

Effectiveness of altered service periods of the 4-Poster tick management device for control of tick populations at Brookhaven National Laboratory on Long Island, New York

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Abstract

The 4-Poster, a tick control device developed by the United States Department of Agriculture (USDA), is a passive feeding station designed to control ticks that utilize white-tailed deer (*Odocoileus virginianus*) as a host. The device consists of a central bin that is filled with whole kernel corn. Attached to either end are paint rollers treated with 10% Permethrin that rub against the deer's neck, head, and ears as they eat the corn. At Brookhaven National Laboratory (BNL), a team of research personnel including summer undergraduate research interns have been investigating the effectiveness of 4-Poster devices on tick populations for the last five years to study the decrease of the tick populations. This year will be the first time that half of the 4-Poster devices will have reduced servicing; once every three weeks versus the minimum weekly required servicing. The variation in servicing is being done to see if the reduced treatment will still have the same efficacy in tick control on white-tailed deer. Wildlife cameras were set up at each 4-poster station to track the deer visits at each site. Plus, thirty-one-minute flagging surveys for samples around the perimeter of each 4-Poster device were carried out in late-June to early-July. Data will be analyzed using statistical tools to compare current observations with the previous data to draw any reasonable and scientific conclusions. The modified 4-Poster maintenance is expected to remain effective at killing ticks improving the health of the deer population and lessen likelihood of tick-borne disease transmission to humans.

Introduction

Ticks are obligate blood-feeders that feed off humans, birds, reptiles, and domestic mammals. These are parasites that may transfer various diseases to animals and humans. The Center for Disease Control (CDC)^{1, 2} identifies tick-borne illnesses as a public health hazard that is very difficult to control. There are three common types of ticks that are located on Long Island, New York; black-legged or deer ticks (*Ixodes scapularis*), dog ticks (*Dermacentor variabilis*), and Lone Star ticks (*Amblyomma americanum*). These ticks may carry diseases such as Lyme disease, Babesiosis, Ehrlichiosis (HME), Anaplasmosis (HGA), Rocky Mountain Spotted Fever (RMSF), and Southern Tick-Associated Rash Illness (STARI). Deer are the one out of three-key hosts for adult blacklegged (*Ixodes scapularis*) and adult Lone Star ticks (*Amblyomma americanum*). Ticks are mainly found around the neck, head, and back of the ears of the white-tailed deer. Therefore, deer play an important role in maintaining tick populations and transferring them to different areas around Long Island and Brookhaven National Laboratory. Hunting and killing the deer alone will not get rid of ticks, they would just find another host. Instead, the 4-Poster deer treatment station was developed by the United States Department of Agriculture (USDA) and approved by the United States Environmental Protection Agency (EPA) for commercial use in 2004.

