

**Title:** The Effects of Mulching Leaves in Place on Tick Populations in Lawns and Parks

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**Abstract:**

In an effort to reduce costs on waste management, several municipalities in Westchester County are promoting efforts such as the “Love ‘Em and Leave ‘Em” initiative, which encourages homeowners to mulch fall leaves in place. With this push to “leave them on the lawn”, questions have been raised about the effect this practice may have on tick habitat. Assessing tick populations on lawns will help determine if mulch mowing can affect tick populations and thus vector-borne disease incidence.

Tick populations were evaluated on fourteen plots at twelve sites, which represent eight home lawns and four public parks in Westchester County, NY. Five sites have been mulch-mowed for 1-3 years, four have been mulch-mowed for 4-7 years, and five sites have had leaves removed in the fall. Each site was dragged for ticks one time per week for six weeks in the spring, seven weeks in the autumn, and once each in July and August for a total of 15 assessments. Collected ticks were identified to species and life stage and tested for tick-borne diseases.

The number of collected ticks was very low, with only nineteen ticks collected for the whole year. Tick collection was more dispersed in the spring with eleven ticks collected on seven plots. No ticks were collected in the summer and eight ticks were collected on three plots in the fall. While the low numbers do not allow for statistical analysis, the results indicate the need to continue the study for the next few years with some modifications, including concentrating collections during peak tick activity and increasing collection frequency during these times.

**Background and justification:**

Fall leaf management is a challenge for communities, especially in densely populated areas with many trees. Roadside leaf piles clog storm drains, cause flooding and pose other hazards. Since NYS municipalities banned leaves from landfills in the late 1980’s, leaves have been collected and sent to a municipal facility or shipped long distance to be composted. Leaf pick-up and transport is costly and increases fuel use and emissions. Leaf litter is also an important habitat for arthropods, and changes in leaf management practices may impact important pests such as ticks.

Several municipalities in Westchester County are promoting the "Love ‘Em and Leave ‘Em" initiative, which encourages homeowners to mulch fall leaves in place. Research is currently underway to gain a better understanding of how leaf mulching will affect soil and turf quality, however, the implications of this practice on tick populations are not well known.

A steering committee comprised of representatives from New York State Department of Environmental Conservation (NYSDEC), NYS Turf and Landscape Association, Westchester Department of Solid Waste, Cooperative Extension, environmental groups and homeowners have

been involved in developing the overall research project. The Cornell IPM Turf Team, with representatives from the Cornell University Horticulture and Entomology Departments, the NYS IPM Program, and numerous Cornell Cooperative Extension offices, have also identified the possible effects of leaf mulching on tick populations to be an important topic. In addition, during visits with New York State legislators, ticks, Lyme disease, and other tick-borne illnesses were identified as being an important issue to the legislators and their constituents.

The black-legged tick is the sole vector of Lyme disease in the Eastern United States, and is capable of transmitting several other pathogens that affect human health as both nymphs and adults. Due to their small size and the subsequent difficult detection, black-legged tick nymphs are particularly important as vectors of human disease. Black-legged ticks are generally found in leaf litter and on ground level vegetation in the woods where they quest for hosts. It is not known whether mulched leaf litter in the lawns is correlated with tick incidence. In a study of tick communities in Midwestern habitats, Rynkiewicz et al. (2014) concluded that microclimate conditions strongly influence the abundance and activity of individual tick species.

In a study by Maupin et al. (1991), the landscape ecology of Lyme disease was examined on 67 residences in Westchester County. Nymph and adult ticks were widely dispersed in four main habitats (woods, the unmaintained edge between woods and lawn, ornamental vegetation, and lawns). The authors proposed several measures that may help reduce the risk of exposure to Lyme disease vectors in residential environments including the removal of leaf litter from the unmaintained edge, and mowing of vegetation during spring and summer in the unmaintained edge between woods and lawns. Raking and bagging leaves exposes residents to tick populations, and the bags still need to be brought to a transfer site or composting facility. Intentionally mowing as close as practical to the woods will reduce tall herbaceous vegetation and prevent woody vegetation from establishing, thus reducing tick habitat. It is possible, therefore, that risk reducing measures could be achieved through mulch mowing of leaves.

Black-legged, lone star, and American dog ticks are commonly found in Westchester County, and each can be found in different habitats and carry different diseases. It is suspected that the degradation of leaf litter through mulch mowing will be detrimental to black-legged ticks found in close proximity to homes due to the decrease in leaf litter and, therefore, the humid environment preferred by the tick. However the effects on lone star ticks, which prefer drier areas is unknown. The proper identification of any ticks collected, therefore, is important. The distribution of tick-borne illnesses in this context is also not well understood, and the testing of a random selection of collected ticks for different disease will help to contribute to this body of knowledge.

**Objectives:**

1. Assess the impact of long-term leaf mulch mowing on populations of tick species found in Westchester County, NY.
2. Evaluate the abundance and distribution of ticks carrying pathogens throughout the different treatment plots to determine if leaf mulch mowing has an impact on the risk of encountering infected ticks.
3. Integrate results with other ongoing research on the impacts of mulch mowing on turf and soil health.

## Procedures:

1. Fourteen plots at twelve sites were selected through outreach efforts by Cornell Cooperative Extension of Westchester County to Westchester County residents, municipal contacts and Master Gardener Volunteer residents and with the help of the “Love ‘Em and Leave ‘Em” initiative, an educational outreach effort by the Green Policy Task Force in Westchester County. Two sites have two plots each. Eight sites are home lawns with the remaining four at public parks and range from 1/5 to 7 acres. Five plots have been mulch-mowed for one to three years, four have been mulch-mowed for over four years, and five plots have had leaves removed.

