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PROCEEDINGS OF THE
COMPTE RENDU DU

Forest Pest Management

FORUM

sur la répression des ravageurs forestiers

2013

DECEMBER 3-5
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OTTAWA CONVENTION CENTRE / CENTRE DES CONGRÈS D'OTTAWA
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The Forest Pest Management Forum is sponsored annually by Natural Resources Canada, Canadian Forest Service, to provide a platform for representatives of various provincial governments and the federal government to present, review and discuss current forest pest conditions in Canada and the United States.

Le Forum sur la répression des ravageurs est parrainé annuellement par le Service canadien des forêts de Ressources naturelles Canada. Il permet à des représentants de divers gouvernements provinciaux et du gouvernement fédéral de présenter et d'examiner la situation des principaux ravageurs forestiers au Canada et aux États-Unis.

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THE 2013 FORUM ORGANIZING COMMITTEE

Le Forum 2013 sur la répression des ravageurs forestiers a connu encore un grand succès grâce à la contribution de plusieurs personnes. Nous remercions tout d'abord nos conférenciers qui ont fait état de leurs connaissances sur les questions discutées et qui ont bien voulu les résumer pour les besoins du présent recueil. Nous aimerions aussi témoigner notre reconnaissance aux personnes qui ont participé au soutien technique. Nos remerciements vont également aux participants qui provenaient de différentes régions du Canada et des États-Unis.

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FOREST PEST MANAGEMENT FORUM 2013

DECEMBER 3-5, 2013
Ottawa Convention Centre
Ottawa, Ontario

TUESDAY, DECEMBER 3

08:00 Registration

Chair: *Judi Beck, Natural Resources Canada, Canadian Forest Service*

Session I: National Forest Pest Strategy

08:20 National Forest Pest Strategy: Update and future direction
Judi Beck, CCFM Forest Pest Working Group co-Chair, Natural Resources Canada, Canadian Forest Service
Lise Caron, Director, Technical Committee co-Chair, Natural Resources Canada, Canadian Forest Service
Gina Penny, NPFS, Technical Committee co-Chair, Nova Scotia Department of Natural Resources

08:40 A risk analysis of brown spruce longhorn beetle in Nova Scotia
Tanya Borgal, Nova Scotia Department of Natural Resources

08:55 A risk analysis of emerald ash borer in northern Ontario and Manitoba, and update on the situation in Quebec
Fiona Ross, Manitoba Conservation and Water Stewardship, Forestry Branch
Pierre Therrien, Ministère des Ressources naturelles du Québec

09:15 A decision support framework for forest invasive alien species
Nitin Verma, Canadian Food Inspection Agency

09:35 Science and technology forest pest research needs and priorities across Canada
Janice Hodge, NPFS Technical Coordinator, JCH Forest Pest Management

10:00 **Break**

10:20 Welcoming Remarks – Assistant Deputy Minister
Tom Rosser, Natural Resources Canada, Canadian Forest Service

Chair: *Jean-Luc St-Germain, Natural Resources Canada, Canadian Forest Service*

Session I: National Forest Pest Strategy (continued)

10:30 Forest pest monitoring and diagnostics in Canada: An overview of current situation
Tim Ebata, British Columbia Ministry of Forests, Lands and Natural Resource Operations

11:00 Update on CFIA's forest pest surveys
Robert Favrin, Canadian Food Inspection Agency

11:15 Update on CFIA's Invasive Alien Species Program
Wendy Asbil, Canadian Food Inspection Agency

11:30 **Lunch (not provided)**

Chair: *Rory McIntosh, Saskatchewan Ministry of Environment, Forest Service Branch*

Session II: Western Pest Management Issues

13:00 British Columbia Report
Tim Ebata, British Columbia Ministry of Forests, Lands and Natural Resource Operations

13:20 Alberta Report
Erica Samis, Alberta Sustainable Resource Development, Forest Management Branch

13:40 Saskatchewan Report
Rory McIntosh, Saskatchewan Ministry of Environment, Forest Service Branch

14:00 Manitoba Report
Fiona Ross, Manitoba Conservation and Water Stewardship, Forestry Branch

Session III: North of 60 Reports

14:20 Northwest Territories Report
Tod Ramsfield, Natural Resources Canada, Canadian Forest Service on behalf of the Government of the Northwest Territories, Environment and Natural Resources

14:40 Yukon Report
Robert Legare, Government of Yukon, Energy, Mines & Resources

15:00 **Break**

Session IV: United States Report

15:30 Overview of forest pest conditions in the U.S.A.
Robert Rabaglia, United States Department of Agriculture, Forest Health Protection

Chair: *Michael Irvine, Ontario Ministry of Natural Resources*

Session V: Pesticide Regulations, Alternatives, Minor Use

16:00 Introduction
Michael Irvine, Ontario Ministry of Natural Resources

16:05 The Canadian Grower Priority Database: Prioritizing forest pest control product needs
Stephen Crozier, Health Canada, Pest Management Regulatory Agency

16:25 Biopesticides – a regulatory overview
James Elwin, Health Canada, Pest Management Regulatory Agency

16:45 PMRA Update
Terry Caunter, Health Canada, Pest Management Regulatory Agency

17:05 Adjourn

WEDNESDAY, DECEMBER 4

08:00 **Registration**

Chair: *Taylor Scarr, Ontario Ministry of Natural Resources*

Session VI: Eastern Pest Management Issues

08:20 Ontario Report
Taylor Scarr, Ontario Ministry of Natural Resources

08:40 Quebec Report
Louis Morneau, Ministère des Ressources naturelles du Québec

09:00 New Brunswick Report
Jeremy Gullison, New Brunswick Department of Natural Resources

09:20 Nova Scotia Report
Gina Penny, Nova Scotia Department of Natural Resources

09:40 Newfoundland and Labrador Report
Dan Lavigne, Newfoundland and Labrador Department of Natural Resources

10:00 Prince Edward Island Report
David Carmichael, P.E.I. Department of Agriculture and Forestry

10:10 **Break**

Sponsor Session: Invasive Species Centre

10:30 Invasive Species Centre: Highlights and Opportunities
Dilhari Fernando, Executive Director, Invasive Species Centre

Chair: *Lise Caron, Natural Resources Canada, Canadian Forest Service*

Session VII: Science policy in pest diagnostic/detection and monitoring tool applications

10:40 The Forest Pathology Working Group: An example of integration
Rona Sturrock, Natural Resources Canada, Canadian Forest Service

10:55 Science and Policy Integration at the Canadian Forest Service: The Forest Pathology Working Group Example
Richard Parfett, Natural Resources Canada, Canadian Forest Service

11:10 Impact of DNA detection on management decisions: example of the poplar canker
Harry Kope, British Columbia Ministry of Forests, Lands and Natural Resource Operations

11:30 **Lunch (not provided)**

Session VII: Science policy in pest diagnostic/detection and monitoring tool applications (continued)

13:00 Diagnostic challenges: Eleven years of testing for *Phytophthora ramorum* in Canada
Stephan Brière, Canadian Food Inspection Agency

13:20 International trade and genomics
Adnan Uzunovic, FPInnovations

13:40 White pine blister rust: Should a new virulent race change policy?
Philippe Tanguay, Natural Resources Canada, Canadian Forest Service

Chair: *Jean Bérubé, Natural Resources Canada, Canadian Forest Service*

Session VIII: Urban trees as a bridgehead for new invasions

14:00 Early detection of emerging fungal diseases from spores in urban centres
Jean Bérubé, Natural Resources Canada, Canadian Forest Service

14:20 New technologies for pest detection
Guillaume Bilodeau, Canadian Food Inspection Agency

14:40 TreeAzin as a systemic insecticide for potential use against Asian Longhorned Beetle –what we know and what we need to know
Dean Thompson, Natural Resources Canada, Canadian Forest Service

15:00 **Break**

Sponsor Session: Forest Protection Limited

15:25 Measuring wind speed during aerial applications of pesticide
Peter Keddy, Forest Protection Limited

Session VIII: Urban trees as a bridgehead for new invasions (continued)

15:35 Research into detection and monitoring for emerald ash borer: Highlights of successful collaboration with urban foresters
Robert Lavallée and Krista Ryall, Natural Resources Canada, Canadian Forest Service

16:00 Estimates of the potential cost of emerald ash borer (*Agrilus planipennis* Fairmaire) to Canadian municipalities
Denys Yemshanov, Natural Resources Canada, Canadian Forest Service

16:20 *Agrilus planipennis*, or how ashes are turning to ashes
Vasily Grebennikov and Eduard Jendek, Canadian Food Inspection Agency

16:40 Out of the cities and into the forest: Urban environments as source populations for invasive forest pests
Lee Humble, Natural Resources Canada, Canadian Forest Service

17:00 Adjourn

THURSDAY, DECEMBER 6

08:00 **Registration**

Chair: *Stephan Brière, Canadian Food Inspection Agency*

Session IX: Firewood as a Pathway: working collaboratively to help mitigate the spread of native and introduced forest pests

08:20 Introduction – Firewood: A collaborative management approach
Stephan Brière, Canadian Food Inspection Agency

08:40 Invasive forest pests and movement of infested firewood: New assessment approaches and data sources
Denys Yemshanov, Natural Resources Canada, Canadian Forest Service

09:00 A proactive approach to firewood regulation in Manitoba
Fiona Ross, Manitoba Conservation and Water Stewardship, Forestry Branch

09:20 Park visitors and the firewood issue: Lessons learned from the case of Brown Spruce Longhorn Beetle at Kouchibougouac National Park
Patrick Nantel, Parks Canada

09:40 Managing the risks associated with firewood at Parcs Québec
Patrick Graillon, Société des établissements de plein air du Québec (Sépaq)

10:00 **Break**

Moderator: *Kelly Withers, Invasive Species Centre, Sault Ste. Marie, ON*

10:20 Stakeholder Discussion Panel – Firewood: a collaborative management approach
Stakeholders have been invited to participate and may include federal departments (CFIA, CFS, Parks Canada), provincial partners (Québec, Manitoba, Ontario) and private stakeholders (campground associations, commercial firewood producers, associations, cities, First Nations, etc).

12:00 Adjourn

FORUM 2013 SUR LA RÉPRESSION DES RAVAGEURS FORESTIERS

3-5 décembre 2013

Centre des congrès d'Ottawa
Ottawa, Ontario

MARDI 3 DÉCEMBRE

8 h 00 Inscription

Présidente : *Judi Beck, Ressources naturelles Canada, Service canadien des forêts*

Séance I : La stratégie nationale de lutte contre les ravageurs forestiers

8 h 20 Mise à jour et orientation future de la Stratégie nationale de lutte contre les ravageurs forestiers
Judi Beck, coprésidente du groupe de travail sur les ravageurs forestiers du CCMF, Ressources naturelles Canada, Service canadien des forêts
Lise Caron, directrice, coprésidente du Comité technique, Ressources naturelles Canada, Service canadien des forêts
Gina Penny, SNLCRF, co-présidente du Comité technique, Nova Scotia Department of Natural Resources

8 h 40 Une analyse des risques liés au longicorne brun de l'épinette en Nouvelle-Écosse
Tanya Borgal, Nova Scotia Department of Natural Resources

8 h 55 Une analyse des risques liés à l'agrile du frêne dans le nord de l'Ontario et au Manitoba, et mise à jour de la situation au Québec
Fiona Ross, Manitoba Conservation and Water Stewardship, Forestry Branch
Pierre Therrien, ministère des Ressources naturelles du Québec

8 h 15 Un cadre d'aide à la prise de décision pour les espèces exotiques envahissantes forestières
Nitin Verma, Agence canadienne d'inspection des aliments

9 h 35 Besoins et priorités en matière de recherche scientifique et de technologies sur les ravageurs forestiers à travers le Canada
Janice Hodge, SNLCRF, coordonnatrice technique, JCH Forest Pest Management

10 h 00 **Pause**

10 h 20 Mot de bienvenue – Sous-ministre adjoint
Tom Rosser, Ressources naturelles Canada, Service canadien des forêts

Président : *Jean-Luc St-Germain, Ressources naturelles Canada, Service canadien des forêts*

Séance I : La stratégie nationale de lutte contre les ravageurs forestiers (suite)

10 h 30 Surveillance et diagnostic des ravageurs forestiers au : un aperçu de la situation actuelle
Tim Ebata, British Columbia Ministry of Forests, Lands and Natural Resource Operations

11 h 00 Mise à jour sur les enquêtes de l'ACIA concernant les ravageurs forestiers
Robert Favrin, Agence canadienne d'inspection des aliments

11 h 15 Mise à jour sur le programme sur les espèces exotiques envahissantes de l'ACIA
Wendy Asbil, Agence canadienne d'inspection des aliments

11 h 30 **Dîner (le repas n'est pas fourni)**

Président : *Rory McIntosh, Saskatchewan Ministry of Environment, Forest Service Branch*

Séance II : La répression des ravageurs dans l'Ouest

13 h 00 Rapport de la Colombie-Britannique
Tim Ebata, British Columbia Ministry of Forests, Lands and Natural Resource Operations

13 h 20 Rapport de l'Alberta
Erica Samis, Alberta Sustainable Resource Development, Forest Management Branch

13 h 40 Rapport de la Saskatchewan
Rory McIntosh, Saskatchewan Ministry of Environment, Forest Service Branch

14 h 00 Rapport du Manitoba
Fiona Ross, Manitoba Conservation and Water Stewardship, Forestry Branch

Séance III : Au nord du 60e parallèle

14 h 20 Rapport des Territoires du Nord-Ouest
Tod Ramsfield, Ressources naturelles Canada, Service canadien des forêts pour le compte du Government of the Northwest Territories, Environment and Natural Resources

14 h 40 Rapport du Yukon
Robert Legare, Government of Yukon, Energy, Mines & Resources

15 h 00 **Pause**

Séance IV : Rapport des États-Unis

15 h 30 Aperçu des conditions des ravageurs forestiers aux États-Unis
Robert, Rabaglia, United States Department of Agriculture, Forest Health Protection

Président : *Michael Irvine, ministère des Richesses naturelles de l'Ontario*

Séance V : Règlements sur les pesticides, solutions possibles, usage limité

16 h 00 Introduction
Michael Irvine, ministère des Richesses naturelles de l'Ontario

16 h 05 La Base de données sur les priorités des producteurs du Canada : prioriser les besoins en matière de lutte contre les ravageurs forestiers
Stephen Crozier, Santé Canada, Agence de réglementation de la lutte antiparasitaire

16 h 25 Biopesticides – Un examen réglementaire
James Elwin, Santé Canada, Agence de réglementation de la lutte antiparasitaire

16 h 45 Mise à jour de l'ARLA
Terry Caunter, Santé Canada, Agence de réglementation de la lutte antiparasitaire

17 h 05 Ajournement des travaux

MERCREDI 4 DÉCEMBRE

8 h 00 **Inscription**

Président : *Taylor Scarr, ministère des Richesses naturelles de l'Ontario*

Séance VI : La répression des ravageurs dans l'Est

8 h 20 Rapport de l'Ontario
Taylor Scarr, ministère des Richesses naturelles de l'Ontario

8 h 40 Rapport du Québec
Louis Morneau, ministère des Ressources naturelles du Québec

9 h 00 Rapport du Nouveau-Brunswick
Jeremy Gullison, ministère des Richesses naturelles du Nouveau-Brunswick

9 h 20 Rapport de la Nouvelle-Écosse
Gina Penny, Nova Scotia Department of Natural Resources

9 h 40 Rapport de Terre-Neuve-et-Labrador
Dan Lavigne, Newfoundland and Labrador Department of Natural Resources

10 h 00 Rapport de l'Île-du-Prince-Édouard
David Carmichael, P.E.I. Department of Agriculture and Forestry

10 h 10 **Pause**

Séance commanditée : Centre sur les espèces envahissantes

10 h 30 Centre sur les espèces envahissantes : Points saillants et possibilités à exploiter
Dilhari Fernando, directrice Exécutive, Centre sur les espèces envahissantes

Présidente : *Lise Caron, Ressources naturelles Canada, Service canadien des forêts*

Séance VII : Science et politiques dans le diagnostic et la détection des ravageurs, et application des outils de surveillance

10 h 40 Le groupe de travail sur la pathologie forestière : un exemple d'intégration
Rona Sturrock, Ressources naturelles Canada, Service canadien des forêts

10 h 55 Dialogue science et politiques au Service canadien des forêts — Exemple du groupe de travail sur la pathologie forestière
Richard Parfett, Ressources naturelles Canada, Service canadien des forêts

10 h 10 Répercussion de la détection de l'ADN sur les décisions de gestion — Exemple du chancre du peuplier
Harry Kope, British Columbia Ministry of Forests, Lands and Natural Resource Operations

11 h 30 **Dîner (le repas n'est pas fourni)**

Séance VII : Science et politiques dans le diagnostic et la détection des ravageurs, et application des outils de surveillance (suite)

13 h 00 Défis diagnostiques : onze années d'essai pour le *Phytophthora ramorum* au Canada
Stephan Brière, Agence canadienne d'inspection des aliments

13 h 20 Le commerce international et la génomique
Adnan Uzunovic, FPInnovations

13 h 40 La rouille vésiculeuse du pin blanc — Une nouvelle race virulente devrait-elle modifier les politiques?
Philippe Tanguay, Ressources naturelles Canada, Service canadien des forêts

Président : *Jean Bérubé, Ressources naturelles Canada, Service canadien des forêts*

Séance VIII : Les arbres urbains comme tête de pont pour les nouveaux envahisseurs

13 h 00 Détection hâtive des maladies forestières émergentes à partir de spores aériennes
Jean Bérubé, Ressources naturelles Canada, Service canadien des forêts

14 h 20 Nouvelles technologies pour la détection des ravageurs
Guillaume Bilodeau, Agence canadienne d'inspection des aliments

14 h 40 Le TreeAzin comme insecticide systémique éventuel pour la lutte contre le longicorne asiatique – Ce que nous savons et ce qu'il nous faut savoir
Dean Thompson, Ressources naturelles Canada, Service canadien des forêts

15 h 00 **Pause**

Séance commanditée : Forest Protection Limited

15 h 25 Mesurer la vitesse du vent lors des applications aériennes de pesticide
Peter Keddy, Forest Protection Limited

Séance VIII : Les arbres urbains comme tête de pont pour les nouveaux envahisseurs (suite)

15 h 35 Recherches sur la détection et la surveillance de l'agrile du frêne : faits saillants d'une collaboration fructueuse avec les forestiers des milieux urbains
Robert Lavallée et Krista Ryall, Ressources naturelles Canada, Service canadien des forêts

15 h 00 Estimation des coûts potentiels liés à l'agrile du frêne (*Agrilus planipennis* Fairmaire) pour les municipalités canadiennes
Denys Yemshanov, Ressources naturelles Canada, Service canadien des forêts

16 h 20 *Agrilus planipennis*, ou comment les frênes se transforment en cendres
Vasily Grebennikov et Eduard Jendek, Agence canadienne d'inspection des aliments

16 h 40 Hors des villes et dans la forêt — Les milieux urbains en tant que points de départ des populations de ravageurs forestiers envahissants
Lee Humble, Ressources naturelles Canada, Service canadien des forêts

17 h 00 Ajournement des travaux

JEUDI 5 DÉCEMBRE

8 h 00 Inscription

Président : *Stephan Brière, Agence canadienne d'inspection des aliments*

Séance IX : Le bois de chauffage comme voie d'entrée — travailler en collaboration pour aider à atténuer la propagation des ravageurs forestiers indigènes et introduits

8 h 20 Introduction – Le bois de chauffage, une approche de gestion collaborative
Stephan Brière, Agence canadienne d'inspection des aliments

8 h 40 Les ravageurs forestiers envahissants et le déplacement du bois de chauffage infesté — Nouvelles méthodes d'évaluation et sources de données
Denys Yemshanov, Ressources naturelles Canada, Service canadien des forêts

9 h 00 Une approche proactive de la réglementation sur le bois de chauffage au Manitoba
Fiona Ross, Manitoba Conservation and Water Stewardship, Forestry Branch

9 h 20 Les visiteurs des parcs et la problématique du bois de chauffage : le cas du Parc national de Kouchibougouac et le longicorne brun de l'épinette
Patrick Nantel, Parcs Canada

9 h 40 Gestion des risques associés au bois de chauffage à Parcs Québec
Patrick Graillon, Société des établissements de plein air du Québec (Sépaq)

10 h 00 **Pause**

Modérateur : *Kelly Withers, Centre sur les espèces envahissantes, Sault Ste. Marie (ON)*

10 h 20 Panel de discussion entre intervenants : Le bois de chauffage — Une approche de gestion collaborative

Les intervenants ont été invités à participer. Ils proviennent de ministères fédéraux (ACIA, SCF, Parcs Canada), provinciaux (Québec, Manitoba, et Ontario) et du secteur privé (associations de terrains de camping, producteurs de bois de chauffage commerciaux, associations, villes, Premières Nations, etc.).

12 h 00 Ajournement des travaux

SESSION I: NATIONAL FOREST PEST STRATEGY

Chair: *Judi Beck*
Natural Resources Canada, Canadian Forest Service

SÉANCE I : LA STRATÉGIE NATIONALE DE LUTTE CONTRE LES RAVAGEURS FORESTIERS

Présidente : *Judi Beck*
Ressources naturelles Canada, Service canadien des forêts

NATIONAL FOREST PEST STRATEGY: UPDATE AND FUTURE DIRECTION

Judi Beck[1], Julie Towers[2], Lise Caron[3], Tony Hopkin[4], Gina Penny[5] and Jean-Luc St-Germain[3]

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P.O. Box 130, Shubenacadie, Nova Scotia B0N 2H0

Federal, provincial and territorial governments are advancing the objectives of a National Forest Pest Strategy under the Canadian Council of Forest Ministers' leadership (CCFM). In 2013-2014, a strategic review of priorities aimed at confirming their alignment and adaptability to jurisdictions' needs as well as changing circumstances has been initiated. The presentation will provide an update on this process, and on the status of the annual work plan under CCFM. Reports and publications in preparation this year include S&T priorities of CCFM member agencies, and risk analyses for brown spruce longhorn beetle, emerald ash borer, and mountain pine beetle. A decision support framework for invasive alien species is also in preparation to facilitate interagency communications and response coordination. Work to further advance risk response to spruce budworm and mountain pine beetle continues this year with 1) scenario-based response plans to expected spruce budworm outbreaks in Canada; and 2) the identification of actions to slow the spread of mountain pine beetle across Canada.

