7.29%	-7.88%	0.21
Spring (Pre-parturition) N		122	145	42	309	0.84			
Summer (Post-parturition) N		143	166	108	417	0.86			
Pre-Hunt N		126	155	83	363	0.81			
Harvest		4	2	0	6	2.33			
Year 3									
Estimated November N		121	153	83	357	0.80	-5.60%	-13.04%	0.20
Spring (Pre-parturition) N		107	142	42	290	0.75			
Summer (Post-parturition) N		128	163	106	396	0.78			
Pre-Hunt N		112	151	81	345	0.74			
Harvest		4	2	0	6	2.33			
Year 4									
Estimated November N		108	150	81	339	0.72	-5.11%	-17.48%	0.19
Spring (Pre-parturition) N		95	139	41	275	0.68			
Summer (Post-parturition) N		115	159	103	378	0.72			
Pre-Hunt N		102	148	80	329	0.69			

Harvest	4	2	0	6	2.33			
Year 5								
Estimated November N	97	146	80	323	0.67	-4.57%	-21.25%	0.18
Spring (Pre-parturition) N	86	136	40	262	0.63			
Summer (Post-parturition) N	106	156	101	363	0.68			
Pre-Hunt N	93	145	78	316	0.64			
Harvest	4	2	0	6	2.33			

CENTRAL REGION (G / H1 / I1 / I2 / J1 / J2)

Areas	G	600
(Sq. Mi.)	H1	353
	I1	316
	I2	354
	J1	446
	J2	740
	Total	2809

(Proportional Permit Distribution)

G	0.33
H1	0.04
I1	0.16
I2	0.23
J1	0.16
J2	0.09

DEER HUNTER MAIL SURVEY DATA (2-Year)

	Regional	Unit G	Unit H1	Unit I1	Unit I2	Unit J1	Unit J2
Estimated Density	0.17	0.25	0.10	0.31	0.34	0.17	0.09
Calves / Adult Cow	0.42	0.53	0.25	0.38	0.46	0.50	0.31
Adult Bulls / Cow	0.96						

ESTIMATED REGIONAL SURVIVAL RATES AND 5-YEAR KILL PER PERMIT ISSUED

Age/Sex	Winter Survival	Summer Survival	Kill / ES Permit	Kill / AO Permit	
Adult Bulls	0.86	0.95	0.44	0.00	Survival based on lit.
Adult Cows	0.91	0.95	0.07	0.00	Kill/es permit is avg. of
Calves	0.53	0.71	0.00	0.00	2015-2019 yrs.

ESTIMATED REGIONAL PRODUCTIVITY OF COWS (2015-2019 southern region)

Age	Proportion of Pop.	Mean C.L Count	In Utero Survival	Calves Born Per Cow	
Yearling	0.15	0.38	0.90	0.34	Prop of pop and CL is 3 southern regions
2.5	0.15	0.89	0.90	0.80	combined and 2015-2019.
3.5+	0.70	1.00	0.90	0.90	
			Weighted Total =	0.80	

Proportion of Pop. and Mean C.L. replaced by Southern NH due to small sample sizes Not updated with 2020-2022 data due to small sample sizes.

REGIONAL ANNUAL PERMIT ISSUANCE AND ESTIMATED UNIT ALLOCATIONS

		(ROUNDED TO NEAREST 1)				(UN-ROUNDED VALUES)			
Regional	Regional	Unit	ES	AO	Total	Unit	ES	AO	Total
ES	AO	G	2	0	2	G	1.99	0.00	1.99
6	0	H1	0	0	0	H1	0.22	0.00	0.22
		I1	1	0	1	I1	0.93	0.00	0.93
		I2	1	0	1	I2	1.39	0.00	1.39
		J1	1	0	1	J1	0.95	0.00	0.95
		J2	1	0	1	J2	0.52	0.00	0.52
		Total	6	0	6	Total	6.00	0.00	6.00

