

2019 Moose Management Recommendation

to the
Vermont Fish and Wildlife Board
February 27, 2019



Vermont Fish and Wildlife Department
Agency of Natural Resources
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Recommendation

The Vermont Fish and Wildlife Department recommends that the Fish and Wildlife Board approve zero (0) permits for the 2019 moose hunting seasons. The Department's commitment to fair and equitable access to hunting warrants that priority be given to addressing changes in current Vermont statutes and Board regulations that constrain opportunities across all hunters in Vermont's moose hunting permit allocation structure. The Board should anticipate that once the statutory issues are addressed by the Vermont Legislature, the Department will recommend a set of changes to the moose rule for 2020 hunting seasons.

Moose Management Issues

Existing biological data support a limited hunting season of bulls-only in Wildlife Management Unit E. This hunt would have very limited influence on moose population numbers there.

A basic tenet of wildlife conservation and management is the fair and equitable access and enjoyment of wildlife. The Vermont Fish and Wildlife Department strives for equitable access for hunters. As we learned in 2018; however, the existing statutory and regulatory framework for the allocation of moose hunting permits prevents a fair opportunity for hunters. The current system was developed at a time when permit numbers far exceeded the numbers that can be sustained by the lower moose densities now experienced throughout the state.

Last years' experience highlighted the need to make several changes to Vermont statutes and regulations to accommodate issuing lower permit numbers. These potential changes include the following:

- Consistency between statute and the moose rule regarding the number of auction permits;
- Adjusting veteran permits and auction permits from a set number to a percentage of the total moose permit recommendation; and
- Addressing the expiration or maintenance of bonus points when permit numbers are so low that the applicants have virtually no chance of being drawn and are consequently forced to submit money or lose their total bonus points.

It is the Department's position that holding another moose hunting season under the constraints experienced last year is not consistent with the tenet described above, and there is merit in addressing this matter prior to holding another moose hunting season. It is important to note that the pending moose management plan will incorporate the final analysis and conclusions of the moose study into long-term management strategies to conserve and manage moose in Vermont. This may require establishing revised moose density objectives, addressing public opinions and input on management strategies, and informing the public of the management challenges ahead for moose. The public discussion around the moose management issues alone from the planning process will be helpful in guiding the Department's moose plan. The outcome of the plan will be important in setting the stage for moose management as early as 2020.

Biological Status of Moose

The Vermont Fish and Wildlife Department evaluated the biological status of Vermont's moose population using several key datasets. After its analysis at the regional level, the Department's Big Game Team determined that a moose season of 13 bulls-only permits limited to Region E (WMUs E1 and E2) will, once again, have no significant effect on moose population trends. These permit numbers, however, will once again be subject to the statutory and regulatory constraints regarding the number of permits delegated to auction, veterans and special opportunity hunts with no allowance for the general hunting public.

Status of Vermont's Moose Population

The Vermont Fish and Wildlife Department uses several datasets that inform its moose population models to monitor population trends at the statewide and regional levels (Figure 1).