MISE À JOUR ET ORIENTATION FUTURE DE LA STRATÉGIE NATIONALE DE LUTTE CONTRE LES RAVAGEURS FORESTIERS

Les gouvernements fédéraux, provinciaux et territoriaux font progresser les objectifs d'une Stratégie nationale de lutte contre les ravageurs forestiers sous le leadership du Conseil canadien des ministres des forêts (CCMF). En 2013-2014, une revue stratégique des priorités visant à confirmer leur alignement et leur adaptabilité aux besoins des juridictions ainsi qu'à un contexte en évolution a été initiée. La présentation fournira une mise à jour sur ce processus et sur le statut du plan de travail annuel sous le CCMF. Les rapports et publications en cours de préparation cette année incluent les priorités en S&T des agences membres du CCMF et des analyses du risque pour le longicorne brun de l'épinette, l'agrile du frêne et le dendroctone du pin ponderosa. Un cadre de référence à la prise de décision pour les espèces exotiques envahissantes est également en préparation afin de faciliter la communication et la coordination des réponses entre les agences. Le travail en vue de faire progresser la réponse au risque de la tordeuse des bourgeons de l'épinette et du dendroctone du pin ponderosa continu cette année avec 1) des plans de réponse fondés sur des scénarios d'épidémies prévues de tordeuse des bourgeons de l'épinette et 2) l'identification d'actions pour ralentir la progression du dendroctone du pin ponderosa à travers le Canada.

A RISK ANALYSIS OF BROWN SPRUCE LONGHORN BEETLE IN NOVA SCOTIA

Tanya Borgal, Gina Penny, John Ross, James Bruce, Morgan Oikle, Dustin Oikle, Jeff Ogden and Steve Delorey

Nova Scotia Department of Natural Resources, Forest Protection, Renewable Resources Branch
P.O. Box 130, Shubenacadie, Nova Sotia B0N 2H0

The brown spruce longhorn beetle (BSLB) (*Tetropium fuscum* (F.)) is an invasive pest of spruce that has been established in Nova Scotia since at least 1990, but was not discovered until 1999 when it was positively identified in red spruce trees in Point Pleasant Park, Halifax. The beetle, native to northern and central Europe, is believed to have entered Nova Scotia through solid wood packing material from container ships at the port adjacent to the park. BSLB has been under regulatory control by the Canadian Food Inspection Agency as a pest of plant quarantine significance since 2000. To help slow or prevent the spread of the BSLB a Ministerial Order was issued in October 2000 (revised in 2007 and 2013).

The Province of Nova Scotia completed a risk analysis as an implementation case study of the Risk Analysis Framework developed as part of the National Forest Pest Strategy (NFPS) under the Canadian Council of Forest Ministers. This framework allowed the risk associated with BSLB to be systematically evaluated and described as it pertains to the Nova Scotia situation. It helped focus understanding of the risk associated with the BSLB by identifying and qualifying the insect's impact on multiple values in terms of knowledge, adaptive capacity, uncertainty and information needs. It also resulted in recommending strategies and tactics to mitigate the risk, as well as helping to promote collaboration and transparency, which is in alignment with the Department's Natural Resources Strategy.

UNE ANALYSE DES RISQUES ASSOCIÉS AU LONGICORNE BRUN DE L'ÉPINETTE EN NOUVELLE-ÉCOSSE

Le longicorne brun de l'épinette (LBE) (*Tetropium fuscum* [F.]) est un insecte forestier envahissant qui s'attaque aux épinettes. Il est établi en Nouvelle-Écosse depuis au moins 1990, mais ce n'est qu'en 1999 qu'il a été identifié avec certitude sur les épinettes rouges du parc Point Pleasant, à Halifax. On croit que le coléoptère, originaire de l'Europe du Nord et de l'Europe centrale, est entré en Nouvelle-Écosse par l'entremise des matériaux d'emballage en bois transportés à bord de porte-conteneurs au port adjacent au parc. Depuis 2000, le LBE fait l'objet d'un contrôle réglementaire par l'Agence canadienne d'inspection des aliments, à titre de parasite justifiable de quarantaine. Pour aider à ralentir ou à empêcher la propagation du LBE, une ordonnance ministérielle a été délivrée en octobre 2000 (révisée en 2007 et en 2013).

La province de la Nouvelle-Écosse a effectué une analyse des risques à titre d'étude de cas pour la mise en œuvre du cadre d'analyse des risques élaboré dans la Stratégie nationale sur les ravageurs forestiers (SNRF) qui est sous l'égide du Conseil canadien des ministres des forêts. Ce cadre d'analyse des risques a permis d'évaluer et de décrire systématiquement les risques associés au LBE relativement à la situation en Nouvelle-Écosse. Il a aidé à mieux comprendre les risques associés au LBE en déterminant et en qualifiant l'incidence de l'insecte sur plusieurs valeurs à la lumière des connaissances, de la capacité d'adaptation, de l'incertitude et des besoins en matière d'information. Il a également donné lieu à la recommandation de stratégies et de tactiques pour atténuer les risques. Il a ainsi contribué à promouvoir la collaboration et la transparence, ce qui est en accord avec la stratégie sur les ressources naturelles du ministère.

A RISK ANALYSIS OF EMERALD ASH BORER IN NORTHERN ONTARIO AND MANITOBA, AND UPDATE ON THE SITUATION IN QUEBEC

Fiona Ross[1] and Pierre Therrien[2]

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In 2012-2013, the Forest Pest Working Group of the Canadian Council of Forest Ministers enabled a multi-jurisdictional analysis of the risk of the spread of the emerald ash borer. The specific focus of this pest risk analysis was on the potential pathways into Manitoba and northern Ontario, and potential management responses in urban, linear (shelterbelt) and native forests. This presentation will cover the results from both the risk assessment and risk response component of the risk analysis, including potential preventative measures that could be implemented to delay the establishment date or decrease the eventual impacts of the insect.

In a view to provide an overall picture of responses to emerald ash borer across Canada, the presentation will also include a section on the current situation in Quebec. This portion of the presentation will provide an overview of provincial-municipal actions against the insect in the province, notably addressing the aspects related to prevention efforts.

ANALYSE DU RISQUE POUR L'AGRILE DU FRÊNE DANS LE NORD DE L'ONTARIO ET LE MANITOBA ET MISE À JOUR DE LA SITUATION AU QUÉBEC

En 2012-2013, le Groupe de travail sur les ravageurs forestiers du Conseil canadien des ministres des forêts a rendu possible une analyse multi juridictionnelle du risque de propagation de l'agrile du frêne. Cette analyse du risque phytosanitaire s'est concentrée sur les voies d'accès potentielles vers le Manitoba et le nord de l'Ontario, et sur les réponses de gestion potentielles dans les forêts urbaines, les forêts linéaires (coupe-vent) et les forêts naturelles. Nous présentons les résultats de la composante d'évaluation du risque et de la réponse au risque de l'analyse du risque, incluant des mesures de prévention potentielles qui pourraient être mises en œuvre pour retarder la date d'établissement ou diminuer les impacts éventuels de l'insecte.

Dans l'optique de donner une vision d'ensemble des activités de réponse contre l'agrile du frêne au Canada, la présentation inclura également un volet sur la situation actuelle au Québec. Cette portion de la présentation fera un portrait d'ensemble des actions provinciales-municipales contre l'insecte dans cette province, en abordant notamment les aspects relatifs aux efforts de prévention.

A DECISION SUPPORT FRAMEWORK FOR FOREST INVASIVE ALIEN SPECIES

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Forest invasive alien species (FIAS) incursions affect multiple jurisdictions in Canada, either directly or indirectly. A conversation has not yet begun among the affected parties about a response to this issue. Given that these situations can evolve quickly, timeliness of actions is essential. Having a clear framework, that all interested parties agree will contribute to an increased collective ability to address emerging problems rapidly and minimize impacts over the long-term. The Decision Support Framework for FIAS provides the basis for a consistent, multi-jurisdictional approach to addressing these issues. It emphasizes the importance of responding to FIAS through partnerships, fostered by stakeholder participation in regional and national forums and initiatives. The framework builds upon the principles and objectives of the National Forest Pest Strategy and the Invasive Alien Species Strategy for Canada. The overall goal is to provide an integrated approach to pest management, allowing partners to transparently make joint decisions, while aligning resources in a shared manner.

UN CADRE D'AIDE À LA PRISE DE DÉCISION POUR LES ESPÈCES EXOTIQUES ENVAHISSANTES FORESTIÈRES

Les incursions d'espèces exotiques envahissantes forestières (EEEF) affectent de multiples juridictions au Canada, que ce soit directement ou indirectement. Il n'existe pas de dialogue établi à propos des actions et des réponses à donner de la part de toutes les parties concernées. Puisque ces situations peuvent évoluer rapidement, des actions en temps opportun sont essentielles. Le fait d'avoir un cadre clair sur lequel toutes les parties intéressées se mettent d'accord de manière proactive permettra de contribuer à augmenter la capacité collective à faire face rapidement aux problèmes émergents et à minimiser les impacts à long terme. La cadre d'aide à la prise de décision pour les EEEF fournit la base d'une approche multi juridictionnelle cohérente pour aborder ces questions. Il met l'accent sur l'importance de répondre aux EEEF par le biais de partenariats, en encourageant la participation des intervenants dans des forums et des initiatives de niveaux régional et national. Le cadre s'appuie sur les principes et les objectifs de la Stratégie nationale de lutte contre les ravageurs forestiers et la Stratégie pour les espèces exotiques envahissantes du Canada. Le but d'ensemble est de fournir une approche intégrée de gestion des ravageurs permettant aux partenaires de prendre des décisions conjointes de manière transparente, tout en alignant leurs ressources d'une façon commune.

SCIENCE AND TECHNOLOGY FOREST PEST RESEARCH NEEDS AND PRIORITIES ACROSS CANADA

Janice Hodge

National Forest Pest Strategy Technical Coordinator, JCH Forest Pest Management
7700 DeJong Drive, Coldstream, British Columbia V1B 1P3

In 2008 National Forest Pest Strategy (NFPS) Science and Technology Technical Advisory Group recommended that a more integrated process be followed for identifying and prioritizing the science and technology needs of Canada's pest management community, and for communicating those needs to research planning decision-makers who can then incorporate them into short- and long-term research programs. In 2012-2013, a project team conducted a new survey to identify national research needs and priorities. Four out of top 10 national research topics stand out with 11 of the 12 provinces and territories selecting them. These topics were: 1) climate change influences on pest behaviour (spatial and temporal analysis), pest population trends and pest impacts; 2) pest risk analysis; 3) pest population dynamics and processes; and 4) semiochemical monitoring tools. The high-priority pests at a national scale included, eastern spruce budworm, mountain pine beetle, spruce beetle, and emerald ash borer. Although not a pest, climate change and its associated abiotic disturbances were the third-ranked research category of priority.

BESOINS ET PRIORITÉS EN MATIÈRE DE RECHERCHE SCIENTIFIQUE ET DE TECHNOLOGIES SUR LES RAVAGEURS FORESTIERS À TRAVERS LE CANADA

En 2008, le Comité consultatif technique en science et technologie de la Stratégie nationale de lutte contre les ravageurs forestiers (SNLRF) a recommandé de suivre un processus mieux intégré pour identifier et prioriser les besoins scientifiques et technologiques de la communauté canadienne de lutte contre les ravageurs et pour communiquer ces besoins aux décideurs en matière de planification des recherches, qui pourront alors les incorporer dans les programmes de recherche à court et à long terme. En 2012-2013, une équipe de projet a réalisé une nouvelle étude pour cerner les priorités et les besoins nationaux en matière de recherche. Quatre des dix plus grands sujets de recherche nationaux se démarquent par le fait que 11 des 12 provinces et territoires les ont choisis. Il s'agit (1) de l'influence du changement climatique sur le comportement des ravageurs (analyse spatiale et temporelle), sur les tendances des populations de ravageurs et sur l'impact des ravageurs, (2) de l'analyse des risques liés aux ravageurs, (3) de la dynamique et des processus des populations de ravageurs et (4) des outils de surveillance sémiochimiques. Les ravageurs qui sont considérés comme prioritaires à l'échelle nationale sont la tordeuse des bourgeons de l'épinette de l'Est, le dendroctone du pin ponderosa, le dendroctone de l'épinette et l'agrile du frêne. Même s'il ne s'agit pas d'un ravageur, le changement climatique et les perturbations abiotiques qui y sont associées occupaient le troisième rang des priorités de recherche.

FOREST PEST MONITORING AND DIAGNOSTICS IN CANADA: AN OVERVIEW OF CURRENT SITUATION

Janice Hodge[1], Tim Ebata[2]

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[2] British Columbia Ministry of Forests, Lands and Natural Resource Operations, Resource Practices Branch
9th Floor, 727 Fisgard Street, Victoria, British Columbia V8W 1R8

In Canada, the National Forest Pest Strategy (NFPS) promotes a proactive, risk-based approach to forest pest management. Between 2008 and 2011 the NFPS Monitoring and Diagnostics Technical Advisory Group undertook several stock-taking exercises to identify current levels of national forest pest monitoring, monitoring gaps, and diagnostic and taxonomic capacity and availability. The monitoring survey found that currently 64% of the managed forest (about 51% of the forested land base) is monitored by the provinces and territories (with the exception of Nunavut) through a combination of aerial and ground surveys, and that gaps exist in northern latitudes, deciduous forests and non-contiguous forest types, most of which are in unmanaged forests. The diagnostic survey found that there was availability of diagnosticians; however there was limited capacity and availability of pathologists, particularly taxonomists at all levels of government in Canada.

SURVEILLANCE ET DIAGNOSTIC DES RAVAGEURS FORESTIERS AU CANADA : UN APERÇU DE LA SITUATION ACTUELLE

Au Canada, la Stratégie nationale de lutte contre les ravageurs forestiers (SNLRF) encourage une approche proactive et fondée sur la gestion des risques de la lutte contre les ravageurs forestiers. Entre 2008 et 2011, le Groupe consultatif technique de surveillance et de diagnostic de la SNLRF a entrepris plusieurs exercices d'inventaire pour déterminer les niveaux actuels de surveillance nationale des ravageurs forestiers, les lacunes en matière de surveillance de même que la capacité et la disponibilité diagnostiques et taxonomiques. L'étude de surveillance a révélé qu'actuellement 64 % du territoire forestier aménagé (environ 51 % des terres boisées) est surveillé par les provinces et les territoires (à l'exception du Nunavut) par une combinaison de levés terrestres et aériens. On a aussi constaté qu'il existe des lacunes aux latitudes boréales, dans les forêts de feuillus et les types de forêts non contigus, dont la plupart se trouvent dans des forêts non gérées. L'étude sur le diagnostic a révélé que des diagnosticiens sont disponibles, mais que la capacité et la disponibilité des pathologistes étaient toutefois limitées, en particulier les taxonomistes, dans tous les niveaux de gouvernement au Canada.

UPDATE ON CFIA'S FOREST PEST SURVEYS

NOT AVAILABLE / NON DISPONIBLE

UPDATE OF CFIA'S INVASIVE ALIEN SPECIES PROGRAM

NOT AVAILABLE / NON DISPONIBLE

SESSION II: WESTERN PEST MANAGEMENT ISSUES

Chair: *Rory McIntosh*
Saskatchewan Ministry of Environment, Forest Service Branch

SÉANCE II : LA RÉPRESSION DES RAVAGEURS DANS L'OUEST

Président : *Rory McIntosh*
Saskatchewan Ministry of Environment, Forest Service Branch

BRITISH COLUMBIA REPORT

Tim Ebata

Resource Practices Branch, B.C. Ministry of Forests, Lands, and Natural Resource Operations
9th floor, 727 Fisgard Street, P.O. Box 9513, Stn. Prov. Govt., Victoria, British Columbia V8W 9C2

Since 1999, the province of British Columbia has continued a province-wide aerial overview survey (AOS) that was abandoned by the CFS's Forest Insect and Disease Survey in 1996. The AOS captured the rise and fall of the mountain pine beetle outbreak - the largest forest disturbance ever recorded in the province. The provincial survey contractors track their flight lines using recreational level hand held GPS receivers and allows easy estimation of the ongoing progress and ultimately the coverage achieved by the survey program. Due to exceptional periods of dry summer weather, 91% of the province's forested area (including parks, federal and private lands) were surveyed between early July and the end of September 2013 (figure 1). This is a new record for the program.

Mountain pine beetle continued to be the most important damaging agent mapped and area damaged was nearly the same as in 2012 at 2.97 million ha (figure 2). The distribution of damage by severity class differed considerably between years as more area in 2013 was in the trace and light severity classes indicating the population's decline (figure 3). The beetle populations remained active in the northern fringes of the original outbreak area stretching from the Bulkley TSA in the west, north to the Yukon border, and East to the Alberta border. Active and recurring infestations were found in the southern interior in the Okanagan TSA and east towards the Alberta border. The only area of the province where aggressive management has been focused is in the south-east portion of Kootenay – Boundary Region. Beetle numbers remain low while there remains a large supply of mature, susceptible lodgepole pine at risk.

Other bark beetles threaten the remaining live timber supply now heavily impacted by the mountain pine beetle. Douglas-fir beetle is found throughout the range of Douglas-fir (coast and interior). Area attacked decreased slightly from 21,001 ha in 2012 to 14,868 ha in 2013 but the activity appears to have increased in the Cariboo region. Since 2010, spruce beetle populations continue to decline and are now found in several small infestations throughout the interior of BC totaling 18,693 ha.

The most important forest defoliator in BC is the western spruce budworm, *Choristoneura occidentalis*. This insect has been in outbreak for over a decade and in 2013 the population appears to have declined dropping from 456,783 ha in 2012 to 128,038 ha with the greatest decreases observed in the Thompson-Okanagan region. An aerial spray program was conducted on 78,000 ha (28,000 ha in the Cariboo Region and 50,000 ha in the Thompson-Okanagan Region) using the Btk formulation Foray 48B.

Monitoring of North American strain of European gypsy moth in BC by CFIA and the province resulted in 13 male moths in 12 locations. This pattern was typical of the last several years with the exception of the lone moth caught in the Cariboo Region at McLeese Lake. More intensive trapping will continue in throughout the summer 2014 in areas with positive finds while the rest of the trapping will continue at low intensity.

Other defoliators of note are: two-year cycle budworm (88,000 ha) in the Omineca and Cariboo regions; and extensive forest tent caterpillar and aspen leaf miner (581,000 ha and 2.5 million ha, respectively) throughout the interior (figure 4).

Forest diseases are under-represented in the AOS as their aerial signatures are not as visible as other disturbances. Exceptions in 2013 was the extensive area (837,000 ha) of Venturia shoot blight visible throughout the range of aspen; and the continuing but declining outbreak of larch needle cast in the Kootenay-Boundary Region (6,304 ha from 31,695 ha in 2012).

Other interesting disturbances noted during the survey were the higher than expected levels of bear damage in young stands throughout the interior that increased to 4,965 ha from only 653 ha observed in 2012. Finally, a freak severe hail storm stripped nearly all of the foliage from stands of Douglas-fir in the Cariboo region leaving the forest floor carpeted in needles and branch tips (figure 5). Will the frequency of such damage increase with climate change?

A more detailed report is available on-line at: http://www.for.gov.bc.ca/hfp/health/overview/overview.htm.

Figure 1 – 2013 aerial overview survey flight lines in British Columbia. A record 91% of the province's forested land base was surveyed.

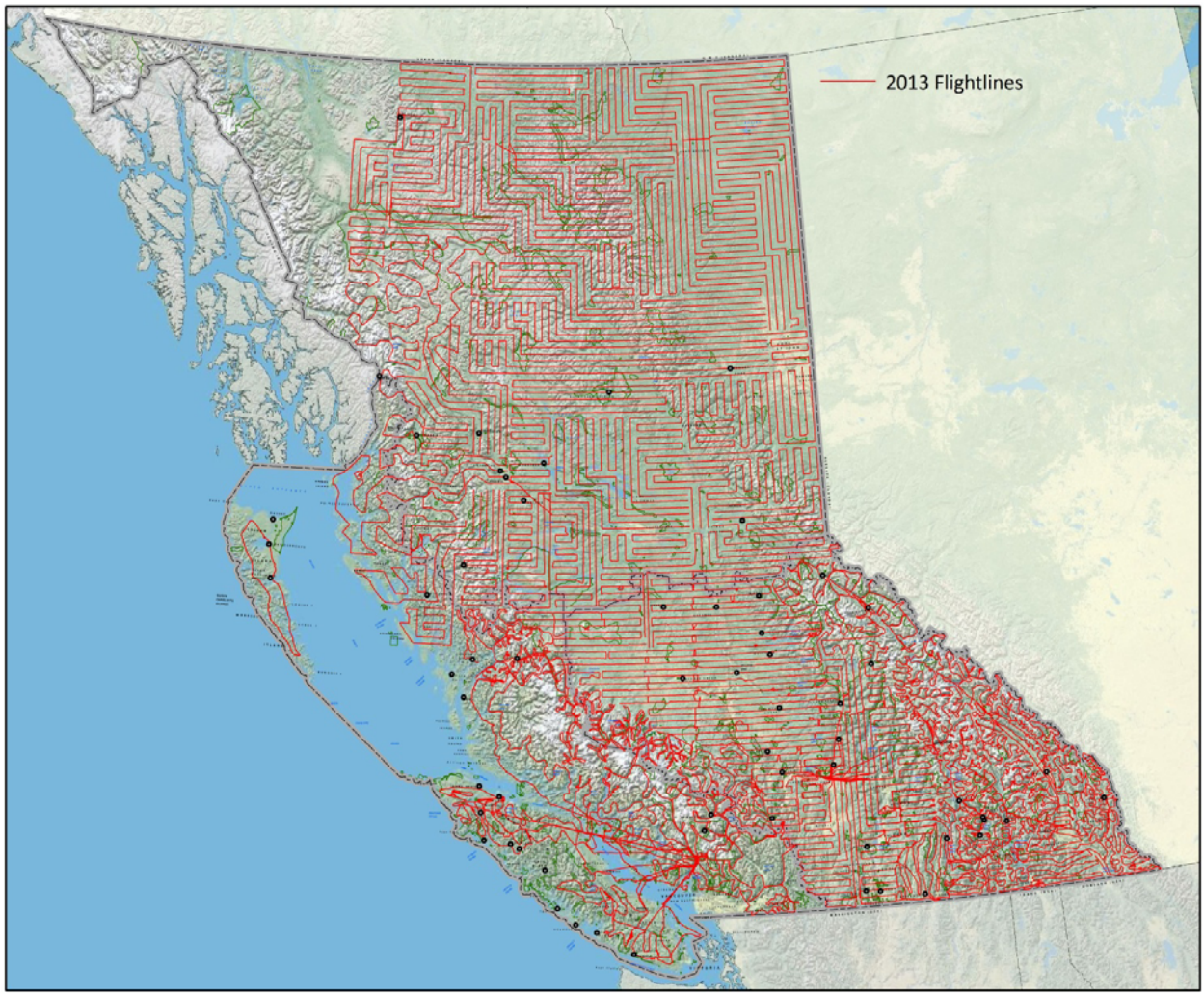

Figure 2 – Annual area of attack by mountain pine beetle in British Columbia from 1999 to 2011.