Methods & Materials

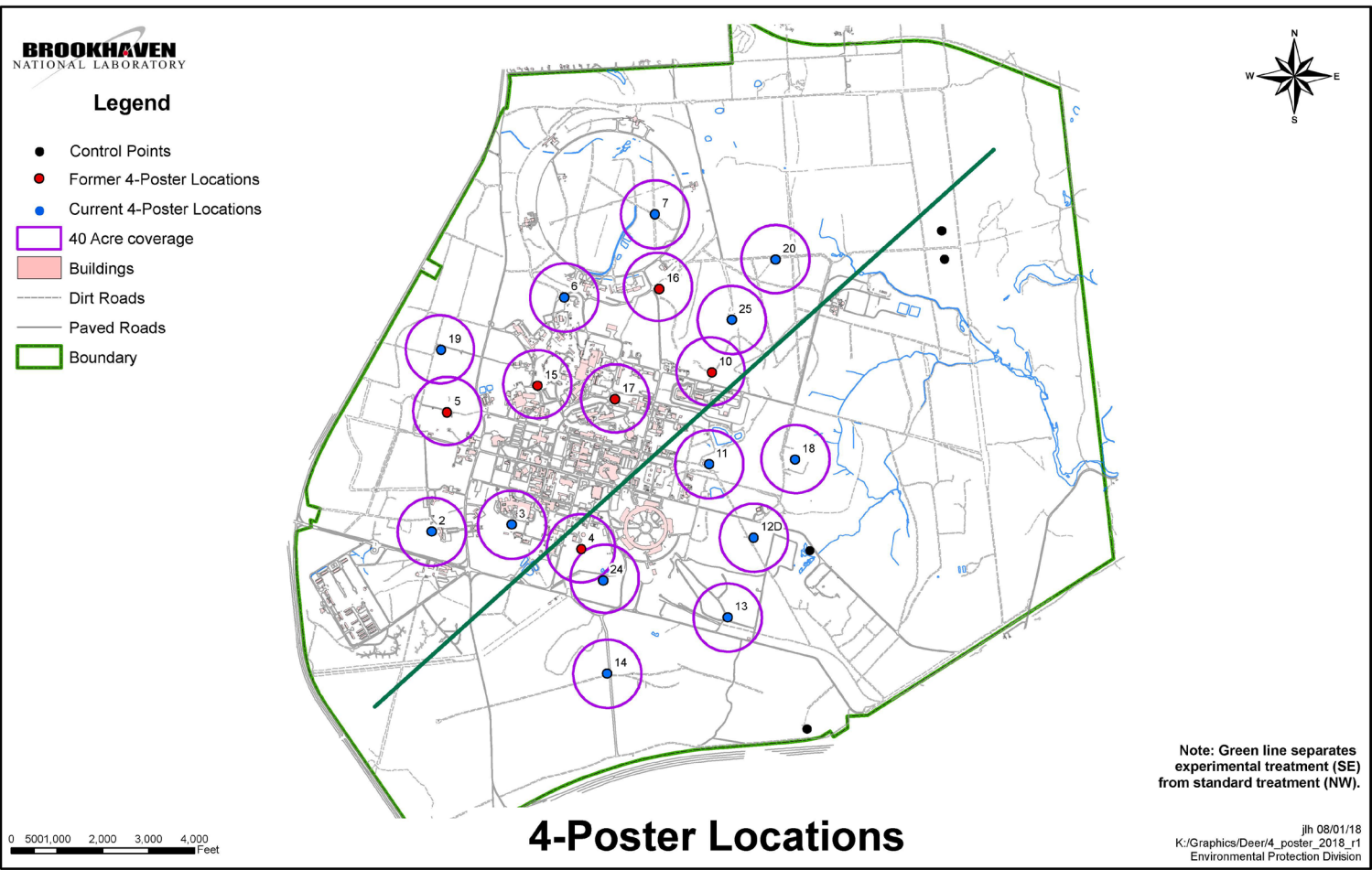
- ❖ Fourteen 4-Poster devices were set up with forty-acre coverage areas around BNL
- ❖ Devices were serviced weekly and with one half serviced every three weeks
- ❖ A 10% Permethrin treatment applied to each roller per 114.0kg of corn added to 4-Poster
- ❖ Each device had a trail camera (either Wildgame Innovations or Moultrie) set up adjacent to it.
- ❖ Memory cards were collected every week and, pictures sorted by deer visiting the site
- ❖ Tick Surveying was done by dragging a cloth flag through vegetation and leaf litter to capture ticks
- ❖ Each device was flagged for thirty times for one-minute
- ❖ Ticks were identified as male, female, nymph, or larva of species *A. americanum*, *I. scapularis*, or *D. variabilis*
- ❖ Each station was sampled between last week of June 2018 to the third week of July 2018



