The Effects of Southern Pine Beetle on Coarse Woody Debris in the Central Pine Barrens

Luke Myers

Abstract

Due to the lack of fire within a fire dependent ecosystem like the Pine Barrens, and climate Long Island the community composition has changed from xeric species to mesic species community composition. This has allowed for the invasion of southern pine beetle (SPB; *Dendroctonus frontalis*), which creates tunnels within the cambium of pitch pines, cutting off nutrient flow and killing the tree. Therefore, changing fuel dynamics and adding more downed woody debris. Extra deadwood within a fire dependent ecosystem may affect fire behavior, changing both prescribed and wildfire. An analysis of the coarse woody debris (CWD) within an area in relation to time will determine the effects of SPB on the fuel dynamics in the barrens. Using Browns' transects to determine that as time since infestation of SPB there is also an increase of CWD. By varying the time since attack, it can be determined how quickly, and in what way SPB is affecting the fuel dynamics of the pine barrens.

Intro

Fuel dynamics is an integral aspect of prescribed fire, shaping flame length, intensity, and fire behavior (NPS, 2024). Within the Central Pine barrens of Long Island and the Northeastern US broadly there has been a long history of fire suppression. The lack of disturbance, whether it be thinning, or fire has allowed for increased density and for succession to take place shifting what was once pine-oak forests to coastal oak forests, not only closing the canopy but reducing flammability (Jordan et al, 2003). This in combination with climate change has allowed for the expansion of the southern pine beetles (SPB) range into the northeast causing extreme tree mortality (NYSDEC). SPB has been able to spread and decimate the central pine barrens so quickly because of how dense the pitch pine stands are, as these denser stands allow for easier pheromone communication, therefore SPB can reproduce more prolifically (NYSDEC). As with other pine beetle infections like that of mountain pine beetle in the western United States (Klustch et al, 2009) it can be assumed that there will be a positive correlation between time since infection and Downed Woody Debris (DWD). There has been no comprehensive analysis on the effects of the Southern Pine Beetle on the Downed Woody Debris within the Central Pine Barrens on Long Island due to the recency of infection. This is critical to determine the effects of SPB on the future of fire within the Central Pine Barrens, along with the future of the health of the ecosystem and can be applied to other pitch pine oak forests along the North Atlantic Coastal Plain. A hypothesis that as time since infection of beetle increases there will be a subsequent increase of downed woody debris within a given area.

Methods

- Different treatment types were established using aerial imagery to assess canopy death these plots were control,1,2, and 3 years since infection
- A 15.25 meter transect was run on a random bearing within the plots determined with aerial imaginary to be in the visual center of stands
- Browns' Woody Debris Analysis was used to sample the debris within areas, 10 transects were sampled under each sample type
- Fuels were split into different size classes: 1 hr, 10hr 100 hr, 1000 hr solid, and 1000 hr rotten
- A litter, live standing , dead standing, and slash measurements were taken every 3 meters
- An application called Behave was used to map fire behavior using data collected and analyzed post collection