REGIONAL POPULATION ESTIMATES

Time	Year 0	Adult Bulls	Adult Cows	Calves	Total	Adult Bulls Per Cow	Annual % Change	Cumulative % Change	Predicted Density
Initial November N		193	201	84	478	0.96	N/A	N/A	0.17
Spring (Pre-parturition) N		166	183	45	393	0.91			
Summer (Post-parturition) N		188	205	146	539	0.92			
Pre-Hunt N		179	195	104	477	0.92			
Harvest		3	0	0	3	6.29			
	Year 1								
Estimated November N		176	194	104	474	0.91	-0.72%	-0.72%	0.17
Spring (Pre-parturition) N		151	177	55	383	0.86			
Summer (Post-parturition) N		179	204	142	525	0.88			
Pre-Hunt N		170	194	101	465	0.88			
Harvest		3	0	0	3	6.29			
	Year 2								
Estimated November N		167	194	101	462	0.86	-2.65%	-3.35%	0.16
Spring (Pre-parturition) N		144	176	53	373	0.82			
Summer (Post-parturition) N		171	203	141	515	0.84			
Pre-Hunt N		162	193	100	455	0.84			
Harvest		3	0	0	3	6.29			
	Year 3								
Estimated November N		159	192	100	452	0.83	-2.07%	-5.36%	0.16
Spring (Pre-parturition) N		137	175	53	365	0.78			
Summer (Post-parturition) N		164	202	140	505	0.81			
Pre-Hunt N		155	192	100	447	0.81			
Harvest		3	0	0	3	6.29			
	Year 4								
Estimated November N		153	191	100	443	0.80	-1.88%	-7.13%	0.16
Spring (Pre-parturition) N		131	174	53	358	0.76			
Summer (Post-parturition) N		158	200	139	497	0.79			
Pre-Hunt N		150	190	99	439	0.79			
Harvest		3	0	0	3	6.29			
	Year 5								
Estimated November N		147	190	99	436	0.78	-1.67%	-8.68%	0.16
Spring (Pre-parturition) N		127	173	52	352	0.73			
Summer (Post-parturition) N		153	199	138	490	0.77			
Pre-Hunt N		145	189	98	433	0.77			
Harvest		3	0	0	3	6.29			

S. WEST REGION (H2N / H2S / K)			(Proportional Permit Distribution)	
Areas	H2N	324	H2N	0.15
(Sq. Mi.)	H2S	305	H2S	0.09
	K	568	K	0.76
	Total	1197		

DEER HUNTER MAIL SURVEY DATA (2-Year)

	Regional	H2N	H2S	K
Estimated Density	0.16	0.18	0.06	0.20
Calves / Adult Cow	0.54	0.25	0.50	0.67
Adult Bulls / Cow	0.72			

ESTIMATED REGIONAL SURVIVAL RATES AND 5-YEAR KILL PER PERMIT ISSUED

Age/Sex	Winter Survival	Summer Survival	Kill / ES Permit	Kill / AO Permit	
Adult Bulls	0.86	0.95	0.23	0.00	Survival based on lit.
Adult Cows	0.91	0.95	0.31	0.00	Kill/es permit is avg. of
Calves	0.53	0.71	0.00	0.00	2015-2019 yrs.

ESTIMATED REGIONAL PRODUCTIVITY OF COWS (2015-2019 southern)

Age	Proportion of Pop.	Mean C.L Count	In Utero Survival	Calves Born Per Cow	
Yearling	0.15	0.38	0.90	0.34	Prop of pop and CL is 3 southern regions combined and 2015-2019.
2.5	0.15	0.89	0.90	0.80	
3.5+	0.70	1.00	0.90	0.90	
Weighted Total =				0.80	

Proportion of Pop. and Mean C.L. replaced by Southern NH due to small sample sizes Not updated with 2020-2022 data due to small sample sizes.

REGIONAL ANNUAL PERMIT ISSUANCE AND ESTIMATED UNIT ALLOCATIONS

		(ROUNDED TO NEAREST 1)			(UN-ROUNDED VALUES)				
Regional ES	Regional AO	Unit	ES	AO	Total	Unit	ES	AO	Total
3	0	H2N	0	0	0	H2N	0.44	0.00	0.44
		H2S	0	0	0	H2S	0.27	0.00	0.27
		K	2	0	2	K	2.29	0.00	2.29
		Total	2	0	2	Total	3.00	0.00	3.00

REGIONAL POPULATION ESTIMATES

		Adult Bulls	Adult Cows	Calves	Total	Adult Bulls Per Cow	Annual % Change	Cumulative % Change	Predicted Density
Time	Year 0								
Initial November N		61	85	46	192	0.72	N/A	N/A	0.16
Spring (Pre-parturition) N		52	77	24	154	0.68			
Summer (Post-parturition) N		65	89	62	216	0.72			

