



**Spruce Budworm Early Intervention:
A Promising Strategy for Atlantic Canada's Forests**

**February 21st, 2018
K.C. Irving Regional Center
Bathurst, New Brunswick**

A close-up photograph of a green spruce branch, likely a balsam poplar, covered in water droplets. The branch is oriented vertically, with the droplets glistening on its needles. The background is a soft, out-of-focus green.

Protecting Our Forests
www.healthyforestpartnership.ca



Spruce Budworm Early Intervention: A Promising Strategy for Atlantic Canada's Forests

8:00 - 9:00am Registration

Moderator: Bernard Daigle, Canadian Forest Service

Bernard (Bernie) received his BSc. in Forestry from the University of New Brunswick in 1978. Following graduation, he worked for private woodlot owner organizations in Nova Scotia and New Brunswick. In 1985, he joined the Canadian Forest Service as a Forestry Officer working ten years on the Forest Resource Development Agreements and fifteen years as lab supervisor at the National Tree Seed Centre. Bernard is currently looking after knowledge exchange activities for the CFS in the Atlantic Region.

9:00 Chris Norfolk, New Brunswick Department of Energy and Resource Development: Opening Remarks and Welcome

Chris Norfolk is the Director of Forest Planning and Stewardship Branch with the N.B. Dept. of Energy and Resource Development. He holds a BSc in Forestry and Environmental Management from the University of New Brunswick and is a registered professional forester in the province of N.B.

9:05 Dr. Rob Johns, Canadian Forest Service

Dr. Johns received his PhD in biology from the University of New Brunswick in 2007 and has been with the Canadian Forest Service in Fredericton since 2009. His research focuses on insect-plant interactions, population and community ecology, and the development of management strategies for forest insect pests.

“Understanding Spruce Budworm Outbreaks: A Historical Perspective”

Spruce budworm is the defoliating pest of spruce and fir in eastern Canada and has been the subject of scientific inquiry for more than a century. This work has produced answers to a variety of questions: What is budworm? Are outbreaks caused by human activities? What drives outbreaks to rise and what causes their collapse? This talk will cover these topics. He will begin with a review of the budworm's basic biology and discuss historical evidence for budworm outbreaks reaching back nearly to the previous Ice Age. I will also outline to some of the major scientific theories seeking to explain why budworm outbreak cycles occur and how these perspectives shape our approach to managing outbreaks.

9:20 Chris Norfolk, New Brunswick Department of Energy and Resource Development

“Spruce Budworm Early Intervention”

A spruce budworm infestation is threatening the forests we rely on for recreation and to drive our economy, with an estimated \$10-15 billion of spruce budworm impacts over 30 years at stake. A spruce budworm outbreak in Quebec has been increasing since 2009 and resulted in 7.2 million hectares defoliated in 2017. Spruce budworm populations are at lower levels but are also increasing in northern New Brunswick. The Healthy Forest Partnership has come together to conduct pioneering research into ways to proactively control spruce budworm. The Healthy Forest Partnership is a consortium of federal and provincial government, forest industry, and five universities that are conducting a 4-year, \$18 million project testing a new early intervention strategy against spruce budworm. The early intervention strategy includes 1) intensive monitoring and early detection, 2) small area target-specific use of Bt or Tebufenozide (Mimic and Limit) biological insecticides to reduce SBW 'hotspots', and 3) tools/techniques to disrupt budworm moth mating and migration. I will describe spruce budworm research trials conducted over the last 4 years, results to date, and plans for 2018. Good results have been achieved after the first 3 years of treatments.

9:40 Dr. Rob Johns, Canadian Forest Service

“Efficacy of the Early Intervention Strategy: Is it ‘working’?”

After four years of research developing the Early Intervention Strategy the most basic question that arises is ‘Is this approach working?’. The short answer is ‘results are promising’. The long answer is also ‘results are promising’, but with more ecology talk to explain why. I will explain the underlying biological basis for how we manage wildlife – whether they be salmon, moose, or budworm – and how we try to use this information with the aim of keeping populations stable. Dr. Johns will then discuss some of the recent evidence for success in the ongoing EIS program, as well as some of the challenges that still lie ahead.

