Budworm Tracker:
A Citizen Science Program

Annual Program Report
2015

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PROGRAM REPORT OUTLINE

BUDWORM TRACKER CORE TEAM

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PROVINCIAL LEADS AND COLLABORATORS

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TECHNICAL COLLABORATORS

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1. PROGRAM DEBRIEF

As expected, spruce budworm pheromone trap captures increased during the past year. This is not that surprising given that the overall outbreak grew from 4.3 million hectares in 2014 to nearly 6.3 million hectares in 2015. To give a little perspective on the current scale of the outbreak, New Brunswick forests cover only about 6 million hectares and the previous outbreak of the 1970s through early 1990s caused moderate to severe defoliation of over 50 million hectares of forest across Eastern Canada.

Monitoring and understanding the rise and spread of the current outbreak is a priority for developing an effective and efficient management program for the budworm, as well as for gaining a better understanding of its migratory ecology – our Budworm Trackers are a huge part of this effort!

2. OVERVIEW OF 2015 TRACKING SEASON

We were very pleased (and, frankly, astounded) at the level of support we received from the Budworm Trackers in 2015. A total of 284 traps were given out in the spring and we received data back from 259, for an impressive 90% return rate. Citizen Science programs are typically lucky to receive even half of this level of support. We were impressed and gratified by the consistent and dedicated efforts of our volunteers. Over 28,000 moths were captured – we've counted them all, but it's taking time to process them in the lab and start analysing the data.

Figure 1 at the end of the document shows the actual trap captures on a map. As we suspected, the highest concentration of moths (i.e., 261+ total moths per trap) were collected near Québec, which is the area of the current outbreak with the most defoliation.

We asked a small number of participants to also set up light traps, which we hoped might help us capture some female budworm (only males are captured in pheromone traps). However, we had limited success with this effort - because of the low capture rates, not because of the participants – and are going to put this effort on the shelf for the upcoming season.

3. WHAT HAVE WE LEARNED TO DATE?

You might be wondering: How do we use the data and samples collected by you, our Budworm Trackers? Firstly, it tells us in general where the highest densities of moths are in the region. This is essential for helping us to better plan more detailed surveys of overwintering larvae in the fall. Secondly, we use your data to help us better understand where the moths that were captured in your trap came from. One way we do this is by looking at what day they were caught. Like all insects, budworm is cold-blooded and their development depends on how warm the climate is where they develop. Because of this, we can predict with fair accuracy when the moths should be flying in your area. Thus, if moths are captured much earlier or later in the season than predicted (for example), we become very suspicious that those moths might be migrants from other areas where the climate differs. We can also take measurements from the moths to see how healthy or old they are and in some cases, whether they've mated. We can also take the moths you collect and send them away for DNA analyses to further confirm whether they came from Québec or are more likely from your area. By the way, if you catch nothing in your trap,

that's just fine! Knowing where budworm are not is just as important to us as knowing where they are: zeros count!

In a nutshell, your efforts and the samples you collect are helping us unravel some of the most poorly understood aspects of spruce budworm outbreaks!

4. WHAT DO YOUR TRAP CATCHES MEAN?

The number of moths in a trap that might result in visible defoliation on nearby balsam fir and spruce trees is about 100+ total moths. You can be sure that if your trap catch was 100+ total moths, we or a collaborator are looking for defoliation in your area. However, there are exceptions. We had several traps this past year in PEI and parts of middle to southern NB that had much more than 100 moths but no visible defoliation. Although we are still examining these samples, we suspect that many of these were late arrivals having migrated from the cooler Québec climate.

For reasons we are still trying to understand, there are instances away from the main bulk of the outbreak where having a large number of moths show up doesn't seem to lead to a large number of budworm eggs being laid in the area. We had one of our own traps in northern NB that had nearly 700 moths in it and surprisingly, not a single spruce budworm egg mass was found in the entire site! This is one of the many mysteries we are still hoping to solve with the help of our Budworm Trackers.