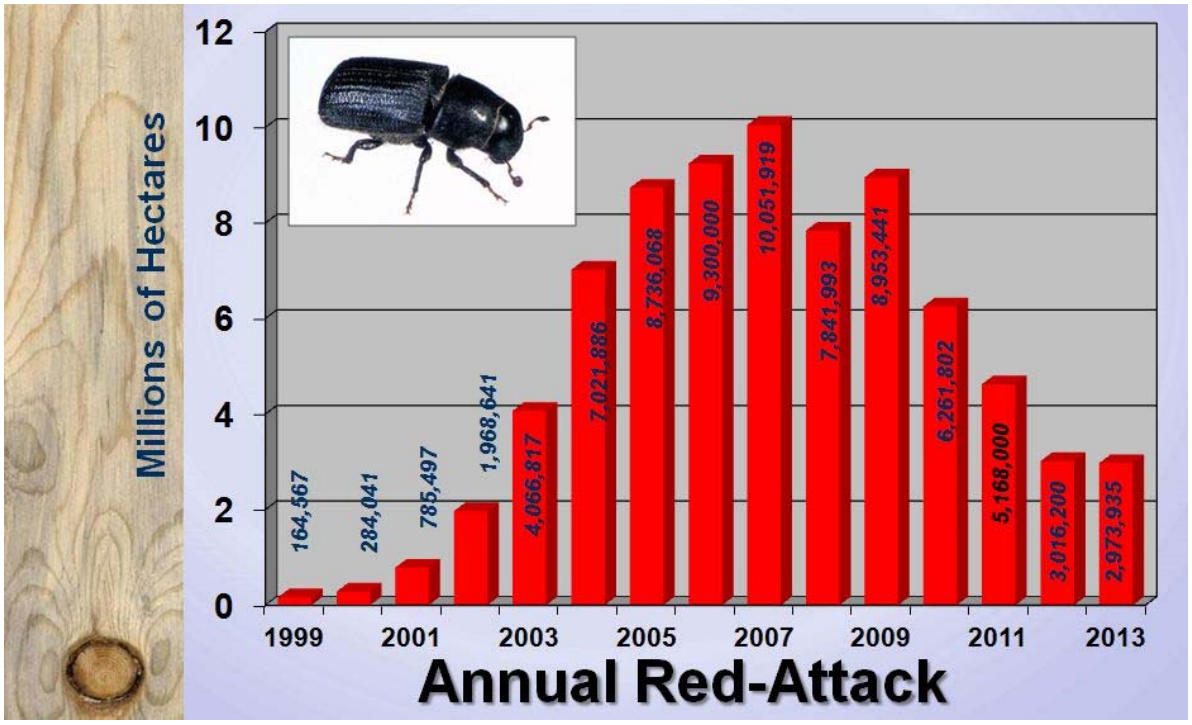

Figure 3 – Distribution of mountain pine beetle damage recorded by the provincial aerial overview survey in 2012.

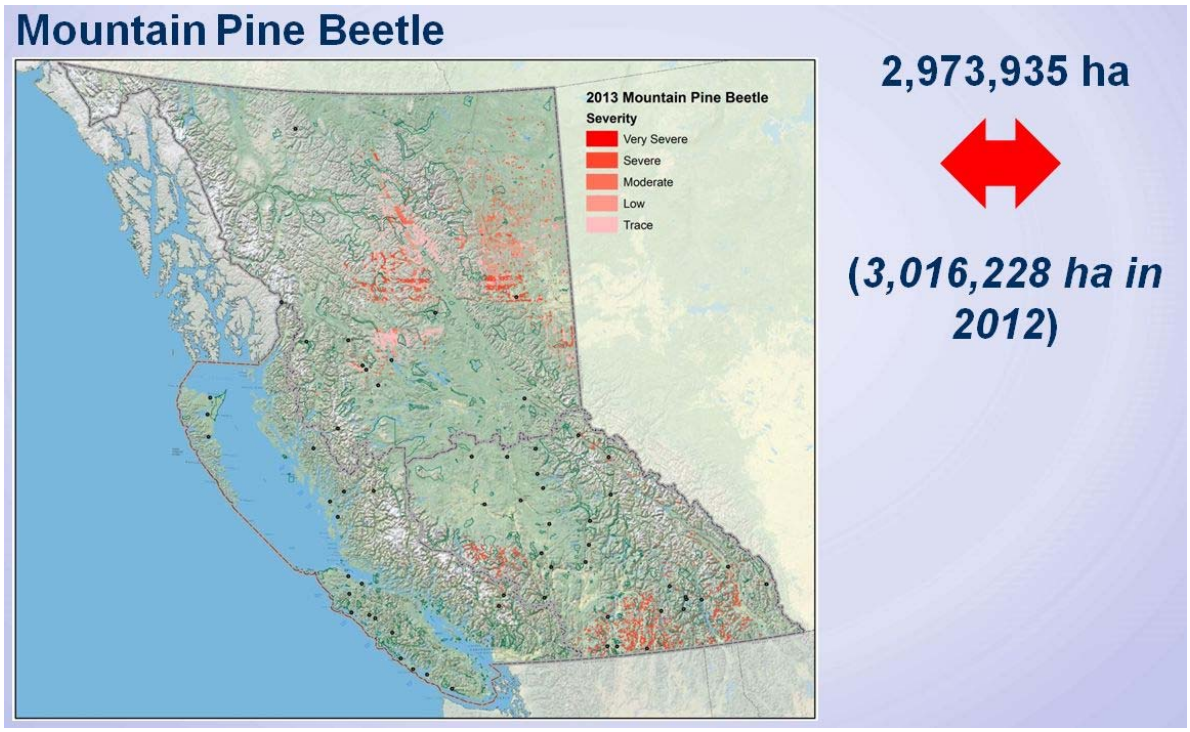

Figure 4 – Severe defoliation by the forest tent caterpillar combined with aspen leaf miner.

Figure 5 – Forest floor after severe hail damage in the Cariboo Region.

ALBERTA REPORT

Erica Samis

Alberta Environment and Sustainable Resource Development
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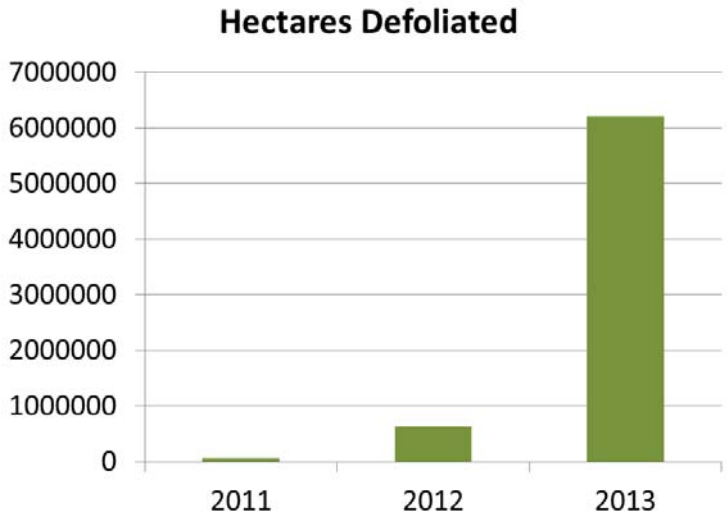
In September 2013, Forest Health and the Alberta Tree Improvement and Seed Centre joined to become the Forest Health and Adaptation Section. This union was one of common interest, goals and a complement of strengths. Our current mandates include work on climate change and adaptation, genetic resource management, applied tree breeding, conservation and species at risk, mountain pine beetle management, forest health surveys and invasive species. Programs such as gene conservation, forest genetics research, seed zones, forest damaging agents, research, extension services and communication and publications help support these mandates.

Vision for the forest health and adaptation program in Alberta
To lead Canada in science-based, proactive, adaptive and innovative management of damaging forest health agents in a forest environment with a multitude of values and challenges posed by a changing climate.

Damaging agents

Aspen defoliation

Agent	Hectares
Forest tent caterpillar	4,015,956
Aspen two-leaf tier	2,118,223
Bruce spanworm	5,061
Aspen dieback	4,695
Large aspen tortrix	1,820
Aspen defoliation	69,460
Total	6,215,215



There was a substantial increase in the amount of aspen defoliation noted in Alberta in 2013. Defoliation recorded in 2001, 2012 and 2013 was 68,426, 629,108 and 6,215,215 hectares respectively. Aspen defoliation was mapped for extent only; no severity classes were noted.

Eastern spruce budworm
2013 was the first year in 20 years that pheromone monitoring traps were not set up throughout the province. Aerial surveying was conducted on a limited basis due to operational constraints during the survey window.

Defoliation Severity	2011 ha (net)	2012 ha (net)	2013 ha (net)
Moderate (35 – 70%)	32,195	83,515	
Severe (Over 70%)	3,208	33,825	
Total	35,403	117,340	

Other interesting forest health projects

Dothistroma

Dothistroma has been reported in Alberta only a few times in the 1990s. This pathogen was detected at ATISC for the first time this year in a high value pine clone bank. A spray program was initiated with applications of Boudreaux mixture in mid-May and mid-July to reduce pathogen inoculum and to reduce losses of the clones.

Rhabdocline pseudotsugae

This pathogen was noted at a Douglas fir provenance trial. No control program was initiated even though many of the trees are severely infected.

Mountain pine beetle

Mountain pine beetle is the most significant forest pest threat to the province's forest resources. In 2012-2013, $40 million was invested in management activities relating to mountain pine beetle was invested. These activities include direct treatment costs, research, communications, rehabilitation of affected stands and other activities.

From May 15 to June 15, 135 R-values were collected on 825 trees at 135 sites across the infestation. R-values provide an indication of relative the success of populations throughout the province and relative to the previous years. Overall, beetle populations were more successful than the previous year.

Aerial surveys conducted from August 15 to September 15 and G:R surveys (624 sites) conducted from August 25 to September 15 provided the information necessary to create the annual ground survey and control program. In the 2012-2013 season, 9,843 sites were ground surveyed and 97,000 trees were controlled.

A series of 321 dispersal bait sites detected mountain pine beetle within 35 km of the Saskatchewan border.

SASKATCHEWAN REPORT

Rory McIntosh
Saskatchewan Ministry of Environment, Forest Service Branch

Defoliators – softwood

Spruce budworm *Choristoneura fumiferana*

Following a general decline, 2002-2008 damage levels of the eastern spruce budworm *Choristoneura fumiferana* have been fluctuating in Saskatchewan. During aerial surveys in 2011, 90,548 ha of moderate and severe defoliation were mapped. In 2012, the net defoliated area dropped significantly to 28,272 ha. In 2013, an area of just over 13,000 ha of mostly moderate defoliation was mapped (Figure 1). Although the outbreak persists in the Pine house and Besnard Lake areas in north central Saskatchewan, the outbreak throughout the rest of the province continues to collapse (Figure 2).

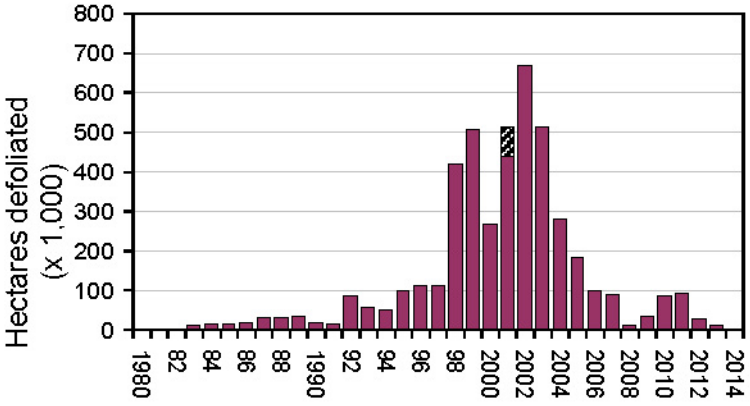
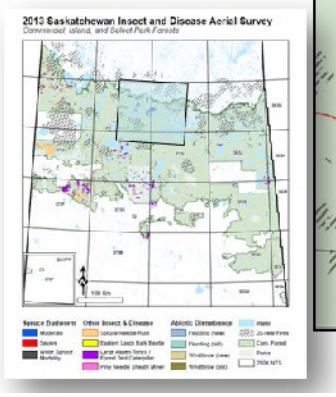


Figure 1. Area of moderate to severe defoliation caused by the spruce budworm *Choristoneura fumiferana* in Saskatchewan 1982-2013.

Summary of 2013, predictions for 2014

Although SBW populations continue to persist in the Besnard and Pinehouse Lake areas west of La Ronge, the outbreak on a provincial scale is in collapse. In 2013, no spray program was implemented due to extremely low defoliation predictions from overwintering L2 surveys.

L2 surveys conducted in 2013 continue to show a significant decline in population growth. The Ministry will not be implementing a spray program for 2014.



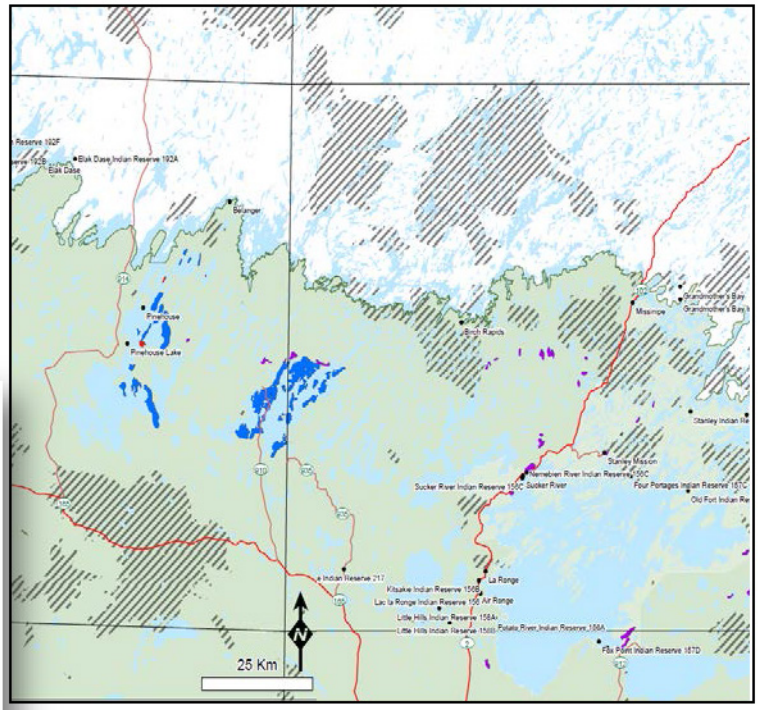


Figure 2. Area of moderate (blue) to severe (red) defoliation caused by the spruce budworm *Choristoneura fumiferana* in Saskatchewan 2013.

Jack pine budworm *Choristoneura pinus pinus*

In 2013, there was again no detectable Jack pine budworm defoliation in Saskatchewan. Jack pine budworm – a periodic defoliator of jack pine, has not been detected since the early 1980s. In 2013, the provincial government continued monitoring moth activity pheromone trapping network was maintained. In general, trap counts remained low throughout the province with the exception of some elevated counts in the Fort a La Corne. No significant trap counts were recorded in 2013.

Defoliators – hardwood

Large aspen tortrix *Choristoneura conflictana* and forest tent caterpillar *Malacosoma disstria*

The area of hardwoods defoliated increased significantly from 24,577 ha in 2011 to 42,454 ha in 2012. In 2013, the outbreak really took off and the area of defoliation tripled to 129,316 ha in 2013. While in 2011 the damage reported was predominantly caused by the large aspen tortrix, this outbreak continued predominantly in the western part of the province. In 2012 and 2013, damage in the central (Prince Albert National Park and the Churchill River) and eastern parts of the province (including Greenwater Lake and Duck Mountain provincial parks in the southeast) was attributed to forest tent caterpillar. Tent caterpillar was also defoliating aspen in the Cypress Hills Interprovincial Park in the southwest (Figure 3).

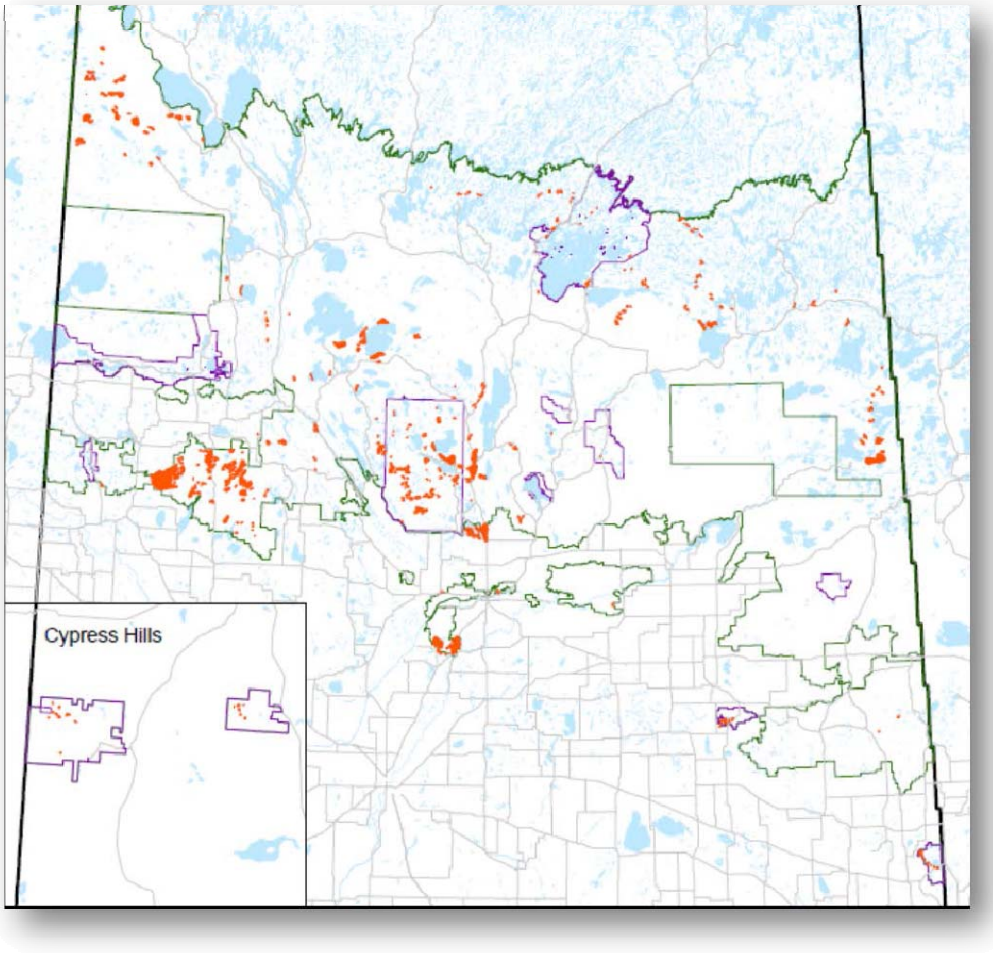


Figure 3. Area of moderate to severe defoliation caused by the forest tent caterpillar *Malacosoma disstria* in Saskatchewan in 2013.

Foliar diseases

Spruce needle rust *Chrysomyxa ledicola*

Spruce needle rust *Chrysomyxa ledicola* (Figure 4) was detected again in 2013, for the third year in a row. Aerial and ground surveys revealed that the area affected increased dramatically to 101,459 ha of spruce forest affected by this pathogen – a significant increase from the 19,500 ha reported in 2012. Areas affected by spruce needle rust were located in and around Dillon Lake, north of the Cold Lake Air Weapons Range, and large areas south of the Weapons Range and around Meadow Lake. There were also significant areas affected around Turtle Lake between Glaslyn and Turtleford (Figure 5).

Figure 4. Spruce needle rust *Chrysomyxa ledicola*.

