



# **NEON Tick Sampling Technical Working Group**

## ***2020 Annual Report***



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National Ecological Observatory Network (NEON) is a project sponsored by the National Science Foundation and proudly operated by Battelle.

# Introduction

Since its inception, NEON has relied on expertise within the science, education, and engineering communities to advise on key areas impacting the design, construction, and maintenance of the observatory with the goal to optimize its operation. Currently, two types of external advisory bodies support staff and leadership in making key decisions that guide all of NEON's activities: the Science, Technology & Education Advisory Committee (STEAC) and Technical Working Groups (TWGs). Both bodies are comprised of experts nominated to serve in these roles who are selected by NEON staff following a rigorous selection process.

NEON currently relies upon input from 22 TWGs. These groups play an important role by providing input to NEON's data collection and processing methods and ensuring that NEON infrastructure, data, and programs are a valuable community resource. Working groups are participatory and advisory; they are often tasked with providing input on issues that have scientific, educational, engineering, or operational implications.

This document includes a summary of activities, recommendations, and NEON's response to those recommendations for the Tick Sampling TWG during the 2020 funding year (November 2019-October 2020).

The Tick Sampling Technical Working Group provides expert input and advice regarding the science design and protocols related to NEON tick abundance, diversity and pathogen sampling.

## Q1 – November 2019-January 2020

### Summary of Activities

We discussed additional ways to sample ticks that are being missed with the drag/flag method. We also talked about priorities for implementing the new tick-borne disease testing for small mammals. We also considered ways to improve the timing of sample collection so that we optimize collections at certain California and southeastern NEON sites.

### TWG Recommendations

The TWG strongly recommended sampling attached ticks from small mammals as the primary method of effectively sampling tick abundance/diversity at some sites. The TWG did not think CO<sub>2</sub> traps were worth the effort because they only trap a small subset of active-host-seeking ticks. The TWG suggested adding (*Rickettsia parkeri*, Heartland virus and Powassan virus) and removing (*Borrelia lonestari* and *ehrlichia chafeensis*) a few pathogens from the list of pathogens for which small mammal blood will be tested. The removed pathogens are either not common/pathogenic (*B. lonestari*) or not likely in small mammals (*ehrlichia chafeensis*). The suggested additions are highly pathogenic (viruses) or thought to contribute to more human infections than the data currently show (*R. parkeri*). It was also recommended to test over a wider timeframe rather than restrict to peak nymphal activity. Our sampling window at several sites is missing adult tick activity. The TWG recommended extending sampling and/or adding a single winter sampling date at sites with adult winter activity.

## NEON Response

The current small mammal sampling protocol does not allow for collection of ticks due to limitations on handling time of these small mammals. Consideration of protocol changes that could allow for tick sampling from mammals would require reductions in other handling activities such as bleeding. This question will be revisited after pilot data from this field season can be assessed for pathogen prevalence. I have adjusted the list of pathogens for testing small mammal blood in the RFP for laboratory testing and will plan to test blood samples from all time-points rather than restricting testing to a particular bout. I will develop an OS-IPT proposal to adjust tick sampling windows at the sites identified in the most recent phone call on Jan 30.

## Q2 – February 2020-April 2020

### Summary of Activities

Emailed a request for feedback on the tick sampling protocol ahead of protocol revisions. Also conducted optimization analyses to determine if shifting tick sampling seasons 4-6 weeks earlier would be likely to increase the catch of adult and nymph ticks.

### TWG Recommendations

It was recommended that recording the distance over which dragging occurred separately from the distance over which flagging occurred will help improve density estimations. It was also recommended to add a winter sampling bout to southeastern sites to increase the capture of adult ticks since nymphal *Ixodes scapularis* are so difficult to catch on drag cloths in the area.

### NEON Response

The addition of winter sampling bouts was not supported by the data we had from earlier years of data when sampling occurred over a wider range of months. Analyses suggested that fewer adult or nymph ticks would be caught by shifting the sampling 1-2 months earlier in the year. A request will be made to begin recording distances for dragging and flagging separately.

## Q3 – May 2020-July 2020

### Summary of Activities

We discussed the most time-effective ways to process large numbers of larvae as well as changes to sampling windows and testing for tick-borne diseases in small mammal blood.

### TWG Recommendations

The consensus was the using weak painter's tape on denim cloth is the easiest way to reduce the cotton fibers and processing time for tick larvae samples. If this method does not work on our cotton cloths, preserving a subset of 50-100 ticks seems reasonable for population genetics, although it may limit the pathogen testing possibilities. A sampling period during November/December might increase the number of adult ticks collected, although it presents logistical challenges for field staffing. Testing the small mammal blood for the same pathogens as the ticks (especially with respect to *Borrelia burgdorferi sensu stricto* vs. *sensu lato*) will enhance compatibility of the 2 datasets and should be a priority.

### NEON Response

We are piloting the use of weak painters' tape in some of our high-larvae domains (D02 and D06) to determine if it will solve the problem of the cotton fibers obscuring samples. If not, we will move forward with subsampling the larvae to reduce overall processing time for field and lab teams. We are looking into feasibility of a variety of options for increasing the capture rate of nymph and adult ticks. We will consider comparability of pathogen datasets when selecting the laboratory that will do the testing of rodent blood and ear samples for tick-borne pathogens.

## Q4 – August 2020-October 2020

### Summary of Activities

There were few agenda items, so we swapped the Q4 meeting for an email. We discussed what to do about the fact that the DSNY site rarely gets ticks in drags, but they are observed off the tick plots regularly. The recommendation was to keep plots the same to maintain long-term sampling continuity. We also discussed making some data analyses a part of 2021 TWG activities, and there was a lot of interest.

### TWG Recommendations

It was determined that the current location of the tick plot at DSNY should stay where they are.

### NEON Response

We are keeping DSNY plots where they are and will continue to evaluate ways to improve the tick sampling to ensure that we are collecting a robust and representative sample at plots. There was also a lot of interest in a TWG data analysis activity to look at phenology to help inform sampling, so we have begun making plans for that at the 2021 kickoff meeting which was held 11/12/20.