Effects of wildland fire on tick habitat and abundance in the NJ Pinelands

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Introduction

- Increasing temperatures are allowing for a northernly expansion of ticks (Raghavan et al., 2018; Ogden et al., 2010), vectors of 16 known human illnesses (Entomological Society of America, 2019).
- These tick-borne diseases (TBD) are increasingly problematic (CDC, NJDOH), and beyond individual treatment, are primarily addressed with the use of aracacides, pathogenic fungi, and vegetative manipulation (White and Gaff 2018). These techniques present certain difficulties at large scales and in natural ecosystems.
- Alternatively prescribed fire may control ticks, via direct mortality, changes in host movements, in vegetation structure, and in the microclimatic conditions required by ticks.

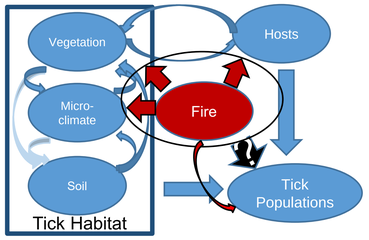

Figure 1. Properties of tick habitats and populations, and their interrelations.

Objective

- Characterize impacts of wildland fire regimes on tick populations, forest vegetation, and microclimates.

Study Area

- NJ Pine Barrens in Burlington and Ocean counties
- 14 plots in separate burned areas in 2019 with varied fire history
- 13 plots in forest without fire for 20+ years.

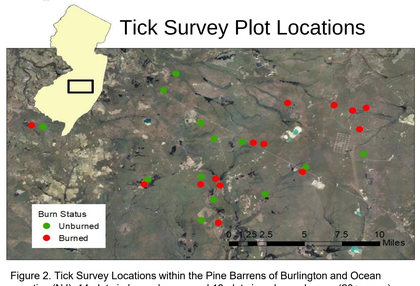

Figure 2. Tick Survey Locations within the Pine Barrens of Burlington and Ocean counties (NJ). 14 plots in burned areas and 13 plots in unburned areas (20+ years)

Figure 3. Photo of high intensity burn, naturally more common in the NJ Pine Barrens

Materials and Methods

Site Characteristics	Methods of Estimate/Characterization
Ticks Presence	Sweeps and Drags of 3 transects per site, per day(3) per tick abundance peak
Fire	Flame Height, Pre/Post Vegetation Mortality and Vegetative Reflectance
Vegetation	LiDAR of understory, Species count, heights, DBH, basal area, dead/live
Tickborne Diseases	qPCR
Microclimate	% Relative Humidity and Temperature (every 5 min.)
Litter	Litter and Duff Depth

Figure 4. Vegetation response less than three months after a high intensity burn in the NJ Pine Barrens. Spring Hill Site

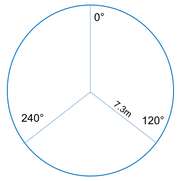

Figure 5. Plot Design and Sampling Transects

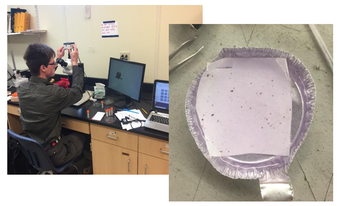

Figure 6. Lab work associated with tick identification, including microscopic identification (left) and tick isolation after collection in field (right).

Preliminary Results

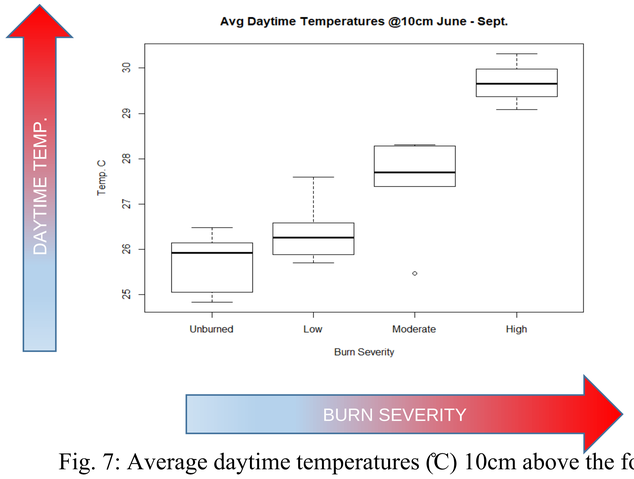

Fig. 7: Average daytime temperatures (℃) 10cm above the forest floor, June-September 2019, across sites of increasing burn severity.

Preliminary Results cont.

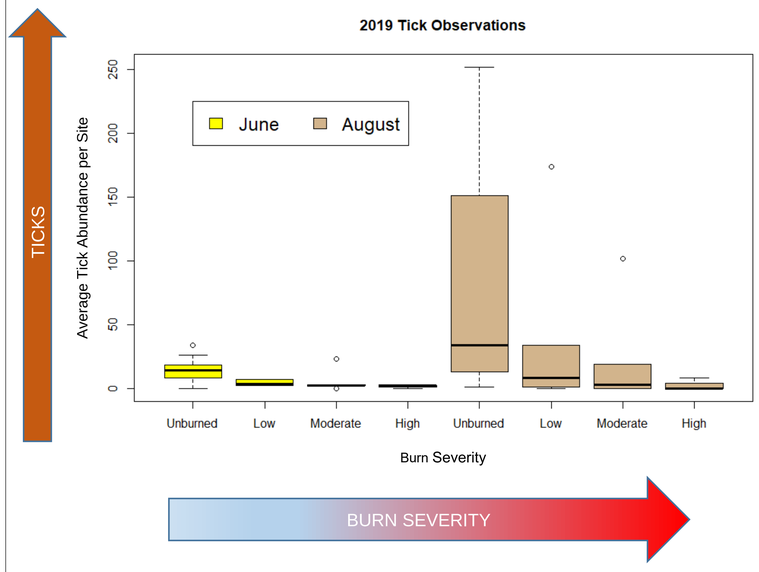

Fig. 8: Average tick abundance in June and August sampling events across increasing burn severity.

Discussion

- There appears to be a relation between tick abundance, fire, and tick habitat between our sites.
  - -Tick abundance at burned sites is lower than tick abundance at unburned sites.
  - -Burn severity appears to be negatively related with tick abundance across our sites.
  - -Humidity appears to decrease and temperature appears to increase with burn severity.
- Further data collection, analyses and results, including samples from 2020 and disease identification, should better elucidate the potential of fire to mitigate growing tick populations and tick-borne diseases in New Jersey.

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