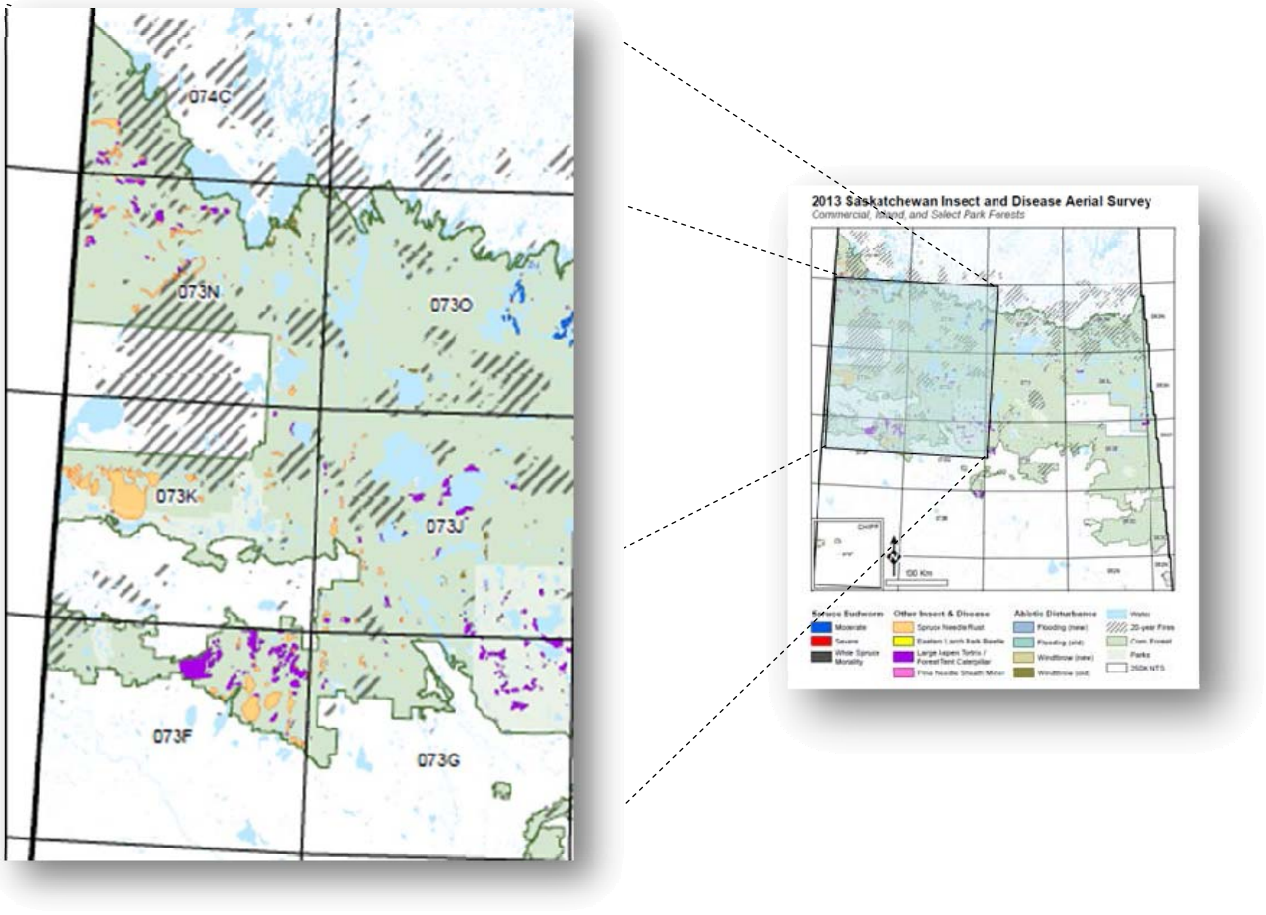


Figure 5. Area of spruce needle rust defoliation (light orange), north and south of the Cold Lake Air Weapons Range and Glaslyn area in western Saskatchewan.

Invasive and non-native pests

Dutch elm disease *Ophiostoma novo ulmi*

In 1980, Dutch elm disease (DED) was first discovered in Saskatchewan (Regina). Since then, DED has slowly spread along the Souris and Qu'Appelle river valleys in southeast and eastern Saskatchewan and is now found throughout most of the range of native elms in Saskatchewan (Figure 6).

With the exception of the larger urban centres, 17 communities (shown in Figure 7 as stars) currently have secured a contractor to conduct surveillance in their jurisdictions. These communities include:

- Balcarres
- Broadview
- Carlyle
- Caronport
- Estevan
- Indian Head
- Langham
- Moosomin
- Outlook
- Oxbow
- Pense
- Preeceville
- Spiritwood
- Wadena
- Watrous
- Wolseley
- Wynyard

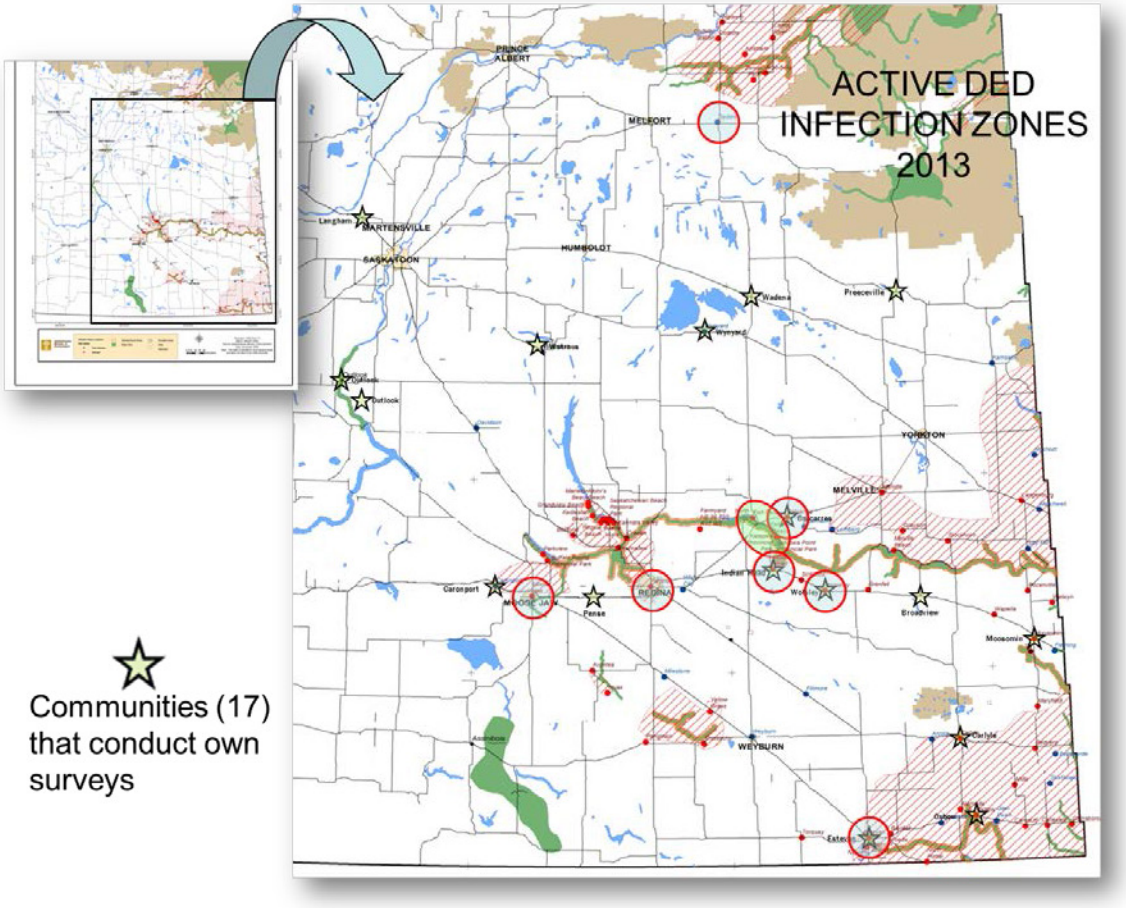


Figure 6. Distribution of Dutch elm disease active zones (red cross-hatch) throughout Saskatchewan in 2013. Saskatchewan's Ministry of Environment continues to survey wild stands in seven buffer areas outside major communities (circles) and in two provincial parks (ovals). In addition to the major urban centres, 17 communities (stars) are conducting DED management action on their own.

Since changes to the provincial program were implemented in April 1, 2010, the municipalities are responsible for DED management programs. The Ministry of Environment conducts surveillance and removal activities in

seven management areas outside major communities (as well as two provincial parks) threatened by DED. The Ministry of Environment also ensures regulatory compliance, diagnostic services and provides scientific and technical support to communities.

2013 highlights:
- According to the provincial crop protection laboratory, no new communities reported DED in 2013.
- DED still present in traditional southeast region of the province.

In 2013, the number of infected trees removed in management (buffer) zones has increased when compared to 2012. The number of trees removed from Echo Valley provincial park is significantly higher than in 2012 (Table 1).

Table 1. Number of DED infected trees marked for removal in the seven buffers and two parks in Saskatchewan in 2012 and 2013.

Buffers	Removed		Parks	Removed	
	2012	2013		2012	2013
Estevan	2	4	**Katepwa**	0	3
Regina	37	64	**Echo Valley**	32	132
Moose Jaw	22	27		0	0
Indian Head	23	28		0	0
Wolseley	0	0			
Tisdale	5	12		0	0
Balcarres	73	79			
Total	**162**	**214**		**32**	**135**

European gypsy moth *Lymantria dispar*

In 2013, the Canadian Food Inspection Agency (CFIA) continued ongoing monitoring in Saskatchewan, deploying 508 Tréce delta II green traps baited with gypsy moth string lure (Table 2). All traps were targeted at the European gypsy moth *Lymantria dispar.* Three traps caught male gypsy moths. One male gypsy moth was collected from a trap in Regina, one from Moose Jaw and one from Kelfield, (west of Saskatoon). In 2014, CFIA will conduct delimitation surveys (16 traps/mile) around all three positive finds.

Table 2. Number and distrtibution of gypsy moth traps in Saskatchewan, in 2013.

LOCATION (and area)	NUMBER Traps	NUMBER Positive
REGINA/MOOSE JAW	196*	2
SASKATOON (Kelfield)	146	1
YORKTON	46	0
N. BATTLEFORD	40	0
NIPAWIN	40	0
MELFORT	40	0
Total	508	3

*Includes 26 deployed by City of Regina

In 2013, the CFIA continued with the emerald ash borer survey, conducting both trapping and visual surveillance. In total, 20 green panel traps were deployed in 2013. None were positive.

• 1 MALE GYPSY MOTH WAS FOUND IN CITY OF REGINA; ONE IN MOOSE JAW; AND ONE IN KELFIELD (west of Saskatoon).
• IN 2013, NO EMERALD ASH BORERS WERE TRAPPED IN SASKATCHEWAN.

Banded elm bark beetle *Scolytus schevyrewi*

In 2004, Saskatchewan first deployed a network of pheromone-baited traps to detect the presence and distribution of the banded elm bark beetle (BEBB) *Scolytus schevyrewi* (Figure 7) across the province, with further expansion in 2007 following its first discovery in Medicine Hat, Alberta in 2007. In 2008, BEBB was first found in Saskatchewan and since then, it has spread and become established throughout the grassland region of the province. In response to concerns that this insect might exacerbate the spread of Dutch elm disease around the province, Saskatchewan's Ministry of Environment supported research at the University of Manitoba. Graduate research conducted in 2010-12, revealed that BEBB rarely attacks American elm in the prairie region and is not considered a major vector of DED. By 2013 BEBB has spread to most of the major urban centers including Saskatoon, Regina, Moose Jaw, and Swift Current throughout the southern half of the province. The beetle has been collected just outside the city of Saskatoon, which is currently this most northerly extent of the known range in Saskatchewan. It is now clear the beetle is established in Saskatchewan. Monitoring for this insect continues.

Figure 7. The banded elm bark beetle *Scolytus schevyrewi* (source: James LeBonte et al. http://extension.entm.purdue.edu/CAPS/pestAlertsPDF/screeningAid_bandedBeetle.pdf downloaded January 15th 2014).

Mountain pine beetle *Dendroctonus ponderosae*

The risk of mountain pine beetle (MPB) spreading eastwards and establishing in Saskatchewan's boreal jack pine forests continues to be the primary concern. In 2013, the government of Alberta reported that MPB had been found in a baited tree southwest of Fort McMurray, within 50 km of the AB/SK border. Currently, there is an active MPB outbreak in the Cypress Hills Interprovincial Park in southwestern Saskatchewan (Figure 8).

In Saskatchewan, there still remains the opportunity to focus on proactive, **preventive** approaches instead of active beetle-focused **suppressive** action.

Figure 8. Building mountain pine beetle infestation in and around the Cypress Hills Interprovincial Park, southwestern Saskatchewan.

Since 2002, Saskatchewan's Ministry of Environment has implemented regulatory controls to prevent the long-distance, human-caused spread of MPB into the province. In July 2008, this restriction order was strengthened by designating MPB a pest under The Forest Resources Management Act (FRMA) and designating the lands where the moratorium is to be enforced. This designation enables greater powers of inspection and mitigative action under the FRMA.

SK & AB interprovincial agreement to slow the spread of MPB in Alberta

Central to Saskatchewan's strategic approach is to focus on aggressive fall and burn operations in the leading edge **in Alberta** to prevent or slow the spread of mountain pine beetle into the boreal forest and across Canada. As the MPB invades novel ecosystems (and colonizes naïve hosts) there is a unique opportunity to reduce MPB spread into the boreal jack pine in the boreal bridge zone east of Slave Lake, Alberta. The forests in this region are fragmented, beetle survival is currently poor, and the extent of damage is low. In 2011, the province of Saskatchewan entered into a multi-year agreement to partner with the province of Alberta to develop a coordinated, strategic approach to control the spread of the mountain pine beetle into Saskatchewan's boreal forest. This agreement was continued in 2013 for a third year.

Under this agreement annual work plans are developed by the Spread Management Action Committee (SMAC) integrating current aerial and ground survey data to prioritize and coordinate control activities. Work in 2012 focused on the leading edge through maintaining a tree-baiting network to delineate the leading edge; conducting air photography as a technique to monitor spread through "change detection"; and Level 1 (single tree) removal of MPB infested trees in the Slave Lake and Marten Hills areas.

Saskatchewan continues to be vigilant in early detection surveillance and preparations for rapid response. In 2011, a tree-baiting grid was established in SK to provide an extension of the AB detection baiting program, to help detect and delineate the "leading edge" of MPB and detect presence/spread into SK. This grid was expanded in 2013.

Mountain pine beetle surveys

The surveillance program is divided into two components: the Cypress Hills Interprovincial Park (CHIP) and the northern boreal forest. Saskatchewan's strategic approach to the MPB threat is very similar to that of fire-fighting – early detection leading to immediate, rapid and aggressive response. To help focus surveillance and detection of MPB, SK has implemented risk and susceptibility mapping – forest-focused approaches aimed at determining the extent and distribution of susceptible pine in the western part of the province. The distribution of these high risk stands, coupled with fire disturbance data are used to help focus efficient aerial and ground surveillance activities (Figure 9).

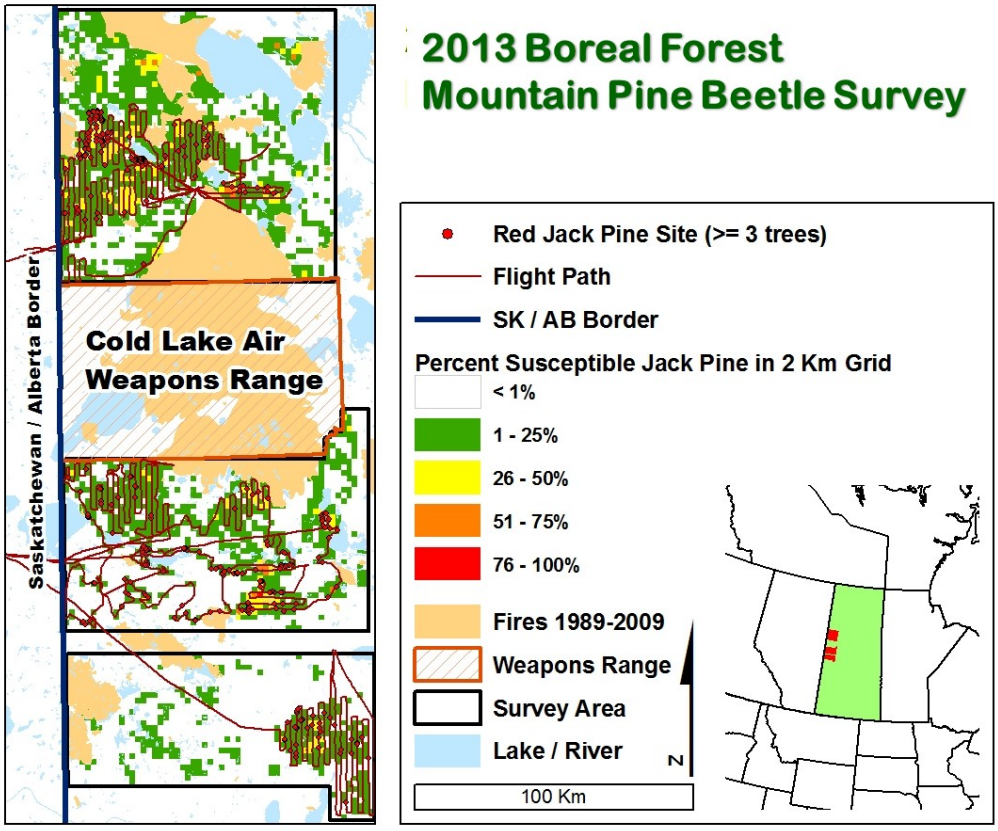


Figure 9. Map of western Saskatchewan showing areas north and south of the Cold Lake Air Weapons Range where Saskatchewan's Ministry of Environment is conducting extended aerial monitoring prioritized on the distribution of susceptible pine stands**.**

Cypress Hills Interprovincial Park (CHIP)

Saskatchewan's Ministry of Environment has been monitoring MPB in the CHIP since the last outbreak declined in 1985-86. Aerial overview surveys are used to locate all red trees, shown as the red dots on the map (Figure 10). These observations are then verified by detailed and systematic ground surveys. The outbreak remains concentrated in the south western corner (West Benson drainage) of the park along the SK/AB border (Figure 11).

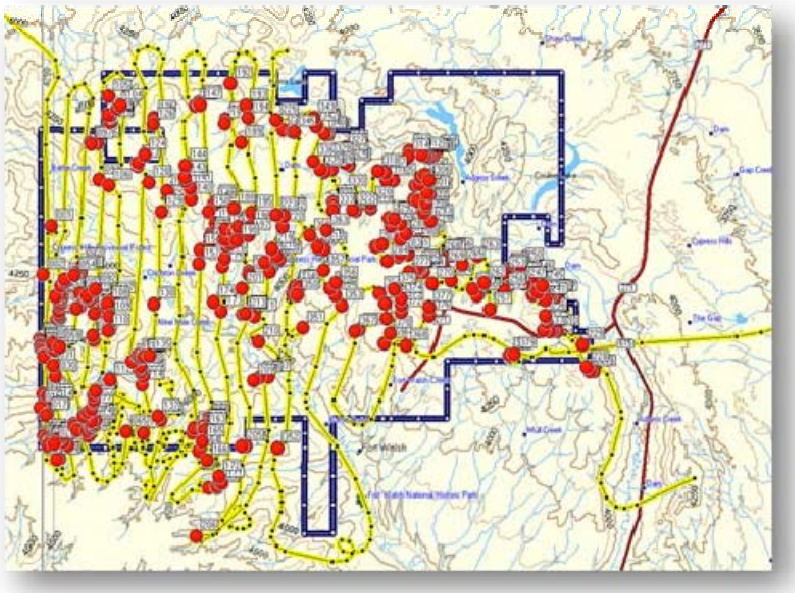


Figure 10. Track log of aerial surveys conducted in the West Block of the Cypress Hills Interprovincial Park in southwestern Saskatchewan.

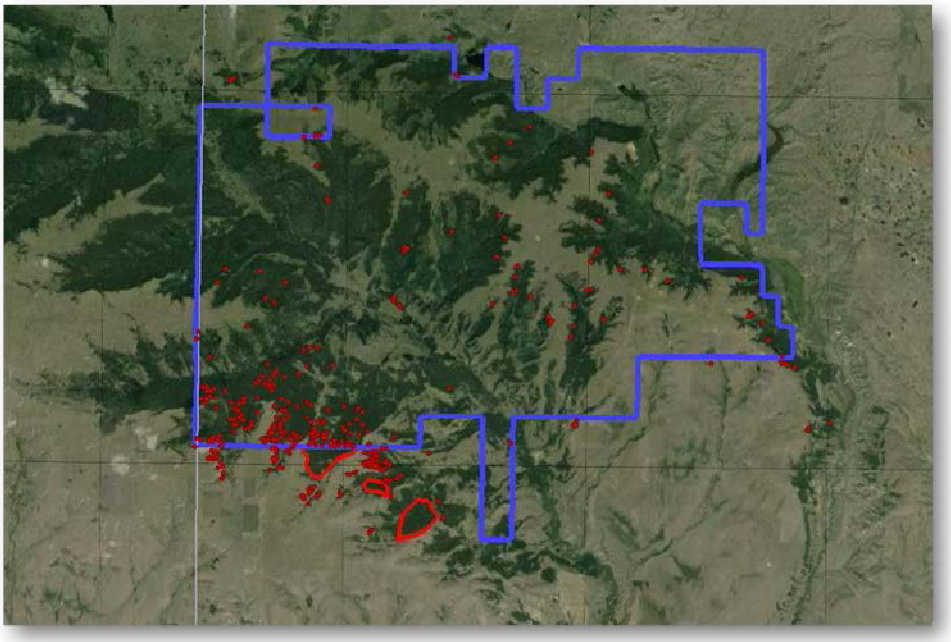


Figure 11. Location and distribution of mountain pine beetle infested trees (red dots) detected through aerial surveys and confirmed by ground checks in the West Block of Cypress Hills Interprovincial Park in southwestern Saskatchewan, in 2013. NB: infestations in lands outside the park are so extensive they are represented by polygons.