References

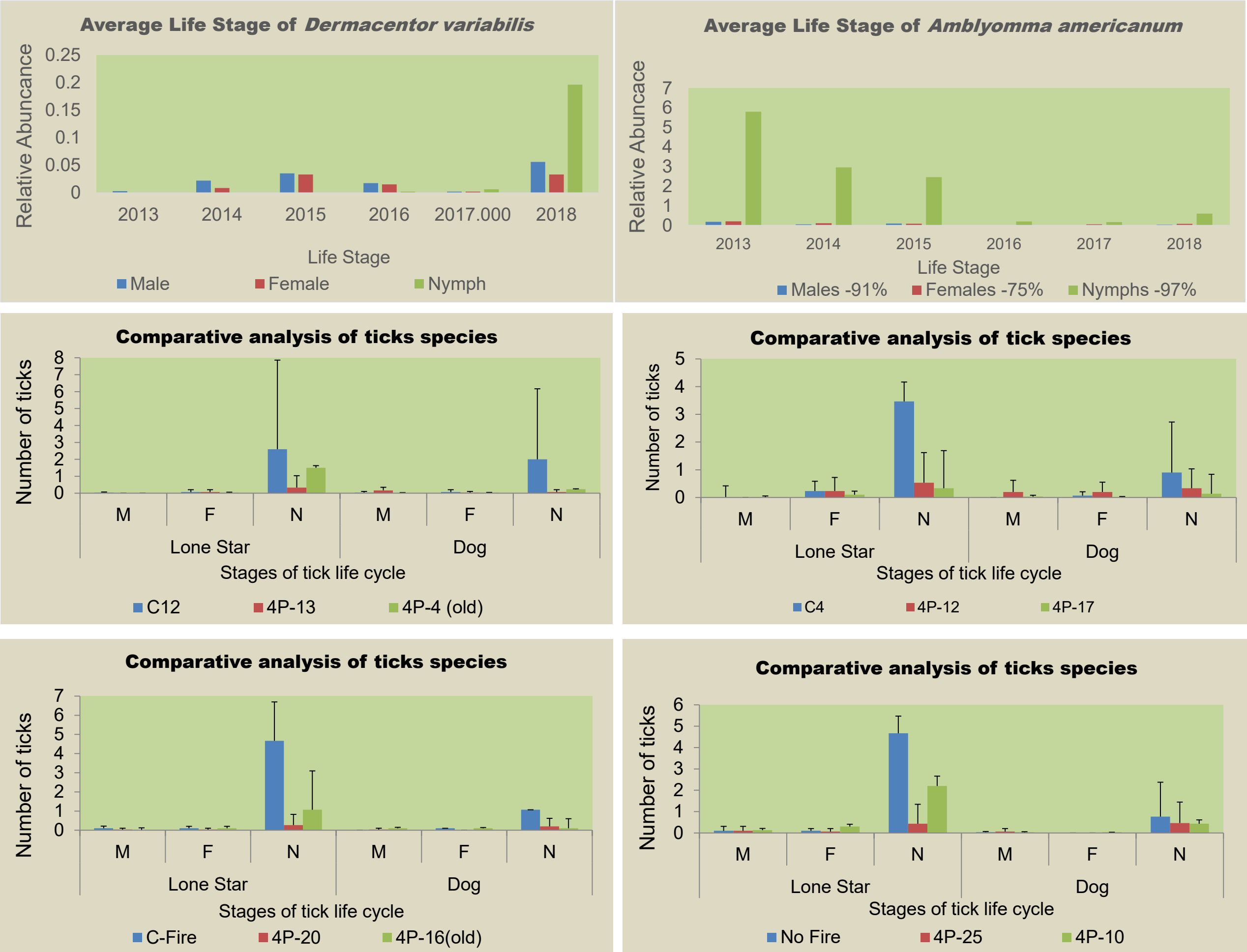
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BNL Sampling Sites Map



Results

- ❖ Control sites have the most ticks, followed by the old 4-Posters, and the least amount of ticks were found in the new 4-Poster areas
- ❖ Lone Star Nymphs are most dominant found in all areas
- ❖ The two Northeast control sites have the same amount of Lone Star Nymphs
- ❖ The Northeast control site with no fire has more Lone Star females, which is not good because each female can produce up to 2000 or more eggs each time
- ❖ The cameras showed that the site with reduced services has less deer visiting compared to the site with normal weekly services
- ❖ When there is no corn the deer do not visit the 4-Poster area as much, which means less deer are getting treated
- ❖ Compared to the data five years ago the average number of ticks have decreased around the area of BNL
- ❖ The only significant change is that the Nymphs have increased this year



Discussion & Conclusion

- ❖ The 4-Posters were effective this year but not to the extent we were expecting
- ❖ The most significant data collected was *A. americanum* and *D. variabilis* nymphs this summer.
- ❖ The amount of male and female *D. variabilis* increased while the amount of *A. americanum* decrease significantly
- ❖ There were hardly any *I. scapularis* found in the areas
- ❖ The larvae were expected to be a problem in mid-July which was not the case this summer
- ❖ Picture analysis were not that accurate this summer because of issues with encrypted memory cards
- ❖ The control sites, as expected, had the highest number of ticks due to the moist areas and leaf litter
- ❖ Also, due to the higher temperatures and humidity this year with hardly any rain increased the population of ticks

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