

Modelling the Winter Tick Epizootic in Moose

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Changing climatic conditions have increased the severity of winter tick (*Dermacentor albipictus*) parasitism of moose (*Alces alces*). We present two models of these dynamics, the first being a simplified, analytical model and the second being a more realistic, numerical model. Using the first model, we found a necessary and sufficient condition relating the reproductive rate of moose and the tick parasitism rate for the moose population to extirpate or persist. As changing climatic conditions are resulting in longer tick questing periods and increased tick reproduction, we also use this model to compare under what combination of these ‘season’ lengths the moose population will extirpate or persist. Using the second numerical model, we compare under what combination of tick reproduction and tick parasitism rates the moose population will extirpate or persist. We also investigate the effectiveness of mitigating the effects of tick parasitism by hunting, the most widely employed conservation effort at this time, by predicting the effects of different hunting rates at different times of year on the minimum and maximum moose herd sizes. We conclude that changes in season length can lead to local extirpations. However, reducing tick reproduction or tick survival and harvesting moose can stabilize moose populations.