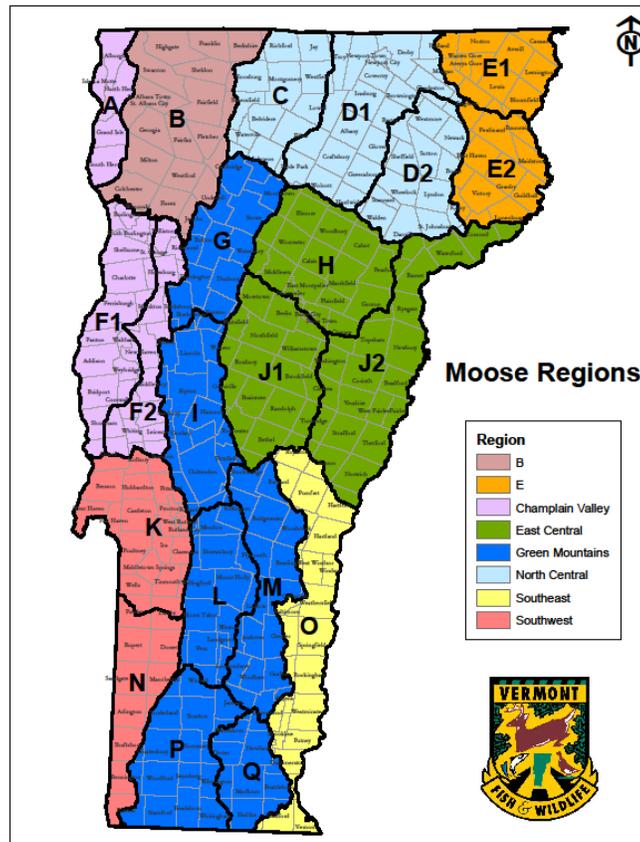


Figure 1. Vermont moose management regions

Rolling three-year averaged moose sighting rates from deer hunter surveys are used as a population index that is incorporated into our moose population estimation formula. The moose sighting rates are an index of the population and not necessarily reflective of the true population, because many factors (e.g., weather, hunter behavior) can affect sighting rates from one year to the next. Thus,

we use other indexes of population such as incidental mortality reports along with survival and productivity from the three-year moose study to assess how closely our population estimate matches the true population. While moose sightings from the 2018 Deer Hunter Survey were greater than the three-year average, and in Region E were 110% greater than the three-year average (Table 1), comparison with incidental mortality, survival and productivity data suggest the population is more likely to have remained stable with previous years or continued declining in some regions.

Table 1. Moose sighting rates in 2018 compared to 2016-2018 average.

Region	Sighting rates		Percent Difference
	2016-2018	2018	
WMU E1 & E2	1.31	2.75	110
North Central	0.3	0.32	7
East Central	0.2	0.31	55
Green Mountains	0.19	0.17	-11
WMU B	0.08	0.13	63
Champlain Valley	0.02	0.02	0
Southeast	0.02	0.02	0
Southwest	0.02	0.02	0

Moose population estimates: The increased sighting rates of moose by November season deer hunters in 2018 resulted in greater three-year moose population estimates for four (4) of eight (8) regions (Table 2). Of the four regions with target moose densities, only Region E (WMUs E1 and E2) is within the current established threshold for hunting (25% of the target population). The bull:cow ratios from last year’s Deer Hunter Survey are still good statewide (88 bulls:100 cows) and within Region E (80 bulls:100 cows), and they remain consistent with adult sex ratio objectives.

The new rolling three-year estimate for Region E is 1.3 moose/mile² (Table 2). It’s unlikely, however, that the population in Region E could have grown that much with the 52% calf mortality rates and relatively low fecundity rates observed in our collared moose study last year. Forty hunters returned a Region E survey in 2018, and 9 different hunters saw a total of 90 moose. One hunter, over 12 hunting days, saw 38, or 42% of all moose seen in Region E. If this one hunter had not returned a survey, the Region E population estimate would have remained fairly stable at 1.11 moose/mile², with an 80% confidence interval range of 0.95 to 1.28 moose/mile².

Table 2. Rolling 3-Year 2016-2018 Moose population Estimate by Region

REGION	Target Density (Moose/Mile ²)	Target Popn	2016 – 18 Pop Est (Density/mi ²)	Difference	Percent Difference
E	1.0	632	830 (1.3)	198	0.31
NC	0.5-1.0	834	342 (0.3)	-491	-0.59
EC	0.25 - 0.5	507	309 (0.2)	-198	-0.39
GM	0.0 - 0.5	994	410 (0.19)	-584	-0.59
B	NA	NA	34	34	0.00
CV	NA	NA	0	0	0.00
SE	NA	NA	12	12	0.00
SW	NA	NA	0	0	0.00
Total		2967	1938	-1029	-0.35

Non-hunting Moose Mortalities: We maintain a statewide database of all recorded non-hunting moose mortalities that occur in addition to the legal hunting harvest (Table 3). These data are collected and reported on a biological year basis, which begins on June 1, after most of the moose calves have been born. We review summaries of non-hunting moose mortalities each year when we develop season recommendations, as this information helps us assess how well our moose population estimate matches the true population.

The total number of moose dying from non-hunting causes in the Biological Year ending May 31, 2018 was 93, virtually unchanged from the previous year. The total for WMU E also remained stable (26 vs. 25), supporting evidence that the WMU E population may not have increased as indicated by the deer hunter sighting rates.