Each year, all trees verified during the ground surveys and marked for removal are removed. In 2006, only two trees were removed; however, this number has been gradually increasing each year until 2011-12 when the number of trees for removal doubled. In 2013, the number of trees marked for removal (444) only increased by 27 trees (Figure 12).

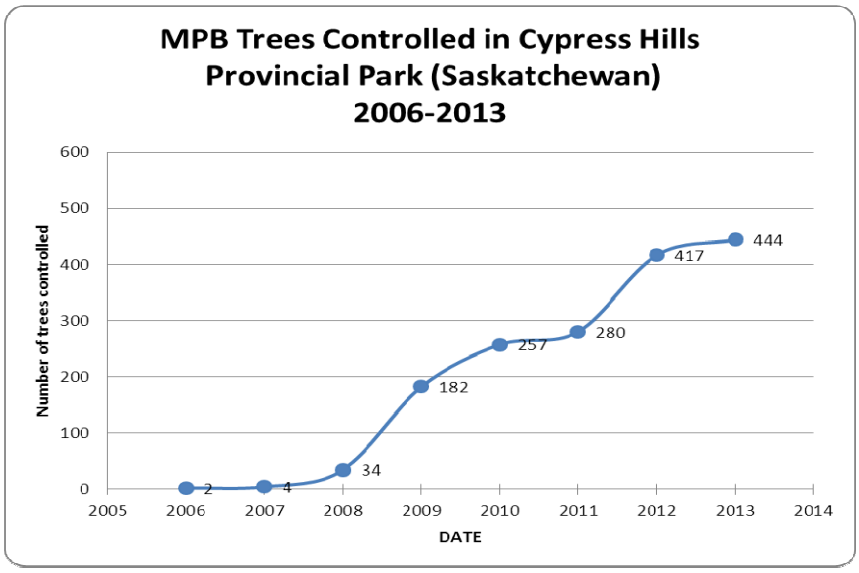


Figure 12. Total number of trees controlled in Cypress Hills Interprovincial Park from 2006 to 2013.

Since this outbreak is located across multiple jurisdictions, including private land to the south of the CHIP, Saskatchewan continues to extend aerial surveillance to monitor all susceptible pine stands inside and adjacent to the park (with the exception of Alberta). The province continues to work together with federal agencies and First Nations to coordinate work and assist in the control of infested trees on First Nations' land outside of the park boundaries. The ministry is also working with the Province of Alberta, ranchers and municipal leaders to develop a collaborative, regional approach to managing MPB in the area.

Northern boreal forest surveys

The Ministry of Environment conducts systematic monitoring along the AB/SK border, with a focus on areas of highly susceptible jack pine. The Ministry surveys approximately 1.6 million ha of pine forests, extending 100 km east from the Alberta border and from the southern forest fringe north to the Churchill River. The 2013 systematic rotary wing aerial surveys were conducted in September/October to detect red trees. Of the boreal forest identified 324 sites with over 1,500 suspect "red" or recently dead jack pine (Figure 14). Approximately 20% of these locations were ground-truthed (where access permitted). Ground surveys verify MPB attack or confirm mortality resulted from other biotic and abiotic agents. The most common damage agents found in the "red" trees were engraver beetles *Ips* spp., sawyer beetles *Monochamus* spp., and root rot *Armillaria* spp.

In 2012, in alignment with the leading edge monitoring network in Alberta, the Ministry decided to expand the existing early detection network. To serve this purpose, 40 heli-landing areas were cut in pine and pine-leading stands – one per township, location is represented by the helicopter symbol within the yellow squares. In 2013, 24 sites (green squares) were added. (Figure 14). The purpose of this initiative was two-fold: first, to provide a contiguous grid within which to deploy tree baiting stations to delineate the leading edge as it transitions across AB and SK; and second, to provide a network of access points from which Level 1 single tree response action might be deployed if necessary.

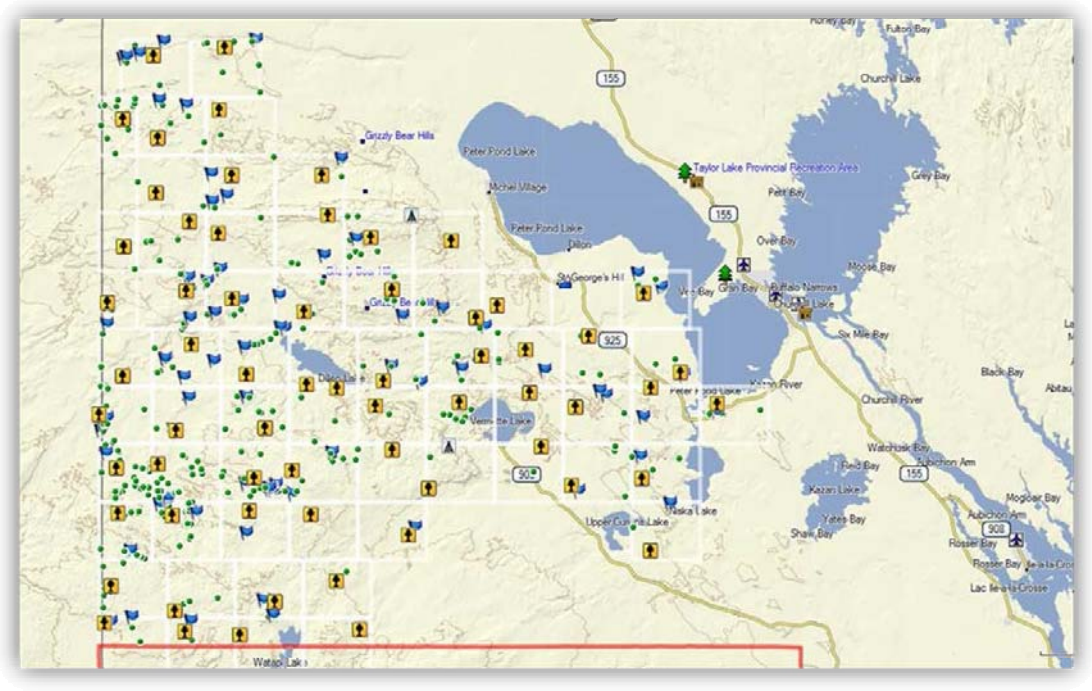


Figure 13. Distribution of fader trees (green dots) and initial ground survey sites (blue flags) in northern boreal survey.

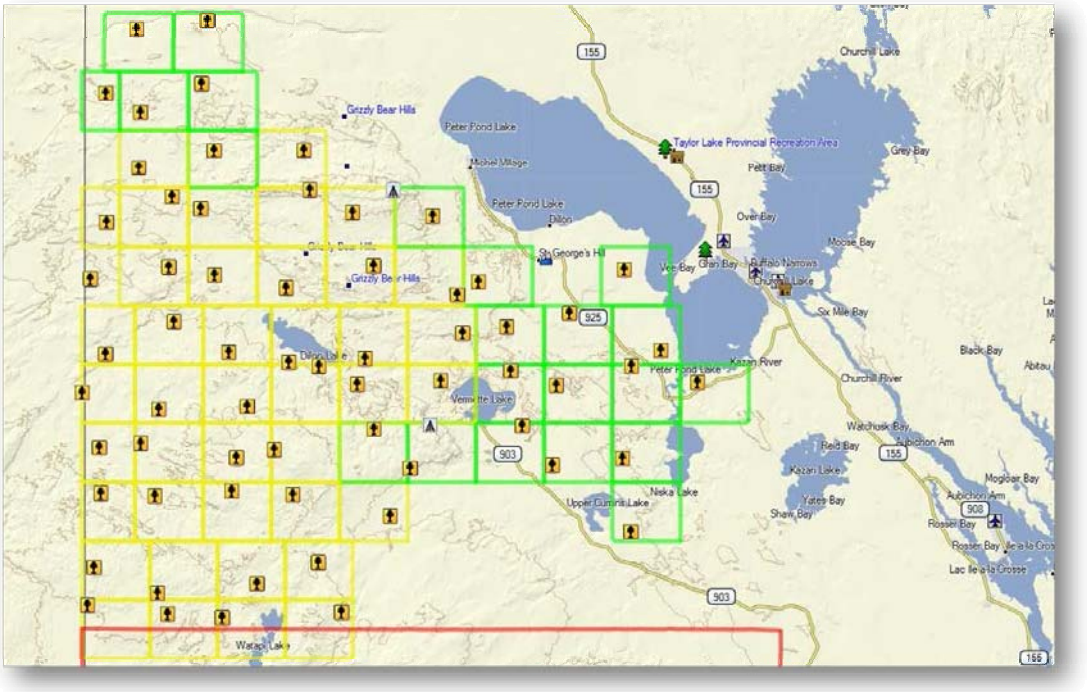


Figure 14. Distribution of heli-landing areas installed in 2012 (yellow), and additional sites installed in 2013 (green) to create access opportunities and to expand the leading edge monitoring network across the region.

CURRENTLY NO MOUNTAIN PINE BEETLES ARE FOUND IN SASKATCHEWAN'S BOREAL FOREST

MANITOBA REPORT

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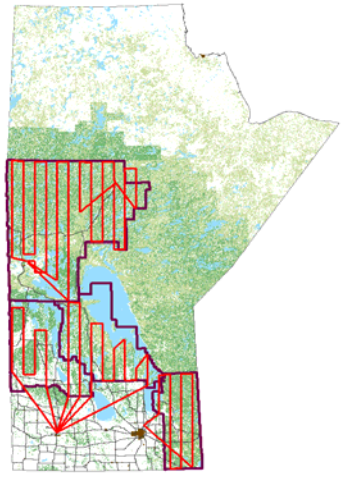
Aerial Surveys

In 2013, Manitoba Conservation and Water Stewardship (MCWS) aerial survey program shifted from a pest specific survey to a province wide systematic survey. This new survey will provide an overall picture of health issues and an accurate estimate of forest defoliation and abiotic events. The survey uses mobile PC Tablets to map defoliation and was conducted in the following forest regions of Manitoba; Northeast region, Northwest region, Western region, Interlake region and Eastern region. The survey design will allow for more coverage over a specific area when required with a baseline survey conducted in each region every year.

Figure1: Map of aerial survey conducted in Manitoba in 2013.



Eastern larch beetle – *Dendroctonus simplex*

Since the early 2000's the populations of eastern larch beetle, a native beetle that attacks native and exotic tamarack (*Larix laricina)* have increased. The 2013 aerial survey captured the extent of the eastern larch beetle outbreak as wide spread damage and mortality was observed throughout the province. Previous research conducted by MCWS found that when the populations of eastern larch beetle reach epidemic levels it can be expected to find an average annual tamarack mortality of 10%. Monitoring for this insect will continue in 2014, however as it is a native bark beetle it is expected that the population will decrease on its own accord.

Forest tent caterpillar – *Malacosoma disstria*

The population of forest tent caterpillar increased within the province in 2013. The aerial survey observed that the Northwest, Western and Interlake regions experienced moderate to server defoliation. Similar defoliation is expected for 2014.

Spruce budworm – *Choristoneura fumiferama*

In 2013, very few pockets of defoliation by spruce budworm, were observed throughout Manitoba. Very light to no defoliation was observed by aerial surveys.

Based on the 2012 defoliation predictions derived from fall egg mass surveys and hazard rating for tree condition, no operational spruce budworm suppression program was implemented in 2013.

In August and September, spruce and fir branch samples are collected at plots throughout the province and processed to assess current defoliation levels and determine egg mass densities to predict 2014 defoliation (Table 1).

Table 1: 2013 Spruce budworm defoliation and predictions for 2014.

Location	2013 defoliation*	2013 egg mass/ 10 m^2	2014 defoliation prediction
Northeast Region	Light	7	Light
Northwest Region	Light	0	Light
Western Region	Light	10	Light
Interlake Region	Light	0	Light
Eastern Region	Light	0	Light

*Defoliation classes are as follows:

Light - up to 35% defoliation of current shoots
- based on <40 egg masses per 10 m^2 of branch area

Moderate - 35% to 70% defoliation of current shoots
- based on 40 to 185 egg masses per 10 m^2 of branch area

Severe - greater than 70% defoliation of current shoots and possible feeding on old foliage
- based on >185 egg masses per 10 m^2 of branch area

Spruce budworm pheromone traps are placed at 33 locations throughout the province and traps/lures were provided to Riding Mountain National Park for monitoring six sites. Three MULTIPHER® insect traps containing spruce budworm pheromone (PVC lure containing 0.3% by weight of a 95:5 blend of (E)- and (Z)-11-tetradecenal) are placed 40 m apart at each plot location in either a straight or triangular configuration. Average moth captures per trap decreased in all regions with a large drop in moth captures found within the Interlake Region, however, moth captures are still low province wide (Table 2). No operational suppression program is planned for 2014.

Table 2: Spruce budworm pheromone trapping.

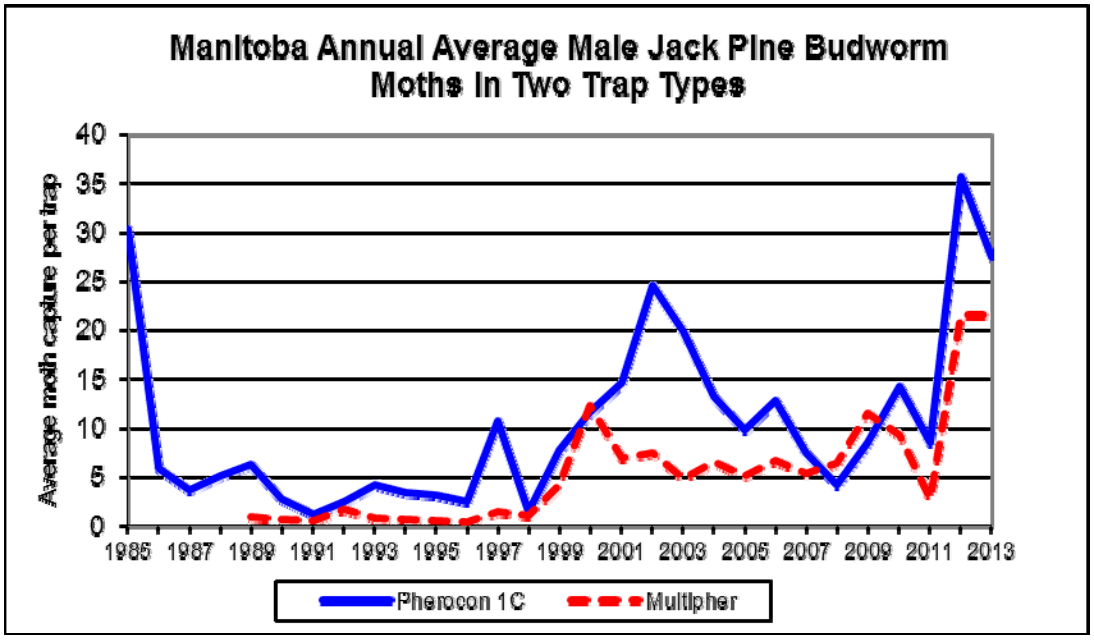
Location	2012 moth capture/trap	2013 moth capture/trap	% change
Northwest Region	152	151	-1%
Northeast Region	548	424	-23%
Western Region	378	367	-3%
Interlake Region	126	64	-49%
Eastern Region	24	20	-17%

Jack pine budworm – *Choristoneura pinus pinus*

Defoliation by jack pine budworm, continues to be negligible throughout the jack pine (*Pinus banksiana*) forests in Manitoba. Adult male moths of jack pine budworm are captured with pheromone-baited traps. This trapping method is being evaluated as an early warning method for outbreaks and a supplemental technique to defoliation predictions by egg mass density surveys.

In 2013, the trapping location were Belair, Shilo and Nopiming. Two trap types, Pherocon 1C and MULTIPHER®, are being field tested for capture efficiency using a 0.03% or 100 µg concentration of pheromone lure. In 2013, the average number of male moths decreased slightly in both the Pherocon and MULTIPHER® traps (Figure 2). This year's average was 27.4 moths per Pherocon trap and 21.5 moths per MULTIPHER® trap.

Figure 2: Annual average capture of male jack pine budworm moths in two trap types.



Dutch elm disease – *Ophiostoma novo-ulmi*

Provincial Dutch elm disease (DED) sanitation crews removed 5,309 trees in 2012/13; 828 within the DED buffer zone of Winnipeg and 4,481 throughout the remainder of the province. The City of Winnipeg removed 3,696 elms and Brandon removed 313 elms. Total elm tree removals were 10,326.

In 2013, Cost-Sharing Agreements were administered within 33 communities. Provincial survey crews marked 6,731 elms for removal (3,294 within the Winnipeg buffer zone, 382 in the City of Brandon and 3,055 in and around the 33 Cost-Sharing Agreement communities). In addition, 210 elm firewood piles were identified for removal. In the City of Winnipeg, 5,671 elms were marked for removal.

Dutch elm disease research

Previous research conducted by MCWS in partnership with the University of Manitoba identified that the rapid removal of trees infected with DED does reduces the disease incident within a community. This research also noted that not all tree have the same risk of spreading the disease as some trees are more attractive to the native elm bark beetle (*Hylurgopinus rufipes*), the vector for disease transmission of DED in Manitoba. This next phase of the research, conducted in partnership with the City of Winnipeg and the University of Manitoba, started in 2013. The goal is to develop a field method to prioritize and identify those trees that are at high risk of disease transmission for DED rapid removal.

Elm bark beetle monitoring – *Scolytus multistriatus* and *Scolytus schevyrewi*

In 1982, MCWS began monitoring for presence of the invasive forest pest, the smaller European elm bark beetle (*Scolytus multistriatus*) which is another vector of Dutch elm disease in Canada. Pheromone traps are situated at several locations throughout southern Manitoba and until 2006 only eight specimens of *S. multistriatus* had been captured. In 2011, an adult of *S. multistriatus* was captured. Numbers of *S. multistriatus* continued to increase with six beetles caught at three locations in 2012. In 2013, no *S. multistriatus* were caught.

In 2007, eleven adults of a new invasive forest pest, banded elm bark beetle, *Scolytus schevyrewi,* were captured in Otterburne and positively identified by the Canadian Food Inspection Agency (CFIA). This new invasive insect to Canada attacks and breeds in both American and Siberian elm and has the potential to transmit Dutch elm disease. Since its introduction several *S. schevyrewi*, have been captured in 2008, 2009, 2011 and 2012. In 2013, 18 *Scolytus schevyrewi* were caught at four locations within Manitoba.

European gypsy moth – *Lymantri dispar*

European gypsy moth, moths continue to be found in Manitoba in very low numbers. The management program conducted in the spring of 2012 in conjunction with the City of Winnipeg and CFIA successfully eradicated European gypsy moth from the management area within the city of Winnipeg. There are seven new detections in Manitoba; all of these new detection were single moth detections. No management program is needed for 2014. Monitoring for this invasive forest pest will continue in 2014 with trap delineation deployed by the CFIA

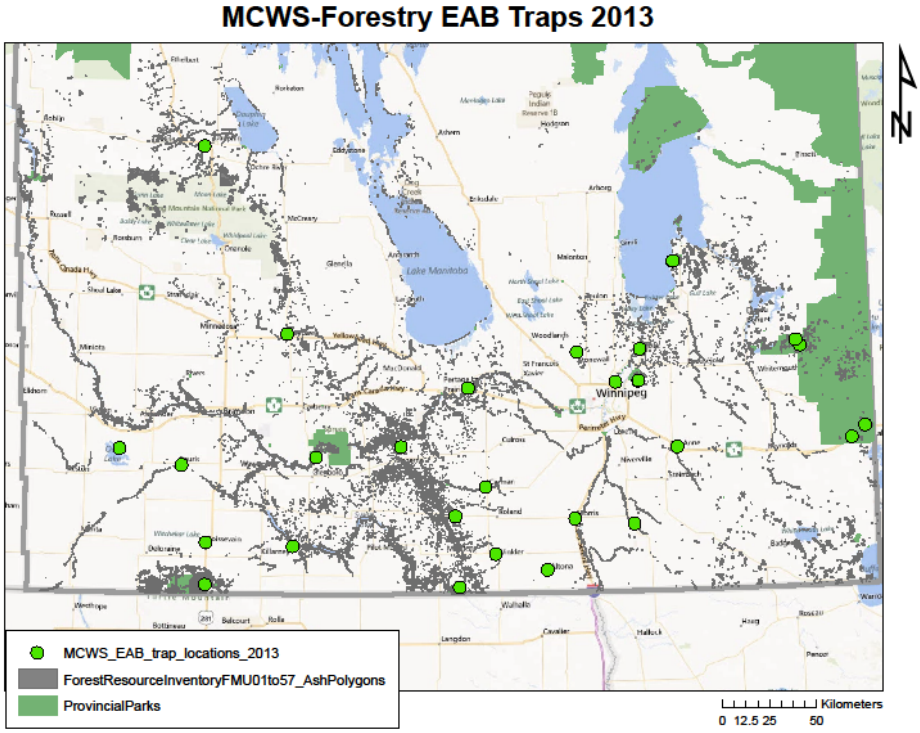
Invasive forest pests and movement of firewood

Manitoba is concerned about the spread of invasive forest insects and diseases through the movement of firewood. Since 2008, four wood collecting bins have been established on major highways at the provincial boundaries: two along the TransCanada Highway and one each at Highways 5 and 16. Manitoba Conservation and Water Stewardship is asking the public not to transport firewood into the province and to deposit all wood they are transporting in the bins. For 2013, travelers deposited pine, ash, oak and other tree species, in both bins along Highway 1 and in bins along Highways 16 and 5. A total of 223 pieces of firewood were deposited by the public. Firewood is inspected for signs of insect activity and burned.

Emerald ash borer – *Agrilus planipennis*

Ash species (*Fraxinus* spp.) are a cornerstone along riparian forest and within Manitoban communities. Planning and preparation continues within Manitoba for the invasive forest insects, emerald ash borer (EAB). To aid in EAB detection MCWS deployed 30 green prism traps placed at high risk location within the province. Trap deployment is coordinated between the City of Winnipeg, MCWS, CFIA and Trees Winnipeg. The location of the green prism traps deployed by MCWS can be seen in figure 3. All traps in Manitoba were found to be negative for the presence of EAB.