10:00 Dr. Rob Johns, Canadian Forest Service

“How do Spruce Budworm Insecticides Work? Basic Biology and Water Testing.”

People have many questions around the two insecticides currently registered for suppressing spruce budworm: *Bacillus thuringiensis kurstaki* (Btk) and tebufenozide. What are they? How do they work? How specific are they to spruce budworm? Why do we say they don’t pose a risk to humans or other animals? Where do these products end up in the environment? In this talk, I will address these questions and discuss the results of water monitoring from areas treated during the past three years of the EIS project.

10:20 Break

10:45 Dr. Michael Stastny, Canadian Forest Service

Dr. Michael Stastny joined the Canadian Forest Service as a Forest Insect Ecologist in 2016, after a three-year postdoctoral fellowship at the University of Ottawa. Initiated into research on forest pests during the mountain pine beetle outbreak in British Columbia, he received his doctoral degree in Ecology and Evolutionary biology from Cornell University. He is a broadly trained community ecologist with research experience from three continents, specializing on interactions between insects and plants, and their implications in the context of environmental change.

“Can’t see the forest for the trees? – Broader ecological implications of spruce budworm control”

While the narrow-spectrum insecticides used in the control of spruce budworm have been rigorously tested to minimize environmental risks, other insects are also carefully monitored to reduce non-target effects while improving treatment efficacy. Indirectly, management of spruce budworm also keeps other potentially destructive insects that could attack weakened spruce at bay. Special attention is also being given to forest watersheds, where prevention of tree damage could serve as a tool to maintain the ecosystem functioning of these critical habitats during outbreaks, preventing negative impacts on riparian food webs and cold-water fish. Consideration of these broader ecological risks and benefits is the key element of Integrated Pest Management against spruce budworm in NB forests.



11:10 Emily Owens, Canadian Forest Service

Emily began her career in Fredericton at UNB in the Faculty of Forestry as an entomology lab manager focusing on pests such as spruce budworm and balsam wooly adelgid. Then, based out of the Yukon, she worked for the University of Alberta on a project focused on the population dynamics of small mammals. Eventually, she returned Fredericton to work at the Canadian Forest Service as a contract biologist to focusing on integrated pest management and to work on both invasive and native pests such as BSLB and Beech flea weevil. Currently, Emily works for the Canadian Forest Service focusing primarily on the SBW EIS project including moth migration dynamics and coordinating the Citizen Science project called "the Budworm Tracker Program."

"Communications and Citizen Science"

The Healthy Forest Partnership communications committee is a group of experts committed to engaging and involving the public in our spruce budworm early intervention research program. Our goal is to keep all interested parties informed of ongoing research and results, and provide the public with the opportunity to speak to and hear from our scientists and experts and about early intervention strategy. One of the ways the communications committee engages the public is through its citizen science program: The Budworm Tracker Program. In this program, hundreds of citizens help researchers monitor spruce budworm populations and detect moving moths, which may be contributing to the spread and rise of the current outbreak. This talk will highlight the committee's communications strategies, how we inform the public, and our efforts to share our science.

11:25 Drew Carleton, New Brunswick Department of Energy and Resource Development

Drew received his MSc. in Entomology from the University of New Brunswick in 2007. He has worked in integrated forest pest management since then, focusing on pests of economic concern to the Maritime region including native species such as hemlock looper, spruce budworm and yellowheaded spruce sawfly, as well as invasive species such as balsam wooly adelgid, brown spruce longhorned beetle and emerald ash borer. Drew worked on the ACOA program as a biologist for two years, developing the Budworm Tracker program and coordinating other research programs before taking on his current role as Provincial Entomologist in the fall of 2015.

