

Spruce Budworm Early Intervention Program

Project Statement – 2019/2020

Project Title

Spruce Budworm Early Intervention Phase II Contribution Program – Automation of the process of budworm detection by weather radar

Project Team

McGill University and the Healthy Forest Partnership.

Lead Researcher: Frédéric Fabry

Need(s) and Objectives

The purpose of this work is to deliver the project Budworm Detection by Weather Radar under the Small Scale Research activity stream as part of the approved Treasury Board Submission “Funding for the 2018 Budget measure: Protecting jobs in Eastern Canada’s forestry sector to support the implementation of the Spruce Budworm Early Intervention Strategy – Phase II”. Phase II continues the Early Intervention Strategy that began in 2014. The ultimate objective of this program is to keep spruce budworm (SBW) populations in Atlantic Canada below epidemic levels through targeted insecticide treatments.

Approach

The Healthy Forest Partnership is interested in tracking the evolution of spruce budworm outbreaks. Recent work (Boulanger et al. 2017) illustrates how weather radars operated by the Meteorological Service of Environment and Climate Change Canada (ECCC) can be used to track the dispersion of spruce budworm moths. But radar detects a variety of echoes from the surface and from the atmosphere that limits the ability to clearly track moths. Boulanger et al. (2017) experimented with a data clean-up procedure to improve the detectability of moths on a specific event (July 15–16th 2013) for a specific radar (Val d’Irène) and running on a specific software environment, the McGill Radar data Analysis Processing and Interactive Display (RAPID) system (Kilambi et al. 1997; Bellon and Kilambi 1999). The goal of the project is to test the possibility of expanding this processing such that 1) it would work on other days and ideally for other radars and 2) that it would not require the aging RAPID system to properly function. The context under which this process would be running is expected to be the day after a nighttime moth dispersal. As much as possible, it should also be built on publicly-available algorithms to read and process radar data.

Anticipated Challenges and Measures to Mitigate Risk

The scientific foundations of the project are solid, though surprises may occur when we start using radar data from other sites than Val d’Irène. We hence do not anticipate any major challenges on that front. The expected difficulties are more logistical and technical in nature, namely: 1) Finding a reliable data

portal for either the Canadian Forest Service (CFS) or the Healthy Forest Partnership to access radar data from ECCC; 2) The effective transfer of the developed code from McGill to either the CFS or another site. Specifically, for the first challenge, the base radar data required is not publicly available. But thanks to our contacts from past work with ECCC, and given that the radar data are expected to be used by another governmental agency, we hope to be able to convince ECCC to allow such data access to occur, hopefully free of charge. For the second issue related to execution and experimentation with the code outside McGill, we must rely on local staff to help. Any computer administration work required to test the program at CFS or at other non-McGill locations is not included in this project.

Support to Program Objectives

This project supports the Early Intervention Strategy for Spruce Budworm – Phase 2 objectives:

- Effective treatment of Atlantic Canada's forest at risk of a spruce budworm outbreak.
- Protection of Atlantic Canada's forest at risk of a spruce budworm outbreak.

Technology Transfer Plan

All of the information and data gained through this project will be shared with the Healthy Forest Partnership for use in collaborative research projects. Communications on this research program will be disseminated through the Healthy Forest Partnership website. The results of this work will be available through scientific publications, reports and presentations.

Location of Project

The project will initially be largely undertaken at McGill University in Montreal, QC. The final demonstration of the resulting implementation should be done outside McGill; tentatively, this would be done at the Canadian Forestry Service research center in Quebec City.

Evaluation of Potential Environmental Impacts

The project involves no field work. The main environmental impacts relate to the use of computers for the duration and as an outcome of the project.

Project Partners

Note that this project is being delivered by McGill University in partnership with the Healthy Forest Partnership, which includes those listed above.

Project Partners	Name	Nature of partnerships (i.e. funding, expertise, in-kind support such as material, transport, lodging, etc.) and its \$ value (if applicable).
Academia	University of New Brunswick	

Provinces/ Territories	Province of NB Province of Nova Scotia Province of Prince Edward Island Province of Newfoundland and Labrador	
Industry (please specify)	Forest NB Forest Nova Scotia J. D. Irving, Limited Twin Rivers Paper Company AV Group Inc. Fornebu Lumber Acadian Timber	

Tasks/Activities

Task 1: Find a reliable radar data portal

Expected Delivery Date: 31 December 2019

Deliverable: A pathway (e.g., web site) from where ECCC radar data could be obtained either in real-time or a posteriori from CFS.

The algorithm largely functioning on raw meteorological radar data, our first goal will be to find a workable continuous source of Canadian radar data. Through our contacts with Environment and Climate Change Canada, we will find and help arrange a process to acquire the needed radar data. Not included in this task is 1) any computer equipment to be installed at a non-McGill site, and 2) any computer administrative work needed to enable the radar data to flow to the computer that may be running our software at NRC or at other non-McGill locations. Among others, we will not help with firewall and other data security issues on government-owned computers.

Note that while we shall find a good data portal, the task of physically obtaining the data on the days of interest will require action by the user. Also note that while we may find a way to access ECCC radar data, charges by ECCC for accessing that data in the future are not included.

Task 2: Expand the McGill-developed algorithm to enhance budworm echoes

Expected Delivery Date: 31 December 2019

Deliverable: A working algorithm capable of running on a non-McGill computer

Specifically, this task involves:

- i) Setting up a process to fetch data from the portal mentioned in Task 1;
- ii) Writing or finding publicly-available code to read raw Canadian radar data;
- iii) Recoding the algorithm of Boulanger et al. (2017) to generate digital output and images of expected spruce budworm echoes. Note that the limitations mentioned in Boulanger et al. (2017) such as the inability to recognize “sea clutter” echoes from the St-Lawrence River will still apply;
- iv) Help set the algorithm up on an existing computer at NRC. Not included in this task is any administrative work required to make the program work at NRC or at other non-McGill locations.

Task 3: Document the work completed

Expected Delivery Date: 31 March 2020

Deliverable: A report in electronic form explaining the completed work as well as the operation of the program

Deliverables

The deliverable of this project consists of the combination of a working algorithm, a report, and the address of a data source to access the radar data needed by the said program.

Expected Delivery Date

December 31, 2019 for the algorithm; March 31, 2020 for the report.