



## Pheromone-based Monitoring and Control Program for Browntail Moth in the Northeast

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### Project Abstract

Browntail moth populations in Maine have seen population growth spurts every 15 years or so, but these were quickly controlled or declined and failed to cause extensive damage. In 2015, populations exploded to 100-year highs, causing both forest and human health problems. Since then, the moth has spread across 4 million acres of Maine, Nova Scotia, and New Brunswick. This outbreak has caused over 150,000 acres of hardwood defoliation and tree mortality in areas that have experienced repeated years of defoliation. In addition, caterpillars have toxic hairs that cause severe rashes and respiratory problems in humans. The hairs go airborne, so direct contact with caterpillars is not required for serious symptoms, and outbreaks negatively impact tourism and outdoor recreation. NSRC researchers will contribute to a browntail moth management plan by developing a monitoring program using mating pheromones. This program will be used to detect current and future outbreak populations prior to buildup and allow for rapid control measures. Pheromones will be used to test if a mating disruption control program is an effective management option. Results will aid federal, state, and regional managers in developing plans to reduce browntail moth populations and their impacts in our region.

### Progress in 2022

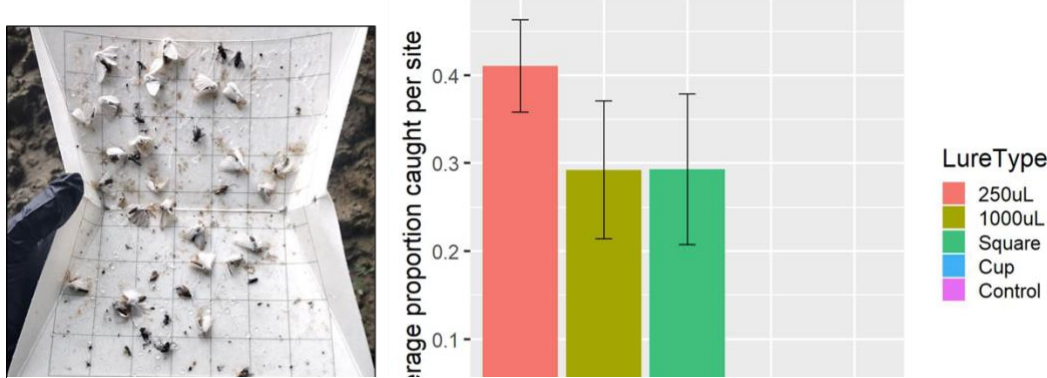
**Trap Designs:** Because 2021 browntail moth (BTM) trap catches were lower than expected using green uni and delta traps, our 2022 study was designed to look at more trap types, especially white colored traps. Our hypothesis was that white traps would be more attractive to adult BTM males, which actively fly at night, as the traps would better reflect moonlight. Each transect also included control traps (i.e., no lures), which caught no moths, indicating that the lure was attracting the males. Results showed a strong preference for the white traps. Pherocon 1C traps (PD) were selected for other trapping projects.

**Lure Chemistry:** 5 different lure chemistries (different concentrations and release methods) were tested at 5 sites using the Pherocon 1C traps during the flight season of 2022. Lures with 250  $\mu$ L of the female sex pheromone were found to capture the highest proportion of BTM males, even though a higher concentration (1000  $\mu$ L) lure was also tested (see figure).

The 250  $\mu$ L lure was selected for the monitoring pilot study.

**Monitoring Program:**

Three Pherocon 1C traps with 250  $\mu$ L lures were set up at 20 sites across Maine. Sites varied in BTM levels, based on the Maine Forest Service's BTM winter web counts, to determine whether male flight catches could also indicate that



*Left – example male BTM trap catches using the synthesized high-purity female sex pheromone lure in a Pherocon 1C trap. Right - proportion of BTM males caught compared between 4 different lure types.*



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variability. Results found strong differences across the state, with central Maine catches indicating higher BTM populations in those areas.

### Problems or Changes

#### Changes:

**2021:** Addition of a study testing BTM lure purity and trap type (green uni vs. green delta traps); see 2021 progress report for results.

**2022:** Addition of a) a second study testing BTM trap types, and b) a study evaluating the efficacy of different BTM lure concentrations/chemistries; results included in this report. A third study was added in 2022 involving the evaluation of spongy moth population densities in Maine. An extra trap containing a spongy moth lure was included at each of the 20 BTM monitoring sites. Results found a significant correlation between spongy moth and BTM populations at sites and will continue to be evaluated for the length of the project. Results hopefully will help answer questions about how BTM populations are affected by the competing spongy moth populations.

#### Problems:

**2022:** Field trials were set up using virgin BTM females to determine whether the synthesized lures could prevent males from finding her. Unfortunately, following multiple trials using different release distances, release densities, marking methods, and times of releases, results were inconclusive; most trials had zero males caught in control traps with virgin females as well as traps with synthesized lures, indicating a design flaw in the methods.

### Plans for 2023

#### Monitoring Program:

1. Starting in January 2023, all 20 monitoring sites from the summer 2022 program will be revisited to count the number of winter webs in a fixed-radius area around where the trap was placed. Preliminary analyses will determine if there is a correlation to the number of males caught per trap and the number of winter webs (an indication of true BTM population density).
2. With the success of the 2022 pilot study, monitoring sites in 2023 will increase to 30 sites.

#### Mating Disruption:

More trials will be established to better elucidate the effect of the synthesized lure at masking the pheromone from a virgin female moth. In addition, pupal packets will be collected and observed to learn more about mating behavior of BTM, such as whether mating occurs in the packet and/or if males congregate around the packet to mate as soon as females emerge (i.e., before they disperse).

### Collaboration

Forest service collaborators have participated in meetings via zoom to provide recommendations for project success.

### Products

News pieces regarding this research:

1. [Browntail moths returning, but scientists are working to limit their spread.](#) By Rose Lundy. 5/8/2022 *The Maine Monitor*
2. [Scientists want to try confusing browntail moths with arousing chemicals to end future outbreaks.](#) By Sam Schipani. 6/30/2021 *Bangor Daily News*
3. [UMaine's Pilot Study on the Browntail Moth Could Be a Game Changer.](#) By Sarah Nickerson. 7/2/2021 *Z107.3*