"A Year in Review: Timeline for a treatment program"

11:45 Chris Norfolk, NB ERD: Questions and Wrap-up

12:15 Lunch (Provided)

Simultaneous Translation Provided

Early Intervention Strategy to Suppress a Spruce Budworm Outbreak

Project Summary



1. Spruce Budworm population dynamics during the rise of an outbreak

(Researchers: Dr. Jacque Régnière)

The research will address questions regarding what Spruce Budworm (SBW) density to initiate an Early Intervention Strategy (EIS), what products may be most effective, and what are the consequences of control options on natural enemy populations attacking SBW in subsequent years.

2. Impacts of EIS on SBW and associated natural enemies

(Researchers: Dr. Rob Johns, Dr. Veronique Martel, Dr. Eldon Eveleigh, Dr. K.S. McCann, Dr. Deepa Pureswaran)

The research will test the efficacy of control options and evaluate possible unintended impacts on very low density Spruce Budworm (SBW) and its parasitoid complex. It will include detailed assessment of proposed Early Intervention Strategy (EIS) and other pesticide and pheromone trials of increasing sizes from 2014 to 2017.

3. Barcoding: Innovative DNA-based diagnostic for SBW & its natural enemies

(Researchers: Dr. Alex Smith, Dr. Eldon Eveleigh, Dr. Rob Johns, Dr. Veronique Martel, Dr. K.S. McCann)

The research will develop novel genomics tools to quantify and identify parasitism of SBW larvae and pupae. This will permit identification of parasitoids in larvae killed by treatments and explicitly evaluate the impact those treatments have on the natural enemy community of SBW. This technology will then be used in the above "SBW population dynamics" project.

4. Aerial application of pesticides and pheromones

(Researchers: Mr. Peter Amirault, Mr. Gerry Cormier, Mr. Luke Amos-Binks)

The research will begin an SBW EIS trial on 5,000 ha in northern NB in 2014 and conduct *Bacillus thuringiensis* (Bt) and pheromone control trials on low populations in Quebec. Continued trials using increasing sized blocks (total 15,000ha 2015, 60,000ha 2016, 150,000ha 2017) of pesticide and or pheromone will then be conducted.

5. Epicenter formation and migratory behavior of adult SBW moths in eastern Canada

(Researchers: Dr. Rob Johns, Dr. Deepa Pureswaran, Dr. D. R. Gray, Dr. Lucie Royer, Dr. Dan Kneeshaw, Dr. Patrick James)

The research will monitor SBW moths over large areas, and provide insight into migratory behavior from 'epicenters' and the associated formation of epicenters.

6. SBW sex pheromone: effect of blend composition on mating

(Researchers: Dr. Peter Silk, Dr. Eldon Eveleigh, & others)

The research will develop and register a more potent 4- component sex pheromone blend for use in mating disruption of SBW and evaluate whether pheromones promote dispersal of female moths.

7. Use of endophytic fungi to reduce SBW impacts

(Researchers: Mr. Greg Adams, Miller, Dr. Dan Quiring, Dr. Andrew McCartney)

The research will expand our knowledge of the impact of inoculating reforestation seedlings of spruces with insect toxin-producing endophytic fungi. Although a plant/fungi interaction has been commercialized for other species, this is the first application in forest trees.

8. Modeling and DSS/ economic analyses

(Researchers: Dr. David MacLean, Cr. Chris Hennigar, Dr. Van Lantz, Dr. Udayalakshmi Vepakomma, Leading Edge Geomatics, Mr. Bo Zhang)

The research will develop SBW population-derived defoliation scenarios for alternative EIS strategies, integrate insecticide efficacy models, develop and test models of SBW 'hot-spot' protection decisions and optimum operational blocking, and evaluate effects of alternative SBW control strategies in NB timber supply, cost-benefits, and economy-wide impact.

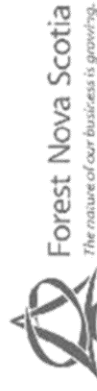
9. Communications

The details of the research will be communicated to the public and stakeholders. Details will include: infestation rates and locations, impacts to human health and the ecosystem, and treatment options.

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The Healthy Forest Partnership



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