Figure 3: Map of emerald ash borer traps deployed by Manitoba Conservation and Water Stewardship, 2013.



Municipalities and communities are encouraged to start monitoring for EAB within their community with technical support provided from the province. In 2013, five additional communities purchased green prism traps to complement the current ongoing effort by the province.

Public education and outreach

Increasing public knowledge and understanding of forest health issues including the risk associated with firewood movement and invasive species management is important to the Province of Manitoba. In 2013, forest health staff participated in 14 trade shows attended by tens of thousands, provided 12 presentations to special interest groups and responded to 555 public inquiries.

SESSION III: NORTH OF 60 REPORT

SÉANCE III : AU NORD DU 60e PARALLÈLE

NORTHWEST TERRITORIES REPORT

Mike Gravel, Jakub Olesinski
Government of the Northwest Territories, Environment and Natural Resources

The Government of the Northwest Territories' Department of Environment and Natural Resources (ENR) delivers forest health monitoring across the NWT. Annual aerial forest health surveys concentrate in areas identified as high risk, i.e. along major rivers and waterways. In 2013, aerial surveys encompassed over 4,000 km of flight routes.

Overall, 141,268 ha of the NWT were mapped as being affected by spruce budworm (*Choristoneura freemani*), aspen serpentine leafminer (*Phyllocnistis populiella*), willow blotch leafminer (*Micrurapteryx salicifoliella*), and the new addition to NWT – false hemlock looper (*Nepytia canosaria*).

Spruce budworm

Spruce budworm remains at relatively low levels since 2004 at 55,000 ha across the NWT in 2013, a 12% decrease (approximately 8,000 ha) from 2012. The majority of spruce budworm defoliation occurred in the Sahtu Region (64°30'N to 66°30'N) where the activity of this pest continues to be severe at or near the Arctic Circle (Fig. 1). Another severely impacted area was mapped along Slave River in the South Slave Region (Fig. 2).

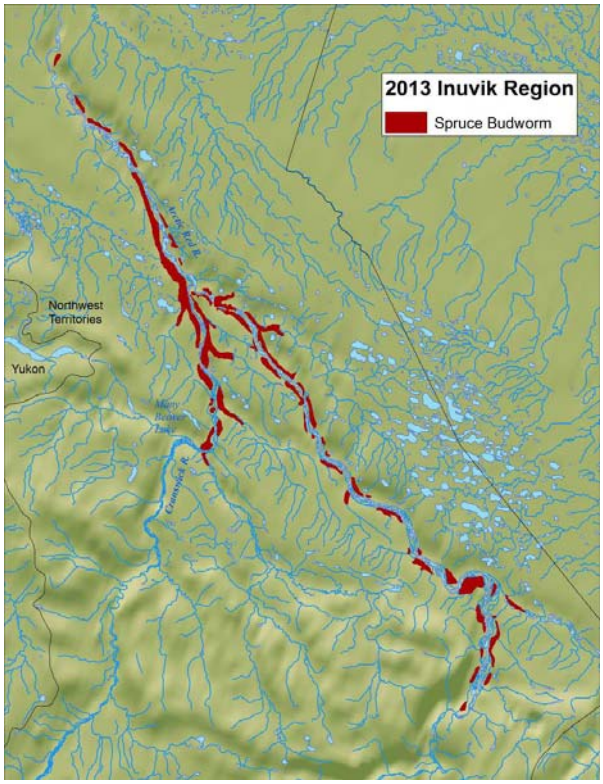


Figure 1. Areas along Arctic Red River near the Arctic Circle in Inuvik Region affected by spruce budworm (moderate to severe defoliation).

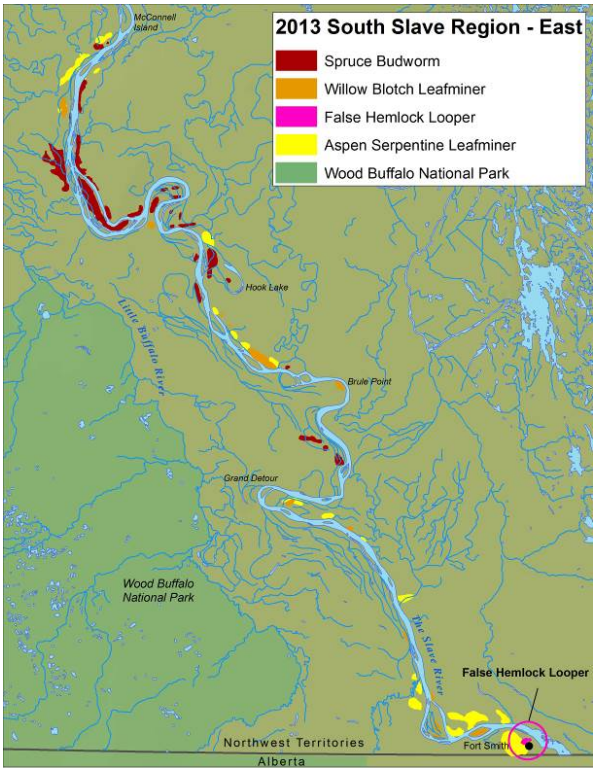


Figure 2. Areas along Slave River in the South Slave Region of the NWT affected by spruce budworm. Also shown are areas affected by aspen serpentine leafminer, willow blotch leafminer, and false hemlock looper (town of Fort Smith).

Aspen serpentine leafminer

Activity of aspen serpentine leafminer appears to fluctuate from year to year with significant decrease of 50% in affected areas across the NWT compared to the previous year. Overall, 81,000 ha were moderately and severely affected in 2013, mostly in Deh Cho Region. The northern most areas affected by this pest were mapped in the Sahtu Region near Tulita.

Willow blotch leafminer

Willow blotch leafminer is one of the prevalent pests in the NWT; however, only 5,148 ha of affected areas were observed in 2013 which was a 90% decrease compared to the previous year. The most affected areas were in the South Slave Region along the Slave River with small isolated patches in northern regions.

False hemlock looper

False hemlock looper is a new addition to pest activity in the southern NWT. It caused moderate defoliation of 120 ha of white spruce and jack pine in the town of Fort Smith. ENR will continue to monitor the area in following years to verify potential establishment or expansion of this pest in the southern NWT.

Mountain pine beetle

Mountain pine beetle (MPB) was officially confirmed in the southern NWT in 2012 at three pheromone baiting locations along SW NWT border. Overwinter survival was noted in March 2013, albeit at low levels. Infested trees were sanitized in May 2013 and no baiting occurred later in the year.

MPB pest risk analysis for NWT - Summary

Background

Given the eruptive nature of this bark beetle and its capability to spread in novel habitats, the NWT government views MPB as a potential threat to the forests and the people of NWT, and has started undertaking proactive measures to better understand this threat. One of these measures was the "Mountain Pine Beetle Risk Analysis for Northwest Territories Pine Forests" completed by JCH Forest Pest Management in 2013.

A pest risk analysis provides an overall risk rating for all of the inventoried pine stands of NWT by assessing the establishment and spread potential as well as the environmental, economic and sociocultural impacts. Risk assessment uses science based approaches to characterize the risk, and acknowledges uncertainties and gaps. Uncertainties are result of missing, inconsistent, or insufficient information. Identification of these uncertainties helps prioritize research needs.

Objectives of the Risk Analysis

1) Assess the likelihood of MPB invading NWT and the potential consequences to economic and environmental values, both in the short-term (2020) and long-term (2070);
2) Evaluate the potential response options that NWT government should consider to minimize both short- and long-term consequences;
3) Identify what additional information would provide a better understanding of the risk to NWT forests.

The level of risk for NWT pine forests

Overall risk as it pertains to likelihood of introduction, establishment, and spread potential of MPB in the NWT pine forests has been rated as low in the short term and medium in a long term. Similarly, impacts have been assessed as low in the short and medium in a long term. The highest impacts in the short term were assessed to be on pine forests that are considered prime boreal woodland caribou habitat, and in the long term also on caribou habitat as well as community protection.

Climate warming is considered a key factor that will contribute to potential expansion of MPB in the NWT. Favorable weather conditions for several consecutive years are predicted to help synchronize populations and promote populations characterized by one year cycle (univoltine populations). In addition, higher brood productivity (even twice as many offspring) in so called naïve pine habitats is expected to further contribute to potentially eruptive activity of MPB. However, the return to average climatic conditions with cold snaps of long enough duration may reduce or eliminate populations.

Current climatic suitability models indicate that the cycle of endemic – incipient – brief eruptive behavior is expected to occur through the next 50 years and may be the signature of MPB in NWT unless new models indicate otherwise.

Key considerations for NWT government to minimize potential impact of MPB

1) Support research in the biology and epidemiology of MPB in novel forests (pine habitats that have not had a history experiencing MPB), particularly in jack pine forests.
2) Delineate management zones to differentiate between values (i.e. communities and boreal woodland caribou).
3) Provide aerial and ground overview survey training to staff.
4) Define the optimum tree-fading time period in northern forests for the purposes of aerial surveys.
5) Reduce uncertainties by conducting ground assessments of populations in easily accessible infestations.
6) Address remaining uncertainties as time and funding permits.

Acknowledgments

We wish to acknowledge Roger Brett, Supervising Forest Health Technician, Canadian Forest Service, Northern Forestry Centre, for his continuous exceptional contribution to our Forest Health Program. Roger has been a major resource in our Forest Insect and Disease Surveys for many years.

YUKON REPORT

NOT AVAILABLE / NON DISPONIBLE

SESSION IV: UNITED STATES REPORT

SÉANCE IV : RAPPORT DES ÉTATS-UNIS

OVERVIEW OF FOREST PEST CONDITIONS IN THE U.S.A.

NOT AVAILABLE / NON DISPONIBLE

SESSION V: PESTICIDE REGULATIONS, ALTERNATIVES, MINOR USE

Chair: *Michael Irvine*
Ontario Ministry of Natural Resources

SÉANCE V : RÉGLEMENTS SUR LES PESTICIDES, SOLUTIONS POSSIBLES, USAGE LIMITÉ

Président : *Michael Irvine*
Ministère des Richesses naturelles de l'Ontario

THE CANADIAN GROWER PRIORITY DATABASE: PRIORITIZING FOREST PEST CONTROL PRODUCT NEEDS

Stephen Crozier

Health Canada, Pest Management Regulatory Agency, Sir Charles Tupper Building
2720 Riverside Drive, Ottawa, Ontario K1A 0M2

The Canadian Grower Priority Database (GPD) was established in 2010 to provide a means for agricultural producers to identify and prioritize those pest control products for which they did not currently have access on the Canadian market. Since that time, over 5,000 grower priorities have been identified and ranked, and over 750 of these priorities are now registered for use in Canada. PMRA is looking to expand the GPD to include forestry commodities and is investigating interest within the sector. The presentation outlines the structure and function of the GPD as a potential means for the forest pest management industry to communicate and prioritize their pest control needs and validating those priorities via a screening committee consisting of individuals within the forest pest management sector.

LA BASE DE DONNÉES SUR LES PRIORITÉS DES PRODUCTEURS DU CANADA : PRIORISER LES BESOINS EN MATIÈRE DE LUTTE CONTRE LES RAVAGEURS FORESTIERS

La Base de données sur les priorités des producteurs canadiens (BDPPC) a été créée en 2010 pour fournir aux producteurs agricoles un moyen d'identifier et de prioriser les produits antiparasitaires pour lesquels ils n'avaient pas accès sur le marché canadien. Depuis ce temps, plus de 5 000 priorités ont été identifiées et classées, et plus de 750 de ces produits jugés priorités sont maintenant homologués au Canada.

L'ARLA cherche à élargir la base de données pour y inclure les produits forestiers et elle étudie actuellement le niveau d'intérêt au sein de ce secteur. Cette présentation décrit dans les grandes lignes la structure et la fonction de la BDPPC comme un moyen potentiel pour l'industrie de la gestion des ravageurs forestiers de communiquer et de hiérarchiser leurs besoins en matière de lutte contre les ravageurs et de valider ces priorités avec un comité de sélection composé de personnes provenant du secteur de la gestion des ravageurs forestiers.

BIOPESTICIDES – A REGULATORY OVERVIEW

James Elwin

Senior Evaluator, Microbial and Biochemical Evaluation Section, Health Canada, Pest Management Regulatory Agency, Health Evaluation Directorate
2720 Riverside Drive, Ottawa, Ontario K1A 0M2

Globally, biopesticides continue to gain broad market adoption. In North America, biologically derived crop chemistry (i.e., products derived from naturally occurring microorganisms, plant extracts and other organic materials) is gaining broad market attention in the agricultural and forestry (including urban) sectors. Regulatory approval for use in Canada remains a mandatory step in gaining market share. Presented here is a broad overview of the current regulatory approach taken by the PMRA and issues important for the registration of biopesticides, which fall under three general categories: a) microbials, b) pheromones and other semiochemicals, and c) non-conventional pesticides (formerly low-risk biochemicals). Topics covered include steps in the registration process such as pre-submission consultations, data quality challenges and formulant issues.

BIOPESTICIDES – UN EXAMEN RÉGLEMENTAIRE

Au niveau mondial, les biopesticides continuent d'être largement adoptés par le marché. En Amérique du Nord, la chimie agricole d'origine biologique (c.-à-d. les produits tirés de microorganismes d'origine naturelle, d'extraits de plantes et d'autres matières organiques) capte l'attention générale du marché dans les secteurs agricoles et forestiers (y compris en milieu urbain). L'approbation réglementaire de leur utilisation au Canada demeure une étape obligatoire pour acquérir une part du marché. On présente ici un aperçu général de l'approche réglementaire courante de l'ARLA et des enjeux importants pour l'inscription des biopesticides entrant dans trois grandes catégories : a) agents microbiens, b) phéromones et autres produits mi-chimiques et c) pesticides non conventionnels (anciennement appelés produits biochimiques à faible risque). Les sujets abordés comprennent les étapes du processus de réglementation, comme les consultations préalables, les problèmes concernant la qualité des données et les problèmes liés aux formulants.

PMRA UPDATE

Terry Caunter

Health Canada, Pest Management Regulatory Agency

NOT AVAILABLE / NON DISPONIBLE

SESSION VI: EASTERN PEST MANAGEMENT ISSUES

Chair: *Taylor Scarr*
Ontario Ministry of Natural Resources

SÉANCE VI : LA RÉPRESSION DES RAVAGEURS DANS L'EST

Président : *Taylor Scarr*
Ministère des Richesses naturelles de l'Ontario

ONTARIO REPORT

Status of Important Insects, Diseases, and Abiotic Events Affecting Forest Health in Ontario 2013

Taylor Scarr, Dan Rowlinson, and Richard Wilson
Ontario Ministry of Natural Resources

Introduction

Forest health monitoring has been conducted in Ontario since the 1930s under a partnership arrangement between the Ontario Ministry of Natural Resources (OMNR) and Natural Resources Canada – Canadian Forest Service (CFS). Since 2008 the field program has been designed and led by OMNR, with CFS providing scientific advice, and leading research projects relevant to monitoring, detection, control, and impact assessment.

In 2013 the scientific and program direction was provided by OMNR's Forest Health and Silviculture Section. The program implementation and coordination was done by OMNR's Inventory, Monitoring, and Assessment Section. The province was divided into work areas, with nine Forest Health Technical Specialists (Figure 1) conducting the surveys and monitoring, and participating in several research projects with CFS.

Figure 1. Forest Health Monitoring work areas, 2013

Insect diagnostics was done through a three-way partnership with OMNR, CFS, and the Invasive Species Centre. Samples collected by the program were identified by the Invasive Species Centre. CFS supported insect diagnostics by providing verification of the original insect identification, and access to the Great Lakes Forestry Centre laboratory and insect collection. Results of the insect collections were entered into the national database managed by CFS.

Disease samples were identified at the Ontario Forest Research Institute. The aerial mapping results of major forest disturbances were collated into maps and graphical reports by OMNR's Forest Health and Silviculture Section.

The annual forest health monitoring program has five components:

- Aerial mapping of major forest disturbances (e.g., insect outbreaks, weather events, decline, and disease damage) to quantify their extent and severity.
- Biomonitoring through the collection of insect and disease samples to track occurrence, changes in range or host species attacked, or changes in abundance.
- Special surveys for pests of interests, particularly invasive species, or pests affecting high value trees such as plantations or seed orchards.
- Conducting or supporting research projects in forest entomology, pathology, or weather impacts.
- Temporary and permanent sample plots to monitor health of forest ecosystems.

All forested land in the province, regardless of ownership (e.g., Crown land, private land, county forests, First Nations reserves, provincial parks, federal parks) is monitored each year. The forest pests which are surveyed include native and introduced species. Abiotic events include extreme occurrences such as drought, pollution, frost, freezing, snow, ice, and scorch. Decline events reported by the program can be caused by biotic (e.g., insects or diseases) or abiotic (e.g. drought or pollution) factors, or a combination of these factors.

Weather patterns

Weather affects the growth, phenology (timing of the different life cycle stages), dispersal, and survival of forest insects. Forest pathogens, especially leaf diseases and needle cast fungi, can become much more common during periods of wet or humid weather. Also, extreme weather events such as drought, snowfall, flooding, tornadoes, microbursts, frost, freezing, scorch, and rapid fluctuations in temperature can affect tree health, causing foliage or twig death, or tree decline or mortality.

Although there were exceptions in some parts of the province, overall the 2013 growing season was cooler and wetter than normal. Spring arrived late, especially in northern Ontario where cold temperatures and snow occurred in April, May, and early June. Temperatures rose towards the end of June, with heat alerts and day time highs in southern Ontario exceeding 30^{o}C. Normal to below-normal temperatures and ample rainfall continued into July and August. Although September saw some warm weather, parts of the province saw high amounts of rainfall that led to significant flooding.

The 2013 weather generally favoured tree growth and health, while forest insects would have done less well because of the cooler temperatures. Fungi likely benefited from the cool wet weather, but did not flare up into major forest disturbances.

Extreme weather and abiotic events

Unlike 2012, there were no drought effects mapped in 2013. An assessment of the impacts of the 2012 drought was undertaken in 2013. These assessments found 2,262 ha of mortality to red pine stands (Figure 2), and 464 ha of mortality to hardwood trees in south central and south eastern Ontario (Figure 3).

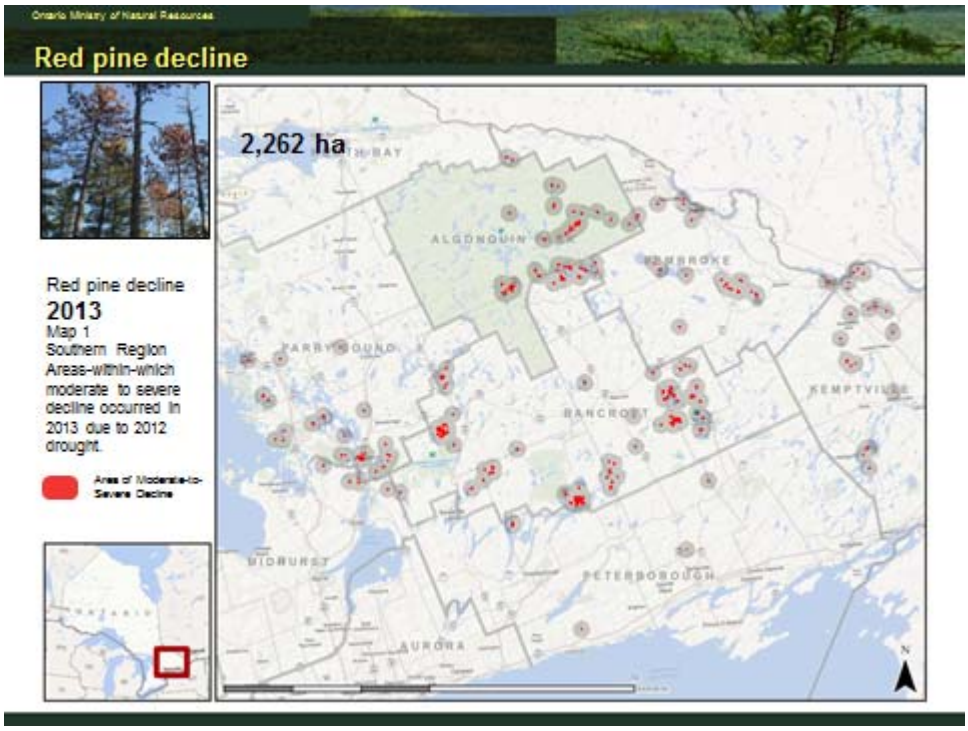


Figure 2. Area-within-which drought in 2012 resulted in moderate-to-severe decline and tree mortality in red pine stands in 2013.

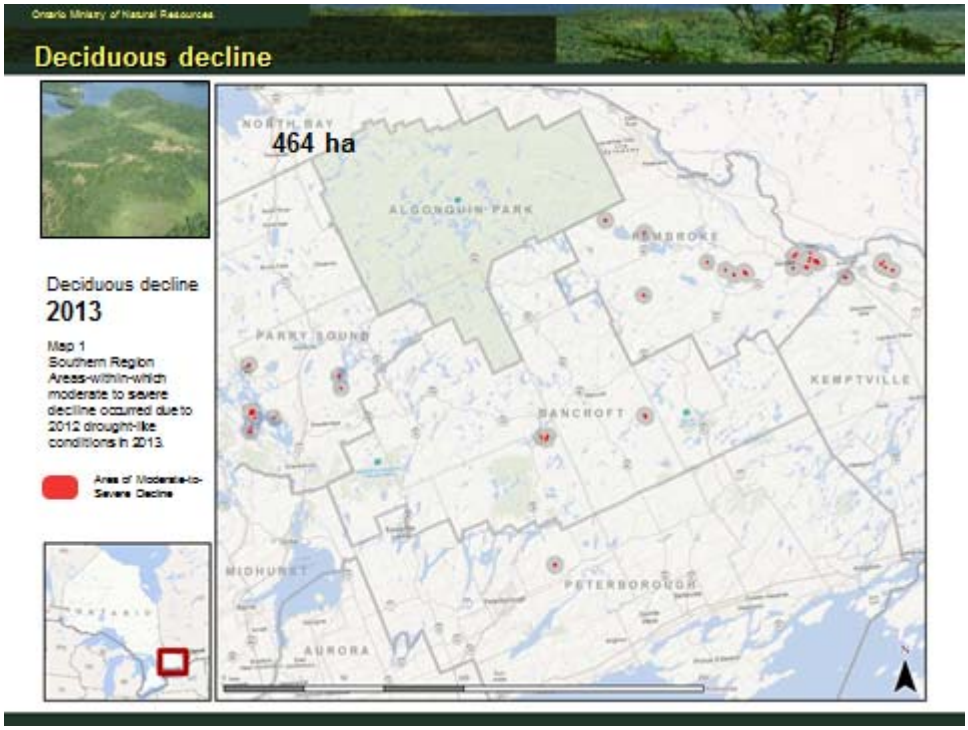


Figure 3. Area-within-which drought in 2012 resulted in hardwood tree decline and mortality in 2013.