5. WHERE IS THIS ALL HEADING?

One of the greatest benefits of Citizen Science is its value as an educational and outreach tool, and we are in part trying to use Budworm Tracker to improve science literacy on one of the most ecologically and economically important insect pests in Canada. However, equally important, a good Citizen Science program should eventually lead to peer-reviewed scientific publications that shed light on the topic of interest. As of now, we have several early publications in development and will share these as they are published. In all likelihood, the data you are helping us collect will appear in publications for years to come and may very well change the way that we monitor insect pests in our region.

We have also been discussing with various groups how we might harness this approach to help improve pest monitoring (and associated decision-making) in other forestry or agricultural systems. In many ways, Atlantic Canada with its small size and tight knit communities is uniquely suited to developing these types of programs and we see it as a perfect platform for developing citizen-based programs. While this program is currently planned to last through 2018, we suspect that its use and impact will continue beyond that. We applaud our many participants for their efforts on this project and hope they will continue to find it as interesting and enlightening as we have.

6. IMPROVEMENTS AND CHANGES TO THE PROGRAM

We received many great suggestions from our Budworm Trackers after the 2015 tracking season and we have worked diligently to use their advice to make this program better. Here are a few of the key changes we've made in preparation for the upcoming season:

	WHAT'S NEW?
1	We've improved the instructions and have prepared online tutorials to help new and veteran participants get their traps set up with limited difficulty.
2	Kits are about half the size as last year. This has allowed us to get a better postal rate and in turn, most of you will be receiving your kit in the mail.
3	For Budworm Trackers that kept your trap from last year, we will be sending you a "replacement kit", which includes all components needed, minus the trap.
4	We have a return pre-paid envelope included in each package. At the end of the season, we'll contact you and all you have to do is put your bags of frozen moth samples into the envelope and put it in the mail.
5	Our Budworm Trackers made it quite clear that the stickers we provided last year were a nightmare to use! This year, we've printed the labels directly onto the sample bags so all you have to do is write the requested information on the bag, including name, trap #, date, and # moths (if you are so inclined to count).
6	Over the winter we developed a social media outreach plan. We recently launched a Budworm Tracker Facebook page: www.facebook.com/budwormtracker and Twitter hashtag #budworktracker. We would love to see our Trackers post pictures, ask questions, and join in the conversation around this program. Our group will be posting lots of pictures, videos, and information about the program throughout the year to keep you informed and up-to-date!
7	We will no longer be asking for rough estimates of moths in traps and would prefer exact counts. You're by no means obligated to count, but if you chose to, you'll be able to track your capture progress in real-time and see it graphed on your login account! Counting your moths before you freeze them is the quickest way to track what is in your area!
8	Throughout the winter, we updated our app for your smartphones and are please to announce we have both Apple and Android apps. We encourage you to count your moths in your trap and update your catches throughout the tracking season on the app or on the website.
9	In 2016, we are looking at having approximately 400 total traps deployed through our network, which will help to fill some of the gaps we had in more hard-to-reach areas from 2015.
10	By the way, we'd be sorry to see you go, but if you decide that your Budworm Tracking days are at an end contact us and let us know. We ask that you send the entire kit back to us via COD at Canada Post and of course in the same box you received the kit in at the beginning of the season. We'll cover the cost of shipping when it arrives!

7. PLANS FOR THE UPCOMING 2016 SEASON

Here is a brief layout of what to expect in 2016! We are currently assembling the kits and aim to have them done by the third week in May. These should arrive by the end of May or first week of June. Within the next few weeks, we will likely call to confirm your participation, to determine if you need a full kit or a replacement kit (for those of you that still have your trap from 2015), and verify your mailing address (your contact information will never be shared or used outside of this program).

If you have any questions, comments, or concerns, don't hesitate to contact us! We will get back to you as soon as humanly possible. In the meantime, Happy tracking!!!

Figure 1. Budworm Tracker trap distribution and associated spruce budworm male moth counts.

*Note the particularly high densities of moths in the Quebec region (where the outbreak is currently at its highest), as well as the more unusual appearances of moths in areas with no current defoliation (e.g., the north of Prince Edward Island – are these perhaps migrants from Québec?).