Table 3: Non-hunting Moose Mortality for Biological Year 2017 (7/01/17 – 6/30/18)

Region	CAUSE OF DEATH						Total BY2017	Total BY2016
	Illegal	Motor Vehicle	Suspected Brainworm	Tick	Other	Unknown		
E	0	19	1	2	0	4	26	25
Others	2	34	17	2	4	8	67	66
Total	2	53	18	4	4	12	93	91

Moose Study Mortality and Productivity: In the second year of a three-year study, 30 8-month old calves, along with 6 cows, were radio-collared in January 2018. Only 1 of 33 cows died during the winter, resulting in a survival rate of 97%. Of 30 collared calves, one slipped its collar partway through the winter season, and 15 of the remaining 29 calves died by the end of May. The 48% calf survival rate was down from 60% the previous year (Figure 2).

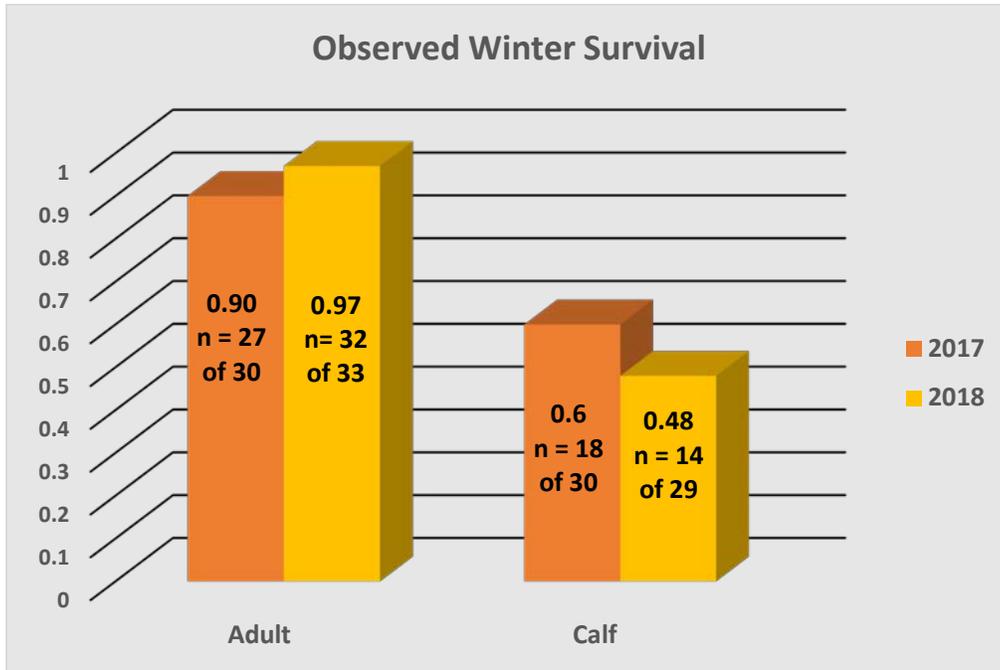


Figure 2. Vermont collared cow and calf winter survival rates, 2018 – 2019.

Infestation by winter ticks was implicated in the cause of death for many of these calves, and in 2018, 6 calves were also infected with brainworm. Over the two years of the study thus far, winter ticks and brainworm have caused over two-thirds of collared moose mortalities (Figure 3).