Pre-Hunt N	61	85	44	190	0.72			
Harvest	0	1	0	1	0.74			
Year 1								
Estimated November N	61	84	44	189	0.72	-1.34%	-1.34%	0.16
Spring (Pre-parturition) N	52	77	23	152	0.68			
Summer (Post-parturition) N	64	88	61	214	0.73			
Pre-Hunt N	61	84	44	188	0.73			
Harvest	0	1	0	1	0.74			
Year 2								
Estimated November N	60	83	44	187	0.73	-0.97%	-2.30%	0.16
Spring (Pre-parturition) N	52	76	23	151	0.69			
Summer (Post-parturition) N	63	87	61	211	0.73			
Pre-Hunt N	60	83	43	186	0.73			
Harvest	0	1	0	1	0.74			
Year 3								
Estimated November N	60	82	43	185	0.73	-1.05%	-3.32%	0.15
Spring (Pre-parturition) N	51	75	23	149	0.69			
Summer (Post-parturition) N	63	86	60	209	0.73			
Pre-Hunt N	60	82	43	184	0.73			
Harvest	0	1	0	1	0.74			
Year 4								
Estimated November N	59	81	43	183	0.73	-1.06%	-4.35%	0.15
Spring (Pre-parturition) N	51	74	23	148	0.69			
Summer (Post-parturition) N	62	85	59	207	0.73			
Pre-Hunt N	59	81	42	182	0.73			
Harvest	0	1	0	1	0.74			
Year 5								
Estimated November N	59	80	42	181	0.73	-1.08%	-5.38%	0.15
Spring (Pre-parturition) N	50	73	22	146	0.69			
Summer (Post-parturition) N	62	84	59	205	0.73			
Pre-Hunt N	59	80	42	180	0.73			
Harvest	0	1	0	1	0.74			

S. EAST REGION (L / M)			(Proportional Permit Distribution)	
Areas	L	412	L	0.56
(Sq. Mi.)	M	527	M	0.44
	Total	939		

DEER HUNTER MAIL SURVEY DATA (2-Year)

	Regional	Unit L	Unit M
Estimated Density	0.04	0.05	0.03
Calves / Adult Cow	0.33	0.30	0.50
Adult Bulls / Cow	1.00		

ESTIMATED REGIONAL SURVIVAL RATES AND 5-YEAR KILL PER PERMIT ISSUED

Age/Sex	Winter Survival	Summer Survival	Kill / ES Permit	Kill / AO Permit	
Adult Bulls	0.86	0.95	0.24	0.00	Survival based on lit.
Adult Cows	0.91	0.95	0.04	0.00	Kill/es permit is avg. of
Calves	0.53	0.71	0.00	0.00	2018-2022 yrs.

ESTIMATED REGIONAL PRODUCTIVITY OF COWS (2015-2019 southern)

Age	Proportion of Pop.	Mean C.L Count	In Utero Survival	Calves Born Per Cow	
Yearling	0.15	0.38	0.90	0.34	Prop of pop and CL is 3 southern regions combined and 2015-2019.
2.5	0.15	0.89	0.90	0.80	
3.5+	0.70	1.00	0.90	0.90	
Weighted Total =				0.80	

Proportion of Pop. and Mean C.L. replaced by Southern NH due to small sample sizes **Not updated with 2020-2022 data due to small sample sizes**

REGIONAL ANNUAL PERMIT ISSUANCE AND ESTIMATED UNIT ALLOCATIONS

(ROUNDED TO NEAREST 1)						(UN-ROUNDED VALUES)			
Regional ES	Regional AO	Unit L	ES	AO	Total	Unit L	ES	AO	Total
5	0	M	2	0	2	M	2.19	0.00	2.19
		Total	5	0	5	Total	5.00	0.00	5.00

REGIONAL POPULATION ESTIMATES

Time	Year 0	Adult Bulls	Adult Cows	Calves	Total	Adult Bulls Per Cow	Annual % Change	Cumulative % Change	Predicted Density
Initial November N		16	16	5	38	1.00	N/A	N/A	0.04
Spring (Pre-parturition) N		14	15	3	31	0.95			
Summer (Post-parturition) N		15	16	12	43	0.95			
Pre-Hunt N		15	15	8	38	0.95			
Harvest		1	0	0	1	6.00			

Year 1								
Estimated November N	13	15	8	37	0.88	-2.20%	-2.20%	0.04
Spring (Pre-parturition) N	11	14	4	30	0.83			
Summer (Post-parturition) N	14	16	11	41	0.86			
Pre-Hunt N	13	15	8	36	0.86			
Harvest	1	0	0	1	6.00			
Year 2								
Estimated November N	12	15	8	35	0.79	-6.03%	-8.11%	0.04
Spring (Pre-parturition) N	10	14	4	28	0.75			
Summer (Post-parturition) N	12	16	11	39	0.78			
Pre-Hunt N	12	15	8	34	0.78			
Harvest	1	0	0	1	6.00			
Year 3								
Estimated November N	10	15	8	33	0.71	-4.99%	-12.69%	0.03
Spring (Pre-parturition) N	9	13	4	26	0.67			
Summer (Post-parturition) N	11	15	11	37	0.71			
Pre-Hunt N	10	15	8	33	0.71			
Harvest	1	0	0	1	6.00			
Year 4								
Estimated November N	9	14	8	31	0.64	-4.66%	-16.76%	0.03
Spring (Pre-parturition) N	8	13	4	25	0.60			
Summer (Post-parturition) N	10	15	11	36	0.66			
Pre-Hunt N	9	14	7	31	0.66			
Harvest	1	0	0	1	6.00			
Year 5								
Estimated November N	8	14	7	30	0.58	-4.30%	-20.34%	0.03
Spring (Pre-parturition) N	7	13	4	24	0.55			
Summer (Post-parturition) N	9	15	10	34	0.61			
Pre-Hunt N	9	14	7	30	0.61			
Harvest	1	0	0	1	6.00			