A late spring frost in 2013 resulted in damage to trembling aspen trees over a large portion of the province. Much of this could not be aerially mapped because it consisted of scattered copses of trees affected from Ottawa to Sault Ste. Marie. Damage was severe enough in the northwest to permit aerially mapping, with 281,794 ha of damage to trembling aspen (Figure 4).

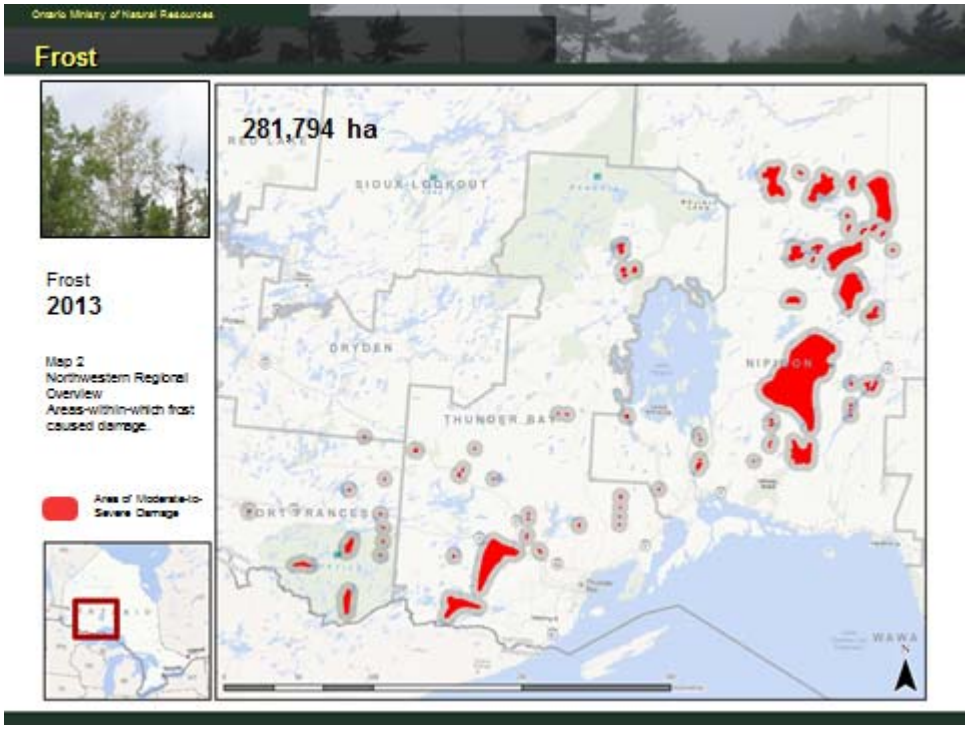


Figure 4. Area-within-which frost caused moderate-to-severe damage in 2013.

A heavy snowfall during in October 2012 resulted in a large area of damage in the northwest. Aerially mapping in 2013 found 3,210,318 ha of damage, most of which occurred next to the Manitoba border in one large block (Figure 5). Damage consisted of trees being bent over, uprooted, or with broken stems or leaders.

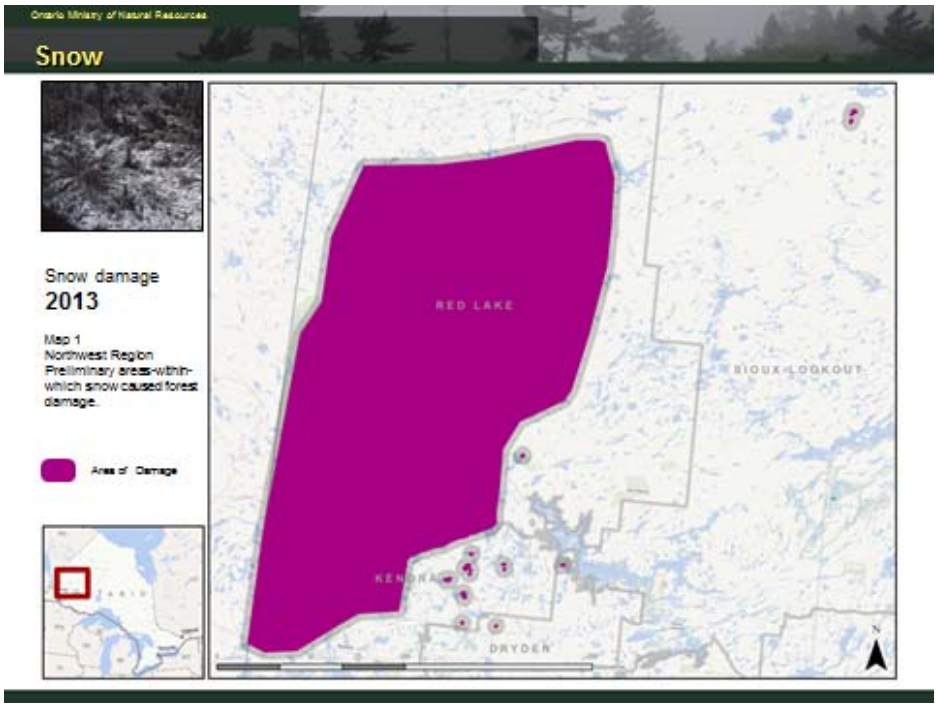


Figure 5. Area-within-which heavy snowfall caused moderate-to-severe damage to conifer and hardwood trees in 2013 (3,210,318 ha).

Blowdown from high wind storms was common in 2013. A total of 5,276 ha was affected, with severe wind damage occurring in all three regions of the province (Figure 6). There were 19 tornadoes in 2013 compared to an annual average of 13. Most of the tornadoes did not occur over forested areas, so blowdown from tornadoes was relatively minor in 2013. The increased number of tornadoes is at least partly a result of the use by the public of hand-held recording devices, making it easier to confirm the existence of a tornado.

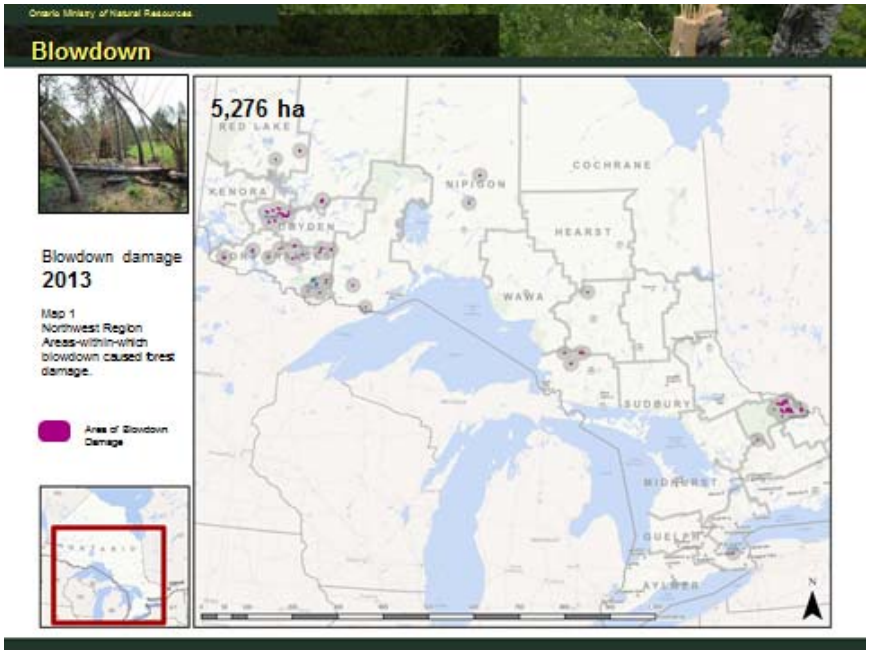


Figure 6. Area-within-which blowdown resulted in moderate-to-severe damage to hardwood and conifer trees in 2013.

Insect infestations

The jack pine budworm (*Choristoneura pinus pinus* Freeman) outbreak which had been steadily declining from its peak of 740,116 ha 2006, actually increased for the second year in a row in 2013. As in 2012, the moderate-to-severe defoliation was limited to northwestern Ontario, with 91,685 ha occurring in Sioux Lookout District, northwest of the town of Sioux Lookout (Figure 7). This was an approximately 50% increase over the 61,036 ha of defoliation in the same general area the previous year. The 2012 defoliation was more than double the 27,765 ha in 2011 (Figure 8).

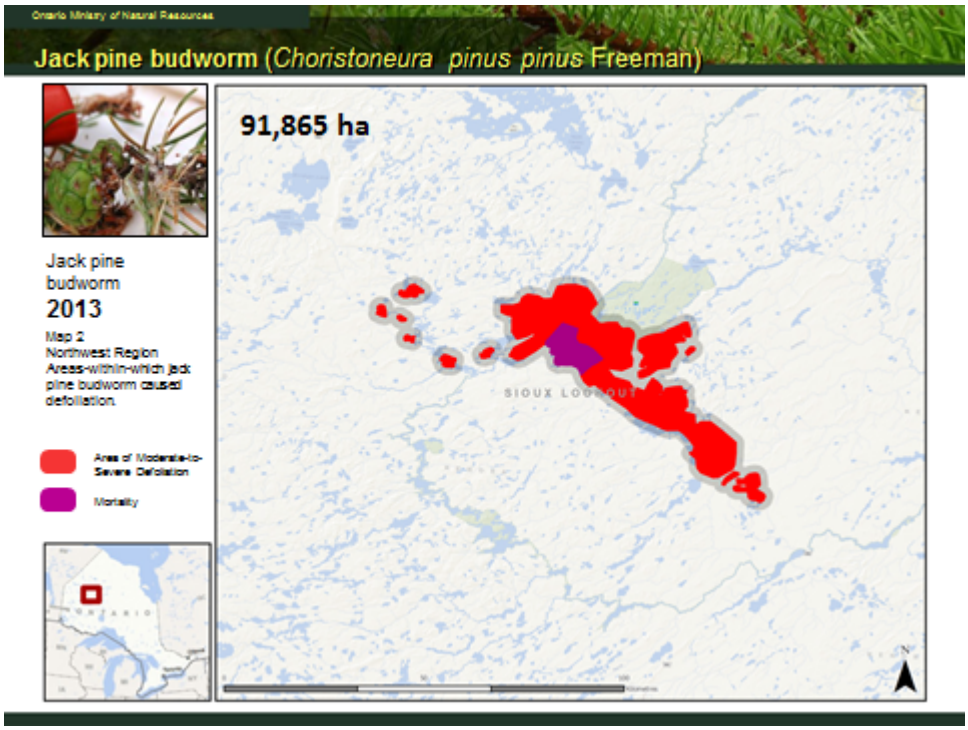


Figure 7. Area-within-which jack pine budworm caused moderate-to-severe defoliation and tree mortality in 2013.

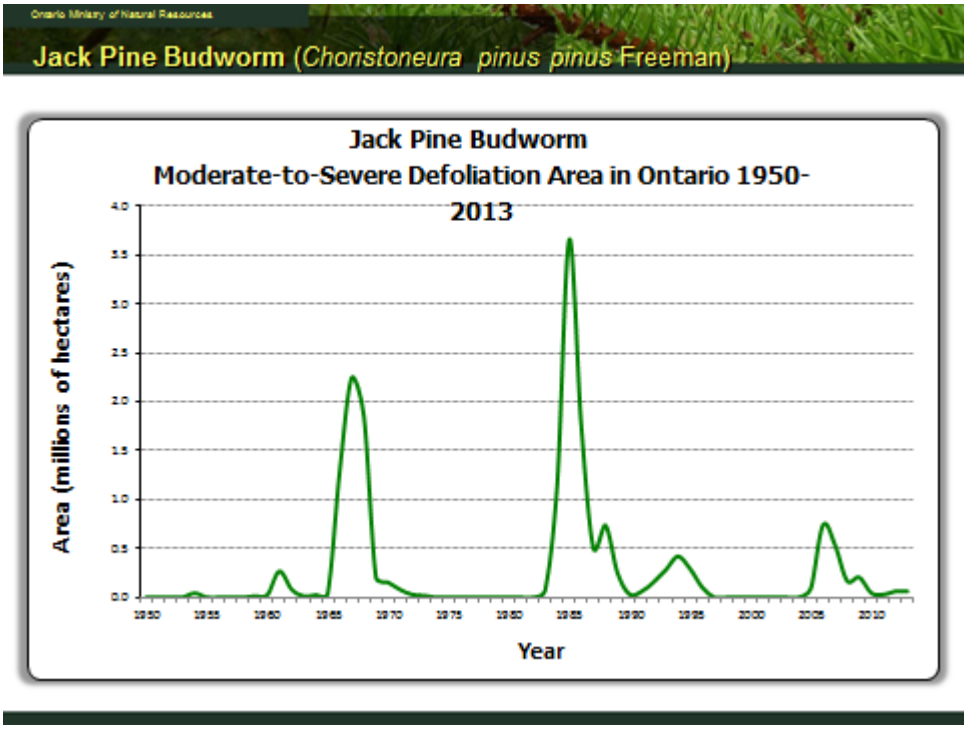


Figure 8. Area-within-which jack pine budworm caused moderate-to-severe defoliation in Ontario, 1950-2013.

These two consecutive years of increasing defoliation follow five years of decreasing populations. Total defoliation is still less than 100,000 ha. This makes it difficult to predict whether this is a temporary increase, or whether it signals the resurgence of the outbreak. The 2012 and 2013 defoliation occurred in an area not previously defoliated earlier in the current outbreak. There is limited forest management or timber harvesting in this area. Thus at this time, no insect management programs are expected to be undertaken. The jack pine budworm situation will continue to be monitored to determine whether the infestation continues to increase, or returns to endemic levels.

The spruce budworm (*Choristoneura fumiferana* Clemens) outbreak that has been persisting in the northeast between Sudbury, North Bay, and Temagami completely collapsed in 2013. Only 348 ha of moderate-to-severe defoliation occurred in 2013 (Figure 9), compared to 99,797 ha in 2012 (Figure 10). The 2013 defoliation occurred in small, scattered pockets from Sudbury to Lake Wahnapitae, North Bay, and Cobalt. Similarly, in 2013 there was no new tree mortality recorded caused by spruce budworm, compared to the 47,911 ha of tree mortality in 2012.

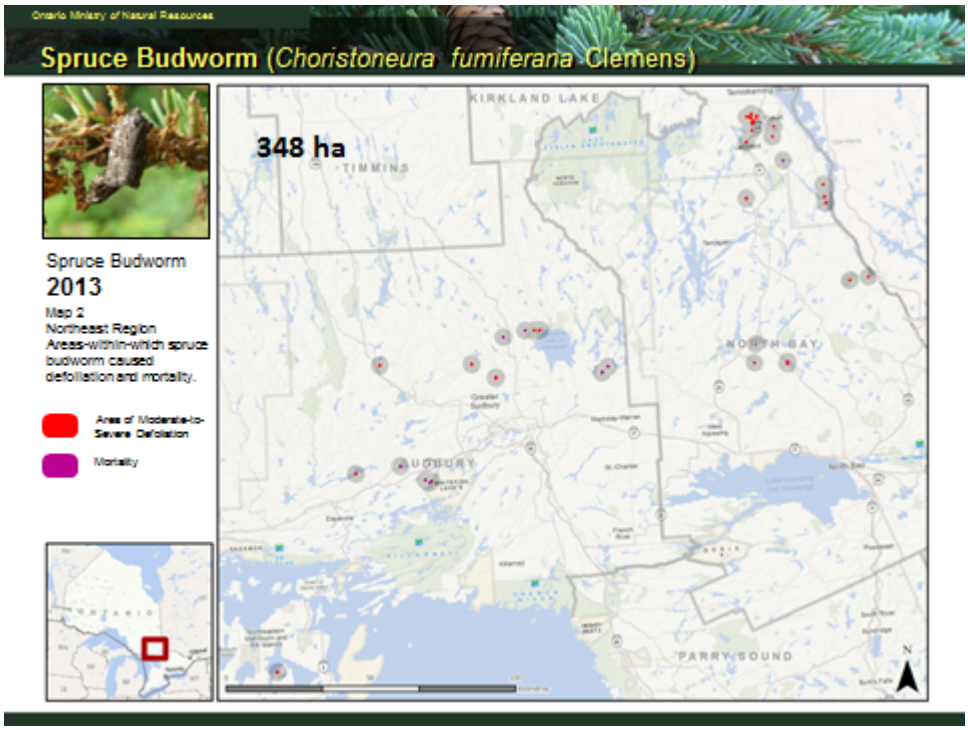


Figure 9. Area-within-which spruce budworm caused moderate-to-severe defoliation in Ontario in 2013.

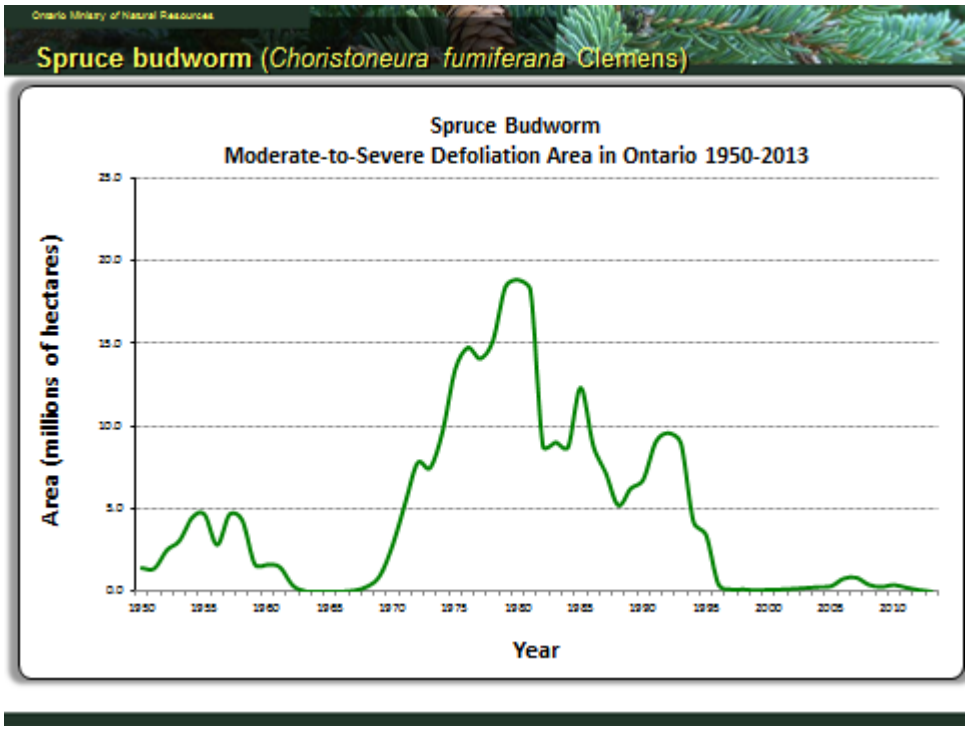


Figure 10. Area-within-which spruce budworm caused moderate-to-severe defoliation in Ontario, 1950-2013.

The population in northeastern Ontario is expected to remain at low levels for the next several years. No other defoliation by this insect is occurring elsewhere in the province, and none is expected within the next five years. Nonetheless, the susceptible forests of spruce and balsam fir across much of northern Ontario are beginning to reach age classes (i.e. > 40 years) preferred by spruce budworm. Spruce budworm pheromone trapping and

aerial surveys will continue to be done to detect any increasing populations which may signal the beginning of the next outbreak.

The forest tent caterpillar (*Malacosoma disstria* Hubner) outbreak in the northwest increased six-fold in 2013. Moderate-to-severe defoliation reached 191,832 ha and stretched from Red Lake to Kenora, Dryden, Sioux Lookout, and Nipigon districts (Figure 11). There was no defoliation in Thunder Bay or Fort Frances areas, although ground surveys found caterpillars present in these areas. The increased area affected in the northwest well above the 30,214 ha affected in 2012 Based on the historical pattern of outbreaks occurring every 10-12 years (Figure 12), the 2012-13 defoliation likely signals that a full-blown outbreak is beginning. This new outbreak has the potential to reach millions of hectares in size over the next few years. Concurrent outbreaks are also beginning in Manitoba, Saskatchewan, and Minnesota.

Forest tent caterpillar also continued to defoliate trees in southern Ontario. The area affected is much smaller than that in the northwest. In 2013 there were 12,303 ha of defoliation occurring in woodlots and forested areas near the southern part of Georgian Bay in Midhurst District (Figure 11). This is down slightly from the 17,767 ha in the same area in 2012. The southern Ontario defoliation is not expected to increase substantially in 2014. However, as the outbreak spreads in the northwest, and moves into northeastern Ontario, it can also be expected to include the central parts of Southern Region over the next several years.

