



# WINTER TICKS AND MOOSE

## *Managing for a Healthy Moose Population*

### History

Prior to European settlement, Vermont was 95% forested and moose were common throughout much of the state. Native Americans and European colonists killed moose opportunistically throughout the year for food and fiber. As Vermont's human population grew, the conversion of forests to agriculture and the unregulated hunting of moose in the 18th and 19th centuries resulted in their disappearance from the state.



Forests gradually returned during the 20th century as hill farms went out of business, and moose began to reappear in Vermont. By 1980, 80% of Vermont was again forested, and moose were regularly seen in Essex County. The absence of predation by mountain lions, wolves or humans allowed rapid population growth. By 1993, moose were abundant enough to support a limited, regulated hunt that eventually expanded to 78% of the state.

Boosted by a spruce budworm outbreak and subsequent large-scale timber harvesting, the moose population experienced significant growth through the 1990s and early 2000s. At its peak, the high moose population was causing significant damage to forest regeneration in some areas of the state, and the health of moose was declining as a result. The Vermont Fish & Wildlife Department issued large numbers of moose

hunting permits for several years to deliberately reduce moose numbers in the Northeast Kingdom so it was more in balance with the available habitat. **This deliberate reduction in the moose numbers reduced impacts to forest regeneration and is likely why Vermont's moose carry fewer winter ticks than those in New Hampshire or Maine.**

**Vermont currently has an estimated 2,300 moose statewide, with more than half of those moose in Essex County. The Fish & Wildlife Department is promoting growth of the herd in most of the state, while looking to reduce moose densities in Essex County—for a new reason.**

### The Effects of Winter Ticks on Moose Populations

In recent years, moose numbers have declined across the Northeast as herds are increasingly under stress from climate change. Wildlife biologists are concerned that shorter winters are allowing winter tick numbers to increase in areas of higher moose density. To address this concern, the Fish & Wildlife Department partnered with the University of Vermont Cooperative Research Unit to join other regional research efforts to study the impacts of winter ticks on moose.

During 2017-2019, researchers captured 36 adult cow moose and 90 calves (~8 months old) in Essex County and fitted them with GPS tracking collars to monitor their health, survival and reproductive rates.

### Study Results

- 87% of adults survived each year, but only 57% of adult cows gave birth, a decline of around 50% compared to birth rates in the early 2000s.
- Only 66% of newborn calves survived their first 60 days.
- Only 49% of calves (8-12 months old) survived their first winter.
- With no ticks, over 90% of calves would have survived.

### Study Conclusions

- Winter ticks were the main cause in 74% of all mortalities and 91% of winter calf mortalities.
- Winter ticks caused the health and productivity of surviving moose to be very poor, and were the primary factor limiting growth of the moose population.

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## UVM – Vermont Fish & Wildlife Partner Research Efforts and Publications

### Jake DeBow: MSc focused on winter tick-related moose health, survival, and reproduction

**Thesis title:** *Effects of Winter Ticks & Internal Parasites on Moose Survival & Fecundity in Vermont, USA* University of Vermont 2017-2019. <https://scholarworks.uvm.edu/graddis/1196>

**Scientific publications** (in final review, estimated publishing summer 2021)

“*Effects of Winter Ticks and Internal Parasites on Moose Survival in Vermont, USA*” DeBow et al., *Journal of Wildlife Management*.

“*Implications of Declining Fecundity in Moose in Vermont, USA*” DeBow et al., *Journal of Wildlife Management*.

### Joshua Blouin: MSc focused on winter tick-related moose habitat use and quality

**Thesis:** Forthcoming May 2021

**Scientific publications** (in final review, estimated publishing summer 2021)

“*Modeling Moose Habitat Suitability by Age, Sex, and Season in Vermont, USA based on GPS Radio-collar Data and Lidar Imagery*” Blouin et al., *Animal Conservation journal*.

“*Moose Habitat Selection and Fitness Consequences During Two Critical Winter Tick Life Stages in Vermont, USA*” Blouin et al., *Frontiers in Ecology and Evolution journal*.

### Elias Rosenblatt: PhD focused on winter tick-related moose genetic health and stress

**Dissertation:** Forthcoming Fall 2021

**Scientific publications** (in review, estimated publishing summer 2021)

“*Juvenile moose (*Alces alces*) stress and nutrition dynamics relate to landscape characteristics, climate-mediated factors, and survival*” Rosenblatt et al., *Conservation Physiology journal*.

### Cheryl Sullivan: PhD focused on efficacy of various fungicides against winter tick larvae

**Scientific publications**

2020. “*Evaluation of spray applications of Metarhizium anisopliae, Metarhizium brunneum and Beauveria bassiana against larval winter ticks, Dermacentor albipictus.*” *Experimental and Applied Acarology*.

2020. “*Pathogenicity of Metarhizium anisopliae and Metarhizium brunneum isolates and efficacy of Met52 G against winter tick larvae, 2019.*” *Arthropod Management Tests*.

In addition to these primary results, several related studies are helping the department better understand the relationship between moose and winter ticks, connecting these health, survival and reproductive findings to moose habitat and genetics.

## Summary

**The Fish & Wildlife Department manages wildlife populations based on science. Research in Vermont and elsewhere in New England has clearly shown that heavy winter tick infestations, associated with high moose densities, are causing reduced survival, productivity, and overall health in the heart of its range—the Northeast Kingdom.** Research has also shown winter ticks do not reach problematic levels in areas with lower moose densities, including most of Vermont. Therefore, the department is proposing to reduce moose densities in the northeastern part of the state where tick impacts are an issue, while allowing for population growth in the remainder of the state. The department will continue to pursue additional scientific research to inform moose management decisions, and that management will continue to be adaptive and respond to new information as it becomes available.

