Deer Tick Abundance in Restored Riparian Buffer Zones in the Lake Champlain Watershed

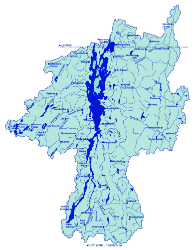

Figure 1: Lake Champlain watershed (Lake Champlain Basin Program, 2003)

Figure 2: A black-legged tick (Smith Collection/Gado/Getty Images, 1990)

Background:

In Vermont, there is a major emphasis on stream/river health and runoff pollution mitigation. Riparian buffer zones between stream and land have been shown to decrease harmful runoff from surrounding areas. These riparian buffer zones consist mainly of indigenous shrubbery and trees that help to trap pollutants before they enter a river (Lv & Wu, 2021). Studies have shown that the blacklegged tick, *Ixodes scapularis,* otherwise known as the deer tick tends to favor forest buffers with shrubbery like those seen in riparian zones (Gilliam, M.E., et al., 2018). It is also the case that riparian buffers tend to provide habitats for small rodents, some of which are major hosts of deer ticks (Cockle, K. L., & Richardson, J. S, 2003). Thus, it stands to reason that buffer zone restoration would be correlated with deer tick abundance however few studies on the matter have been conducted.

Hypothesis: Based on existing literature, we hypothesize that sites with restored riparian buffers will contain more deer ticks per unit area than non-buffered sites in the same area.

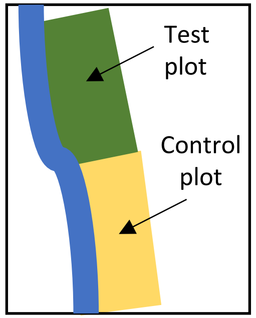

Figure 3: Example plot design

Data Collection:

Study Area: Five separate study sites in the Lake Champlain watershed will be established. These sites will each contain a plot of land bordering a stream or river that lack sufficient riparian buffer. We will partner with the Lake Champlain Fish and Wildlife Conservation Office and local municipalities to identify areas of riverbank erosion that are in need of restoration. In each identified plot, half of the land will undergo riparian buffer restoration by planting native trees and shrubs and half will be left alone.

Plot Design: There will be two habitat plots in each study site. One consisting of newly restored riparian buffer and another adjacent plot consisting of unrestored stream border. These study plots will be approximately 10 x 20 meters in area.

Sampling Protocol: Deer ticks will be collected using standard flagging techniques with drag cloths. A 1m^2 white cloth is dragged along the ground at a slow pace around the 60 m perimeter of a 10 m x 20 m sampling plot. Ticks that cling to the cloth are collected, counted, and categorized by species, sex, and life stage (adult, nymph, or larvae) (*Ticks* 2019). The ticks will further be tested for B. burgdorferi bacteria using indirect fluorescent antibody techniques (Williams, S. C., & Ward, J. S, 2010).

Timeline: This process will take place twice a year when deer ticks are the most active in late spring and early fall. As a before-after control-impact design, data collection will start in the year before site restoration and will continue for the next five years after restoration.

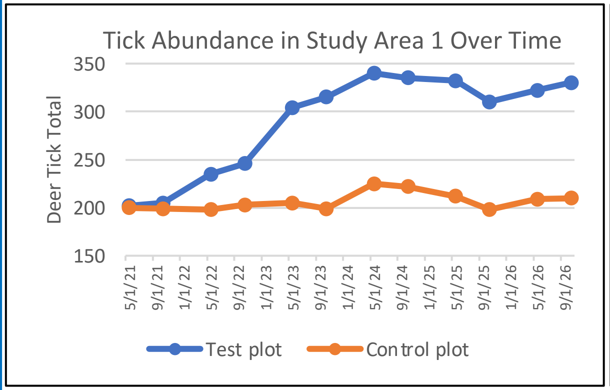

Figure 4: Expected tick totals for study area 1

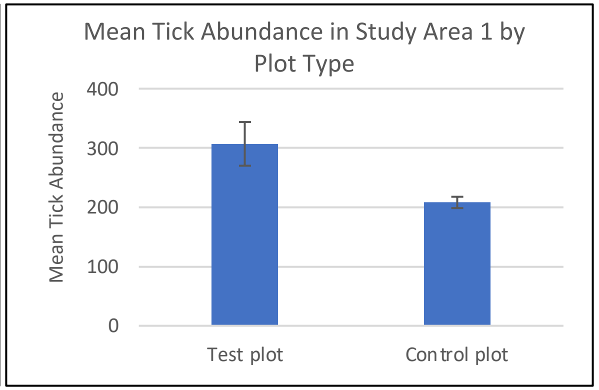

Figure 5: Expected mean tick abundance for study area 1

Intended Analysis: The raw data collected will be used to calculate the mean, standard deviation, and significance of any variation seen between plots. Because the independent variable (restored buffer zone or non-restored buffer zone) is categorical and the dependent variable (deer tick abundance) is discrete, a one-sided t-test will be used for analysis. The result of this t-test will give a p-value that is informative as to whether the data collected is statistically significant. If the p-value is less than 0.05, it can be stated that there is a statistically significant difference in tick abundance between restored buffer sites and adjacent sites. This analysis will be conducted five times corresponding to the five study areas.

Conclusions: As B. burgdorferi carrying ticks become ever more present in the North America due to climate change, it is as important as ever that we study how land management practices can affect tick populations (Bouchard, C., et al., 2015). This research will provide new insight into the impact of riparian buffer restoration on Vermont deer tick dynamics.

References:

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