Results

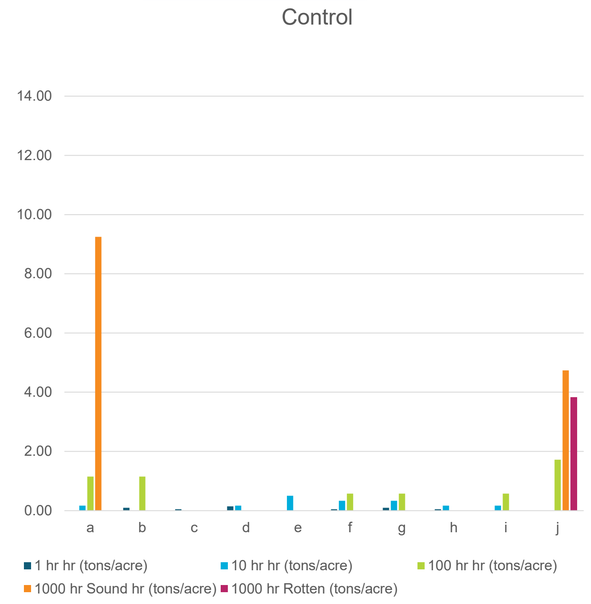


Figure 1: Control transects without visible SPB infection

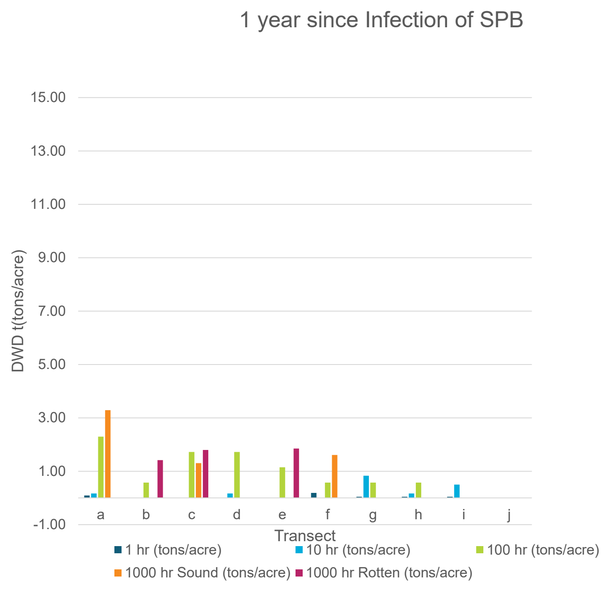


Figure 2: transects within one year since visible SPB infection

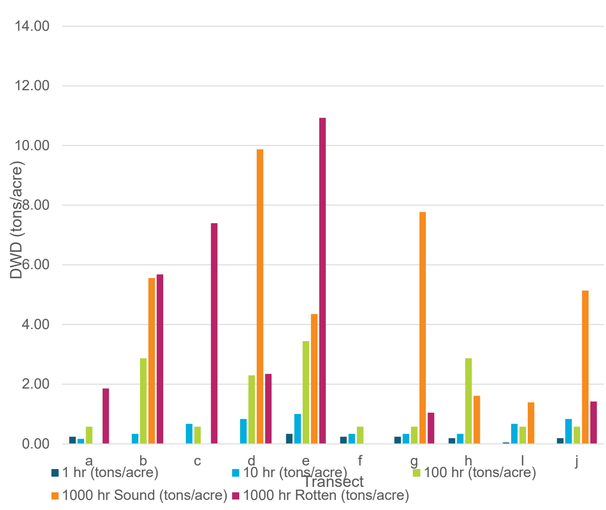


Figure 3: transects within two year since visible SPB infection

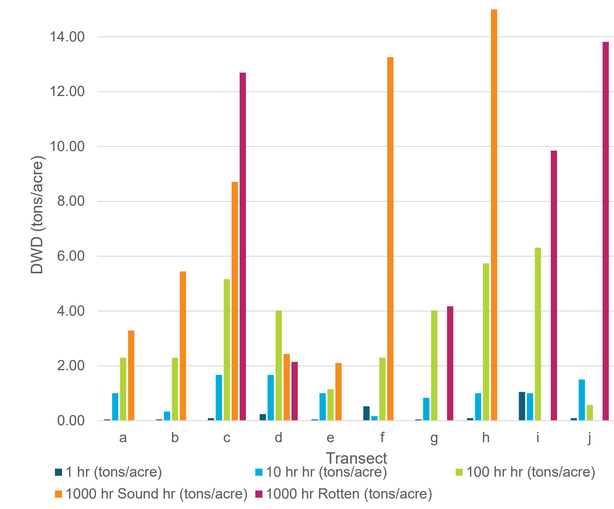


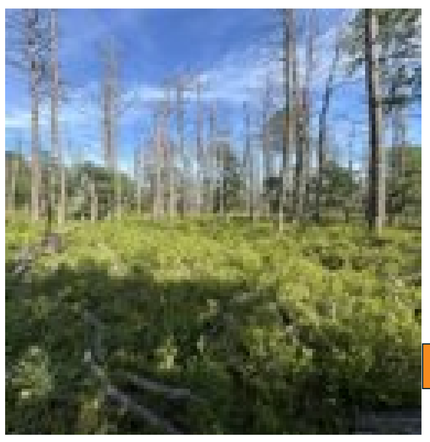
Figure 4: transects within three year since visible SPB infection

Discussion

Within this study the effect of Southern Pine Beetle (SPB) on Downed Woody Debris was analyzed using Brown's Transects. Four different areas were sampled within a chrono-sequence based on varying times since infection of SPB. The hypothesis that as time since infection increases so will the amount of downed woody debris counted within the transect. After sampling and analysis, it can be clearly determined that in terms of a count the hypothesis was supported. As time increases since the time of infection there is a subsequent increase in DWD.

While helpful this information may not be applicable across landscapes due to not only the different treatment types within stands at Brookhaven National Lab, the nature of SPB infections, and the excessive fuel loading within the Pine Barrens on Long Island (Jordan, 2003).

Overall, this data is supportive of the hypothesis that as time goes on since infection of SPB there will also be an increase of DWD.



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