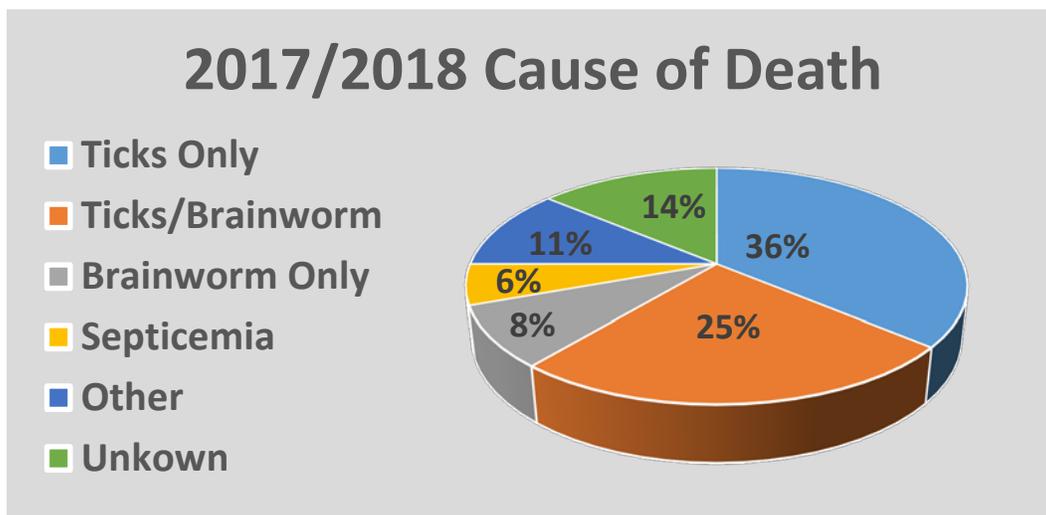


Figure 3. Cause of death of Vermont collared moose, 2017-2018.

Total tick counts were made on 4 half-hides collected from deceased calves. The average estimated tick load (actual number of ticks counted times 2) was 31,147 ticks (range 19,660 – 58,778). This average was 47% higher than the 2017 average count of 21,134 ticks on 4 calf hides.

Similarly, the average number of ticks counted on rump and shoulder transects of live calves at time of capture in January 2018 was 33.4, up 45% from 23.1 the previous year (Figure 3). The observed increase in overwinter mortality in the second year of the study was therefore not surprising.

Thirty additional 8-month old calves were collared in January 2019, and their average tick load at capture was 32.6 ticks, representing no significant change from 2018 (Figure 4).

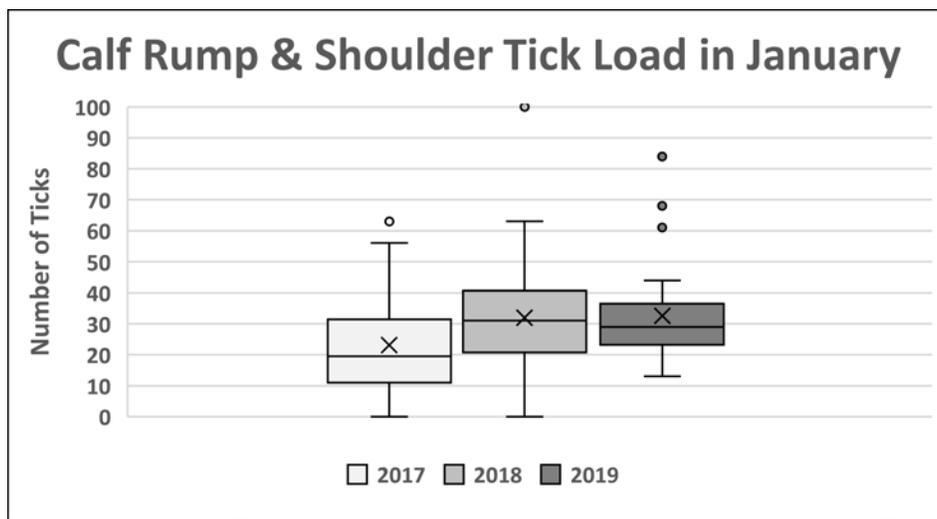


Figure 4. Average tick counts (from shoulder and rump transects) on Vermont calves at time of capture in January, 2017-2019.

In addition to tick loads carried into the winter season, calf body weights have been correlated with tick-induced mortality by published studies of New England moose. The average weight of Vermont calves at time of capture has remained close to 380 pounds through all 3 years (Figure 5). With similar average tick count and body weight of calves collared in 2018 and 2019, losing half of our calves this winter is once again possible.