PERFORMANCE REPORT

State: New Hampshire **Grant:** F20AF11939

Grant Type: Survey and Inventory

Grant Title: NH – WILDLIFE RESEARCH AND MANAGEMENT (W-89-R-21)

Period Covered: July 1, 2022 - June 30, 2023

Purpose/Target Name: PROJECT 2 - MOOSE RESEARCH AND MANAGEMENT

Objective Name: JOB 4 - PROFESSIONAL EXCHANGE AND DISSEMINATION OF PROJECT INFORMATION

Objective Statement: 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:

Federal Aid reports were prepared and submitted in a timely manner.

The project leader gave 10 presentations as well as radio and newspaper interviews on New Hampshire's moose management project.

Public service announcements regarding safe driving practices (Brake for Moose) were posted in the spring and summer on the NH Fish & Game website.

Informational packets were given to moose hunting permittees and a webinar for moose hunters was conducted in summer 2022 and planned for summer 2023.

The moose profile and moose hunting sections of the NH Fish and Game website were revised.

The 2023 Moose Harvest Summary was written under this job and included in the "2022 NH Wildlife Harvest Summary" (see W-89-R-19, Project 1, Job 4, Appendix 1). Printed and a digital copy on the NH Fish and Game website were made available.

The NH Fish and Game moose project and Dartmouth College Woodlands Program hosted the annual meeting of the Northeast Moose Group at the Dartmouth College Woodlands facilities in Second College Grant, NH.

The 2023 North American Moose Conference in Grand Portage, MN, was attended by the moose project leader.

A copy of the 2016-2025 moose planning document can be found in W-89-R-15, Project 8, Job 2, Appendix 1.

Target Date: June 30th annually 2021-2025.

Status of Progress: On schedule.

Significant Deviations: None

Objective Approach: Public education will be accomplished through: the use of speaking engagements and educational seminars; radio, TV and periodical interviews; news releases; PSA's; and articles produced and published by the Fish and Game Department; PowerPoint 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 1 of W-89-R-15, Project 8 Job 2. These objectives are instrumental in helping develop 2016-2025 season recommendations.

The results of educational efforts are difficult to assess quantitatively. They are best assessed by the level of 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.

Presentations on the status and management of moose were given on 10 occasions to a variety of groups, which included middle school students, college students, conservation organizations, and the White Mountain National Forest summer presentation series for campers. In addition, public calls and written inquiries regarding moose were handled as necessary. Finally, numerous media inquiries regarding New Hampshire moose ecology, behavior and management were handled.

The moose hunting seminar, which provides information on moose ecology and hunting to current year moose hunting permittees, was held as a webinar and half of the permittees attended. Permittees were also mailed information to help them prepare for moose hunting. Much of this information has been developed through the Department's moose management grant. Initial steps were taken hold a similar webinar in 2023.

The sections of the NH Fish and Game website relevant to moose, the moose profile and moose hunting webpages, were revised. The goals of the revision were to make content: 1) clearly organized and navigable, 2) relevant, and 3) easy for staff to keep updated. This should improve constituent experience and knowledge as well as improve staff efficiency by having a resource for inquiries.

The 2022 New Hampshire Wildlife Harvest Summary was produced and distributed as a printed booklet placed on the Department website to ensure maximum public access and exposure.

The NH Fish and Game Moose Project coordinated the Northeast Moose Group annual meeting which was held at the Second College Grant in northern New Hampshire. This two day meeting for moose managers from the Northeast U.S. and eastern provinces of Canada focused on habitat management for moose. Lodging and forest management presentations were provided by the Dartmouth College Woodlands Program. There were 19 participants from Maine, Massachusetts, New Hampshire, Quebec, and Vermont, representing state and federal fish and wildlife agencies.

The 2023 North American Moose Conference in Grand Portage, MN, was attended by the moose project leader. The five day meeting included field visits to areas known to support moose, presentations on habitat and population management and diseases and parasites, and a workshop on collaborating with diverse stakeholders. The Conference was attended by 100+ biologists from North America and Scandinavia, and there were 30+ presentations. University of NH (UNH) and NHFG research (see Job 2) was presented by a UNH researcher.

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 (as specified in this grant).

Custom Qualitative Indicator/Output: The public, legislature and Governor and Council have been informed of the biological status and needs of the moose herd. Information regarding the performance of the moose management program has been provided and the public and governmental knowledge regarding moose research and management has been maintained.

Recommendations: Continue this job as planned.

Submitted by:_____

Henry Jones
Moose Project Leader
July 1, 2023