

Summer 2014 Field Research Report

Understanding the influence of biotic and abiotic factors in Lyme disease ecology to predict the future distribution of endemic risk areas in Ontario

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Background:

Lyme disease is the most common vector-borne disease in North America and is an emerging disease in Canada. This disease is caused by the bacteria *Borrelia burgdorferi*. In eastern North America, the bacteria are transmitted by the blacklegged tick or deer tick (*Ixodes scapularis*).

An area is considered to have an established population of blacklegged ticks when all life stages are present for two consecutive years. The area is endemic for the bacteria when there is laboratory evidence of the bacteria either in the tick or small mammal population.ⁱ In the early 1990's, the only known established population of blacklegged ticks in the province was at Long Point, Ontario. Within the last two decades, the tick population has expanded in the province. There are now a number of recognized sites that have established populations of blacklegged ticks and endemic cycles of the bacteria, and blacklegged ticks have been found in increasing numbers in other areas in Ontario. Concurrently, the incidence of human Lyme disease has been on the rise.ⁱⁱ

Objectives:

Our research aims to:

- (1) Understand the current distribution of the blacklegged tick, and the risk of Lyme disease in Ontario.
- (2) Assess the influence of ecological factors on the distribution of the blacklegged tick and Lyme disease risk areas.
- (3) Develop models to predict the future spread of the blacklegged tick and Lyme disease in the province.

Methods:

108 sites were visited across 3 ecoregions in Ontario (5E, 6E and 7E). These sites fit the basic selection criteria, which were forested area, minimum size of 0.25 km squared, and accessible. Numerous conservation authorities and parks granted us permission to conduct research on their lands. Sites were visited once during May – October 2014 to collect data. Due to inclement weather and time constraints, we were not able to visit all sites for which we initially requested access.

Each research site was surveyed for ticks according to protocols from the 1991 Canadian Consensus on Lyme disease.¹ A 1 m² flannel blanket was dragged over parallel transects for the equivalent of 3 person-hours. The blanket was examined every 3 minutes and all adults, nymphs and larvae were removed and counted. Adults and nymphs were collected and submitted to the National Microbiology Laboratory for species identification and testing for *B. burgdorferi*.

Basic ecological data was collected at each site, including:

- Temperature and relative humidity via HOBO data loggers
- Site aspect
- Soil composition and moisture
- Depth of litter layer
- Tree and understory composition

Results

Table 1 outlines the findings of the active tick surveillance. If ticks were present, the laboratory analysis is also provided.

Site	Date of Visit	Results of tick dragging	Laboratory analysis
Emily Provincial Park	August 8, 2014	0	N/A
Petroglyphs Provincial Park	August 15, 2014	0	N/A
Mark S Burnham Provincial Park	August 15, 2014	0	N/A
Youngs Point Conservation Area	August 25, 2014	1 nymph	ID = <i>Haemaphysalis leporispalustris</i> ; Not tested
Warsaw Caves Conservation Area	August 25, 2014	0	N/A
Haroldtown Conservation Area	August 29, 2014	100 larvae, 2 nymphs	ID = <i>Haemaphysalis leporispalustris</i> ; Not tested

Table 1: Results from active tick surveillance conducted in the Peterborough County and City Health Unit.

Discussion:

Active surveillance conducted in the Peterborough County and City Health Unit did not show the presence of blacklegged ticks at this time. These results suggest that the current risk of Lyme disease from blacklegged ticks in this area is low. However, the blacklegged tick population has been expanding in Ontario, and these ticks can be transported into new areas by migratory birds and other mammals. Ongoing monitoring of this area, either through passive or active surveillance, is recommended to continue with Lyme disease risk assessment.

Our research efforts will continue in the summer of 2015. We plan to revisit a number of sites from 2014 as well as a number of new sites where we will conduct active surveillance, complete small mammal sampling and collect additional ecological data. This data will contribute to our breadth of data so we can continue to focus on our research objectives and gain greater insight into the ecology of Lyme disease in Ontario.

The tick species collected does not pose a risk of Lyme disease transmission. The rabbit tick (*Haemaphysalis leporispalustris*) is one of the most common and widely distributed ticks in North America. It predominately feeds on rabbits, and although it can carry a number of tick-borne pathogens, it is not considered a public health risk as these ticks do not commonly parasitize humans.

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Contact:

If you have any questions about our research and this report, please contact Katie Clow at kclow@uoguelph.ca.

ⁱ Consensus conference on Lyme disease. 1991. *Can J Infect Dis* 2(2):49-54.

ⁱⁱ Ogden NH, Lindsay LR, Morshed M, Sockett PN, Artsob H. 2008. The rising challenge of Lyme borreliosis in Canada. *Can Comm Dis Rep* 34(1).