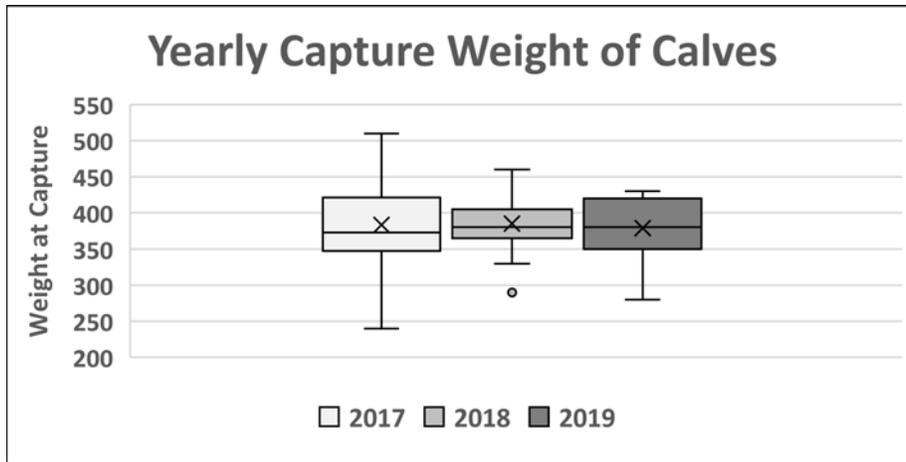


Figure 5. Average weight of collared Vermont calves at time of capture, 2017-2019.

Population Models: For Region E, we use a population model (MOOSPOP) to estimate the impact of hunter harvest on the moose population. This model incorporates estimates of 1) current-year population size, age structure, and adult sex ratio; 2) number of moose hunting permits to be issued; 3) hunter success rates; 4) seasonal mortality by age classes; and 5) ovulation rate by age class of the cow. The starting population size is from the rolling 3-year average deer hunter sightings.

The Department applied analyses of moose data for Region E similarly to past years to quantify the effects of various harvest prescriptions on the moose population trend. Trials were run using limited versus zero moose hunting permits beginning in 2019. These trials were run with very conservative application of moderate to severe population effects from winter ticks with a low tick year every three years, as prescribed from moose research in New Hampshire. We also applied the lower 80% confidence interval 2018 population estimate for Region E as a conservative starting point (718 moose/1.14 moose/mile² vs. 830 moose/1.31 moose/mile²). Tables 4 and 5 illustrate the stabilizing effect of annually applying 13 bull-only permits under the winter tick scenarios offered above. Of course, annual adjustments to the permit numbers allow for adaptive management to achieve the target population. Interannual variability in survival and reproduction are impossible to accurately predict, thus an adaptive management approach also allows for adjustments based on what the final year of the moose study show and what subsequent years of non-hunting mortality and moose sighting data show.

Table 4. MoosPop trial for Region E with 0 permits.

Model Year	Calendar Year	November Population Estimate	Density (Moose/Sq. Mile)		Permits in Year
0	2018	718	1.14	Lambda	0 2019
1	2019	695	1.10	-0.03	0 2020
2	2020	708	1.12	0.02	0 2021
3	2021	823	1.30	0.16	0 2022
4	2022	765	1.21	-0.07	0 2023
5	2023	769	1.22	0.01	0 2024
1.0 Moose/Square Mile = 632 moose (target population)					

Table 5. MoosPop trial for Region E with 13 permits.

Model Year	Calendar Year	November Population Estimate	Density (Moose/Sq. Mile)		Permits in Year	
0	2018	718	1.14	Lambda	13	2019
1	2019	684	1.08	-0.05	13	2020
2	2020	689	1.09	0.01	13	2021
3	2021	797	1.26	0.16	13	2022
4	2022	733	1.16	-0.08	13	2023
5	2023	733	1.16	0.00	13	2024
			1.0 Moose/Square Mile = 632 moose (target population)			

Harvest Potential

The issuance of a small number of bull-only permits produces slightly different density estimates but does not drive overall moose density trends in WMU E. Instead, fluctuations in winter mortality of calves from winter ticks more significantly influences increases and decreases in moose density over the five-year period. A season recommendation of 13 bulls-only permits for WMU E is sustainable, will not influence the population over time, and is consistent with the goals of the current moose plan, one of which is to provide hunting opportunities and local meat.

Proposed Timing and Outreach

The proposed moose management recommendation will be presented to the Fish and Wildlife Board at their February 27, 2018 meeting. The Department will collect public comments for a minimum of 30 days. Public input will be sought at three Department held public hearings to be held in conjunction with the March deer meetings and through emails. The Department will announce the public comment period through press releases, email distribution lists and its website.