Multiple studies, including Daniels et al. (2000) find that dragging is an efficient method for sampling ticks, providing that sampling is conducted by one individual throughout the study to prevent sampler bias.

Dowels were attached to a 3’x3’ white flannel cloth and dragged along the perimeter and diagonally to cross the center within each plot. For narrow plots where diagonal dragging would overlap with the perimeter, the perimeter alone was dragged. The cloth was examined for attached ticks at the end of 30 seconds of sweeping and captured ticks were placed in alcohol filled vials. Each site was dragged for ticks one time per week for 6 weeks in the spring, starting May 26, once each in July and August, and 7 weeks in the autumn, starting October 14, for a total of 15 assessments. Ticks were identified to species, sex, and life stage under a microscope.

2. All ticks were submitted to the UMass Laboratory of Medical Zoology to test ticks for tick-borne illnesses. Unlike many labs only test black-legged ticks for Lyme disease, this lab tests different species of ticks for tick-borne illnesses common to that species. Black-legged ticks were tested for *Borellia burgdorferi*, *Babesia microti*, *Anaplasma phagocytophilum*, and *Borrelia miyamotoi*.

## Results and discussion:

Collection numbers were low, with only 19 ticks collected. Tick collection was more dispersed in the spring (Fig. 1) with eleven ticks collected on seven plots. No ticks were collected in the summer and eight ticks were collected on three plots in the fall.

Thirteen of the nineteen ticks were collected on plots where the leaves were removed, four on plots that have been mulch-mowed for 1-3 years, and two on plots that have been mulch-mowed for over 4 years (Fig. 2).

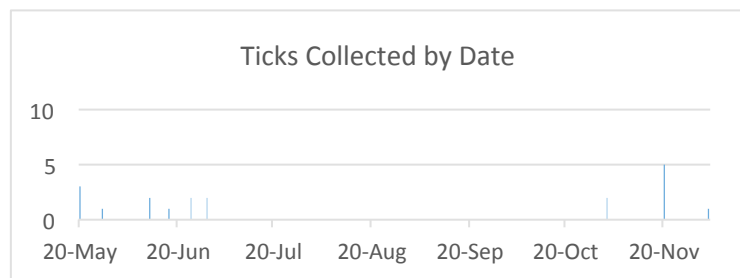


Figure 1: Ticks collected by date. Sweeps were conducted weekly from May 20<sup>27</sup> to June 29, July 28, September 2, and weekly from October 14 to November 24.

Out of the nineteen ticks, six tested positively for tick-borne diseases – five with *Borellia burgdorferi* and one with *Anaplasma phatocytophilum*. All six infected ticks came from the same property in Bedford, NY. Two came from the plot where leaves have been mulch mowed for over four years and four from the plot where leaves are removed.

While the low numbers do not allow for statistical analysis, the results indicate the need to continue the study through at least 2017 with some modifications to target days when ticks are more active. In a study by Ostfeld et al. (2001), the effects of acorn production on *Borrelia burgdorferi* infection prevalence of nymphal ticks was positively correlated due to an increase in host species, especially white-footed mice. As 2015 was a high mast year, we may anticipate an increased abundance of nymphal ticks in 2017, allowing for greater collection numbers and the ability to statistically evaluate capture vs. treatment

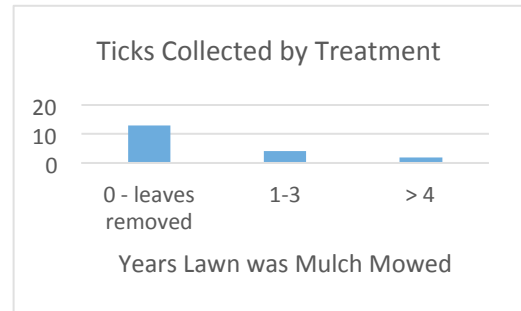


Figure 2: Ticks collected on plots where leaves were removed, leaves have been mulched for one to three years, or leaves have been mulched for more than four years.

2015 was very dry; combined with warmer than usual temperatures, tick activity occurred later in the fall than predicted. Future tick collections should not be scheduled weekly, but concentrated during peak tick activity. Tick collection should occur more frequently than once per week during these times.

### **What is the impact of your work?**

In 2015, we confirmed that black-legged ticks can be found and collected in Westchester County lawns using standard tick dragging techniques. This information has been used in educational settings to emphasize that individuals need to be diligent in protecting themselves from ticks even if they are not entering tall vegetation and woodlands commonly known to be tick habitat.

By evaluating when ticks were collected in 2015, we can use this information to determine collecting schedules for 2016 and 2017 that will provide more statically relevant data.

### **Project location:**

Westchester County

### **Samples of resources developed:**

The following photos were uploaded to the NYS IPM Program flickr site:

#### **Looking for ticks on drag:**

[www.flickr.com/photos/99758165@N06/18016665950/in/album-72157645579157057/](http://www.flickr.com/photos/99758165@N06/18016665950/in/album-72157645579157057/)  
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[www.flickr.com/photos/99758165@N06/17583782653/in/album-72157645579157057/](http://www.flickr.com/photos/99758165@N06/17583782653/in/album-72157645579157057/)

#### **Tick on drag:**

[www.flickr.com/photos/99758165@N06/18204388655/in/album-72157645579157057/](http://www.flickr.com/photos/99758165@N06/18204388655/in/album-72157645579157057/)

**Leaves on lawn:**

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