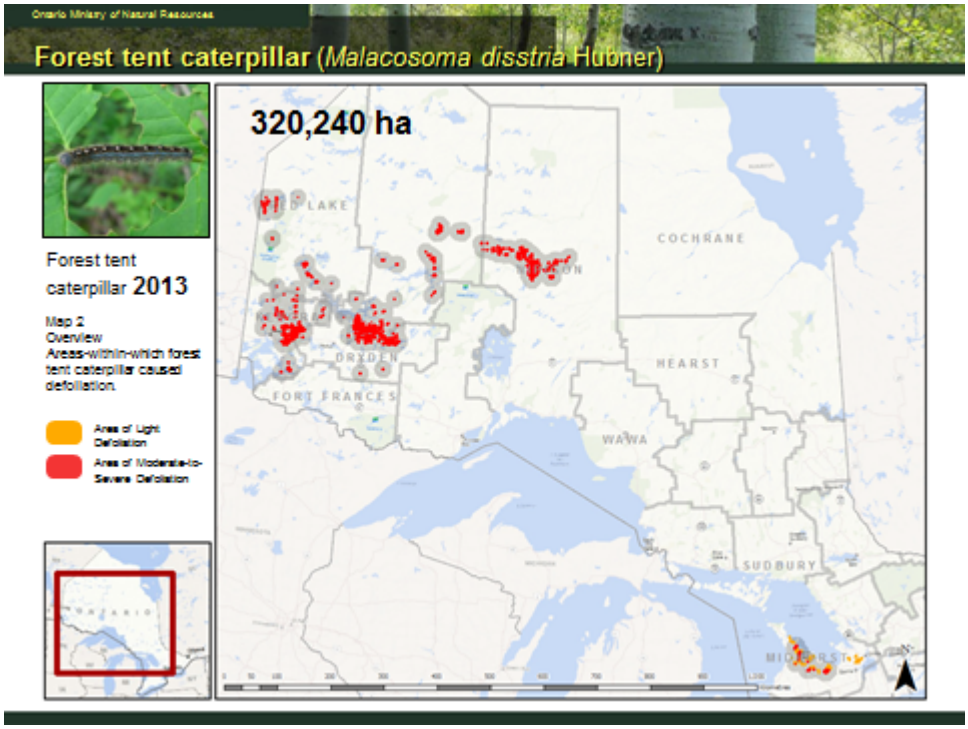


Figure 11. Area-within-which forest tent caterpillar caused defoliation in Ontario 2013.

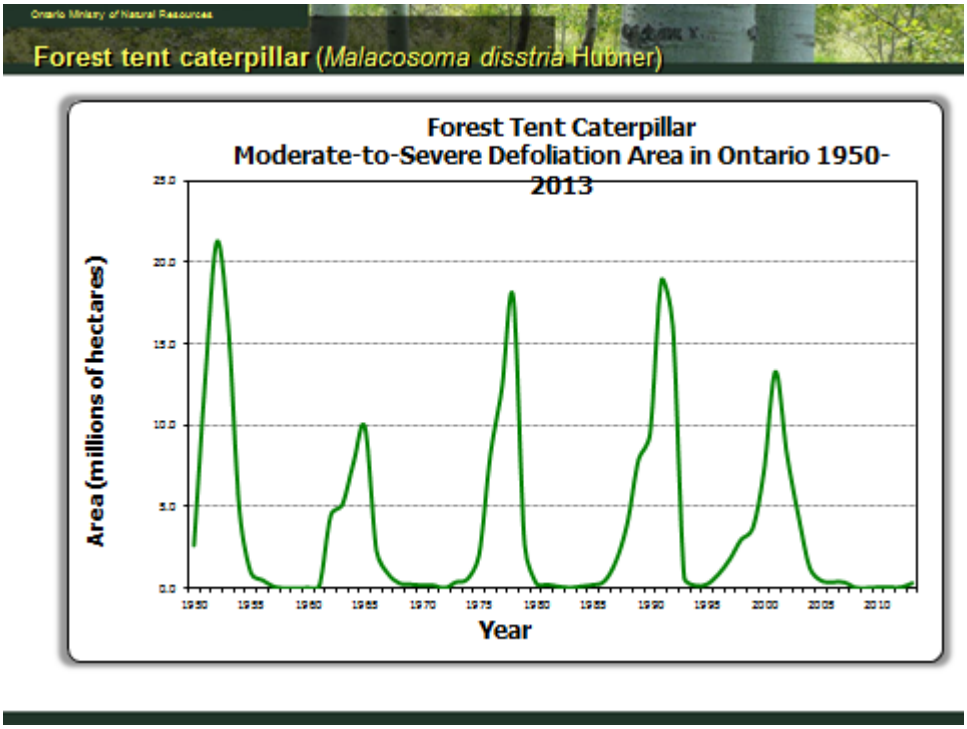


Figure 12. Area-within-which forest tent caterpillar caused moderate-to-severe defoliation in Ontario, 1950-2013.

For the second year in a row, gypsy moth (*Lymantria dispar* (L.)) caused moderate-to-severe defoliation on white birch trees growing on thin soils on rocky sites in and around Sudbury. Defoliation in 2013 reached 8,451 ha (Figure 13), which was very close to the 8,123 ha affected in 2012 (Figure 14).

Gypsy moth was found in southern Ontario where it caused only light defoliation affecting 737 ha near Sarnia in Aylmer District (Figure 13). The insect was commonly found during ground surveys across southern Ontario. There was also a significant population on oak trees in the Etobicoke area of Toronto, where the city conducted an aerial spray program with the bacterial insecticide B.t.k. in 2013.

The common occurrence of the insect in the south normally suggests there should be an increase in defoliation in 2014. However, the very cold temperatures during the 2013-14 winter have likely resulted in significant mortality of the eggs which typically die when temperatures drop below -20°C. Thus gypsy moth is not expected to erupt into an outbreak in southern Ontario in 2014.

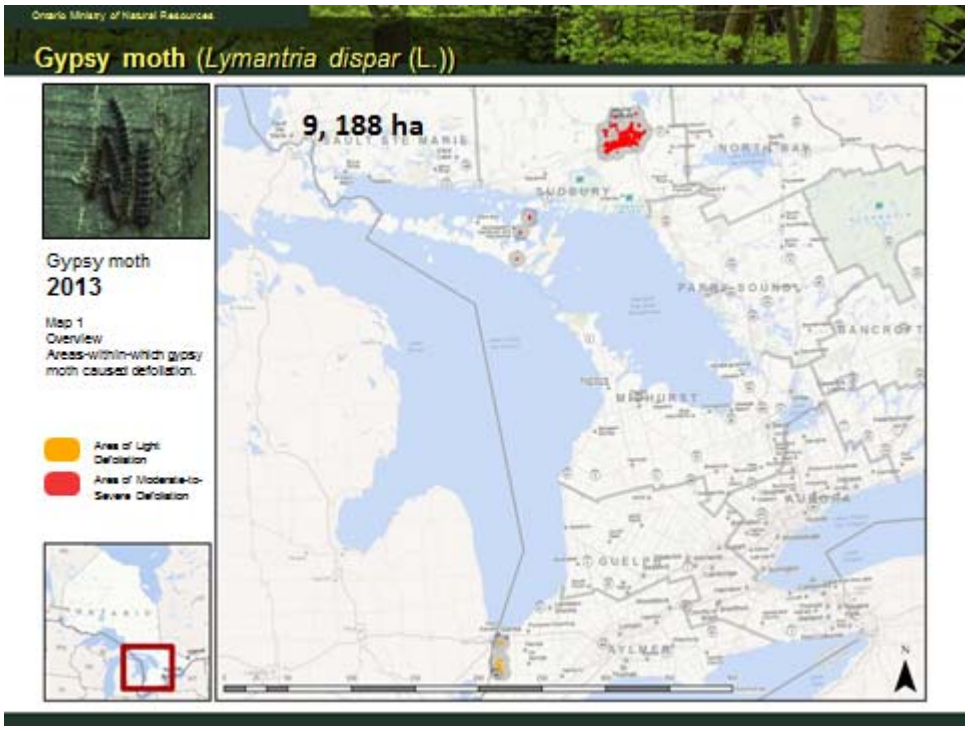


Figure 13. Area-within-which gypsy moth caused defoliation in Ontario in 2013.

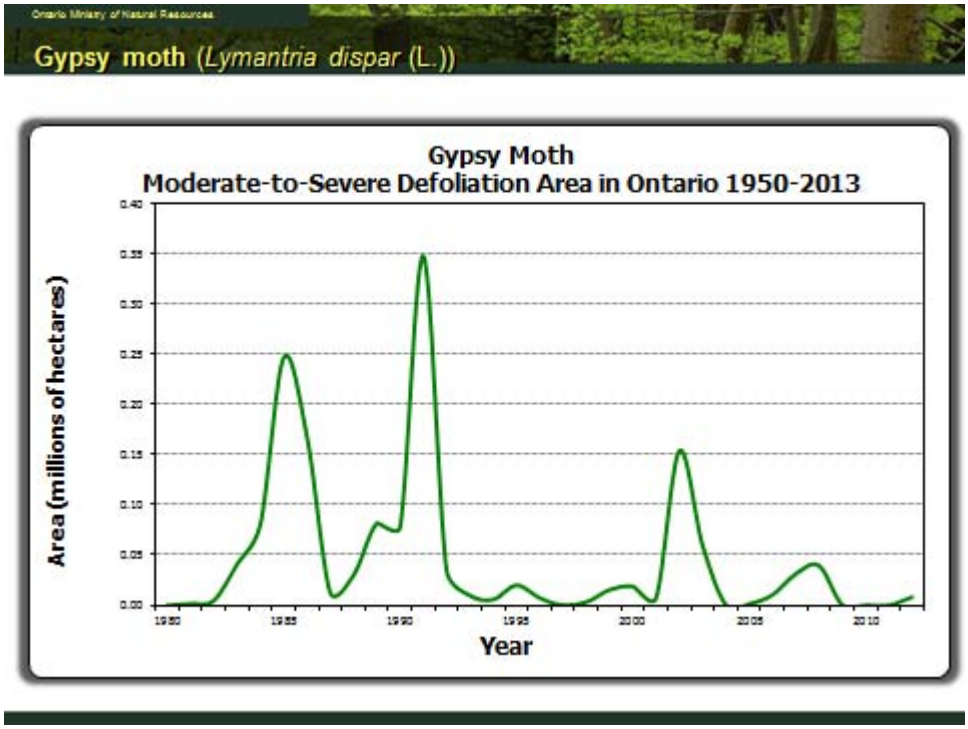


Figure 14. Area-within-which gypsy moth caused moderate-to-severe defoliation in Ontario, 1950-2013.

There were several other insect infestations worth noting in 2013:

- Larch casebearer (*Coleophora laricella* (Hubner)) has been defoliating tamarack trees across southern Ontario since 2001. Defoliation in 2013 occurred in scattered pockets in Southern Region, totaling 5,486 ha. This is slightly above the 5,015 ha affected in 2012, which was a substantial increase over the 1,591 ha in 2011.

- For the third consecutive year, birch skeletonizer (*Bucculatrix canadensisella* Chambers) and the fungus septoria leaf spot (*Septoria betulae* Pass.) caused late-season browning and early leaf-drop across much of northern Ontario. The two species often co-occurred on the same trees, and on the same leaves. The affected area was not aerially mapped, but ground observations found the event occurring from Kenora east to North Bay. The severity of this event (i.e., amount of leaves affected, and the proportion of trees affected in a stand), appeared to be much less than in 2012.

- For the second year in a row, cedar leaf miners (*Argyesthia* spp. and *Coleotechnites thujaella* (Kft.)) caused severe browning on eastern white cedar, affecting 6,209 ha in south central Ontario. This area is down considerably from the 30,486 ha affected in 2012.

- Aspen two-leaf tier (*Enargia decolor* Walker) continued to cause defoliation in 2013, with 22,450 ha of trembling aspen affected in Sault Ste. Marie, Wawa, and Chapleau districts.

Forest pathogens and tree decline

Most tree pathogens do not cause symptoms over large geographic areas to the point where they can be aerially mapped. Nonetheless, leaf diseases occasionally can be mapped when the damage is exceptionally severe. Despite the relatively cool wet weather of 2013, foliar diseases were not common. There were a few exceptions, such as tar spot (*Rhytisma* spp.) on maples, especially Norway maple in much of Ontario. This phenomenon also occurred in Quebec.

Similarly, spruce needle cast (*Chrysomyxa ledi* var. *groenlandicum* Savile) was common on black spruce in Red Lake, Kenora, Dryden, and Sioux Lookout districts. The high humidity in southern Ontario resulted in anthracnose leaf diseases being common on several hardwood species including maples, oaks, basswood, ash, and black walnut. Brown spot needle blight (*Mycosphaerella dearnessii* M.E. Barr) benefited from the wet weather, causing 167 ha of damage to needles of Scots pine in Sault Ste. Marie district, and white pine in Bancroft District. Dutch elm disease, which is ubiquitous within the range of elm in the province, continued to infect and kill vulnerable elm trees.

In late winter 2011-12, a significant thaw-freeze event caused extensive needle browning affecting 281,116 ha in northwestern Ontario. Follow-up assessments in 2013 found good tree recovery, with very little if any tree or branch mortality.

White pine browning and the fungus Dook's needle blight (*Lophophacidium dooksii* Corlett & Shoemaker) which is often associated with the browning of white pine needles, has been common in many parts of the province in previous years. The phenomenon was not noticeable, however, in 2013, with few if any trees showing symptoms.

Invasive species

Emerald ash borer (*Agrilus planipennis* Fairmaire) is regulated by the Canadian Food Inspection Agency (CFIA). There were several new finds of this insect in Ontario in 2013 by CFIA and OMNR. New areas included counties of Grey, Northumberland, Renfrew, Lanark, Simcoe, and Stormont, Dundas and Glengarry, the city of Kawartha Lakes, and Algoma District east of Sault Ste. Marie.

Tree mortality from this insect usually exceeds 99% of the ash trees in an area. Aerial surveys in 2013 showed new decline and mortality of 85,069 ha (Figure 14). Together with the cumulative mortality of 67,971 ha from 2004 to 2012 (Figure 14), the total area affected by emerald ash borer reached 153,040 ha.

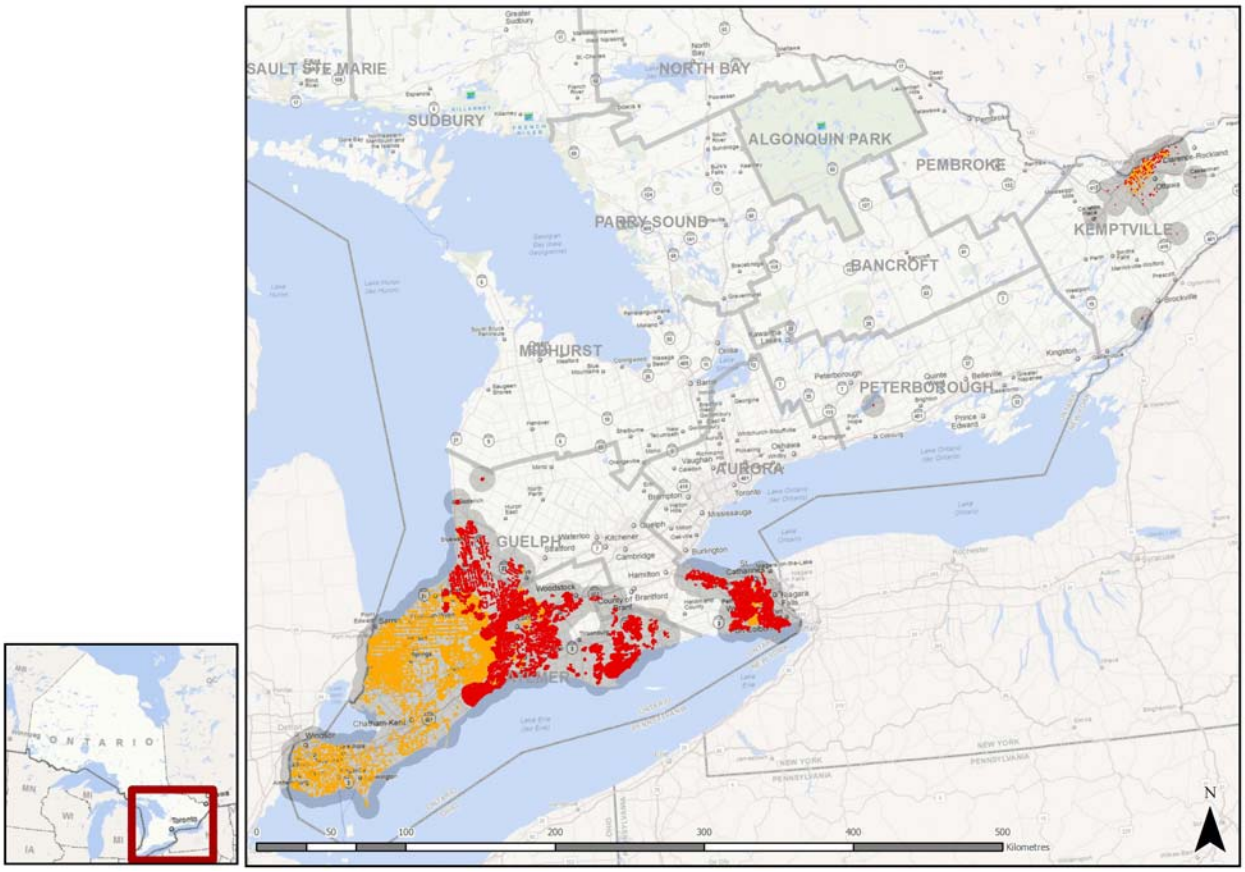


Figure 14. Area-within-which emerald ash borer caused tree decline and mortality in Ontario in 2013 (red) and cumulatively from 2004-2012 (yellow).

In 2013 the first releases of a biocontrol agent were made by the Canadian Forest Service as part of a long term strategy to reduce impacts caused by emerald ash borer. The larval parasitoid *Tetrastichus planipennisi* Yang, native to China, was released at three sites in southwestern Ontario. Follow-up assessments will be done in future years to determine establishment, and impacts on emerald ash borer populations.

On April 5, 2013, CFIA declared Asian long-horned beetle (*Anoplohora glabripennis* Motschulsky) eradicated from Toronto and Vaughan. The declaration was based on a program to cut and chip infested trees and host trees within 400 m, followed by five years of surveys which found no beetles or infested trees. In August 2013, a new infestation was found in Mississauga following the discovery of a beetle on a car. Subsequent surveys by CFIA, the cities of Toronto, Mississauga, and Brampton, and MNR found approximately 25 infested Norway and Manitoba maple trees. Infested trees were in the Mississauga area around Lester B. Pearson International Airport, with the exception of one tree found in an adjacent area within the city of Toronto. This infestation is now under an aggressive eradication program led by CFIA.

Hemlock woolly adelgid (*Adelges tsugae* Annand) was found by CFIA in 2013 infesting a single eastern hemlock tree in the Niagara River gorge. Subsequent surveys by CFIA and OMNR did not find any additional infested trees. This discovery follows the detection and subsequent destruction of five infested hemlock trees in the Etobicoke area of Toronto in 2012. Follow up surveys in the vicinity of the Etobicoke site found two additional infested trees in late fall 2013.

Beech bark disease, which is a combination of an invasive insect (beech scale, *Cryptococcus fagisuga* Linding) and an invasive stem fungus (*Nectria faginata* (Lohman et al.) Castl.) continued to spread in Ontario in 2013 (Figure 15). Damage continues to accelerate in several locations. Killbear Provincial, where severe tree damage has been creating safety hazards near campsites and general use areas, conducted an aggressive beech tree removal and sanitation program in 2013.

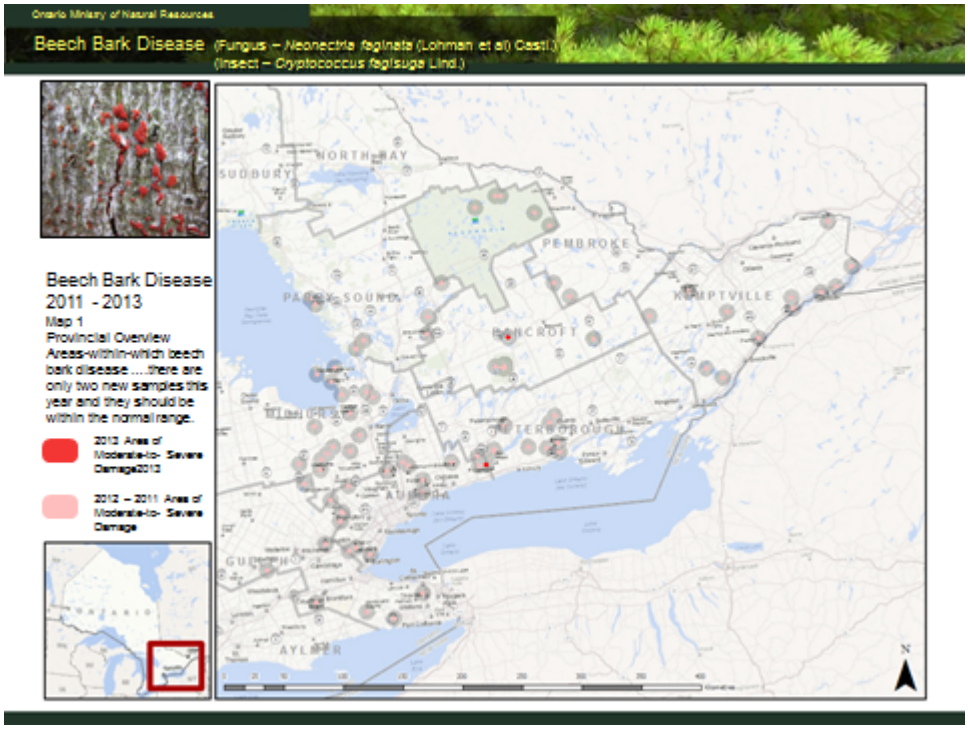


Figure 15. Locations where beech bark disease has been confirmed affecting beech trees in Ontario.

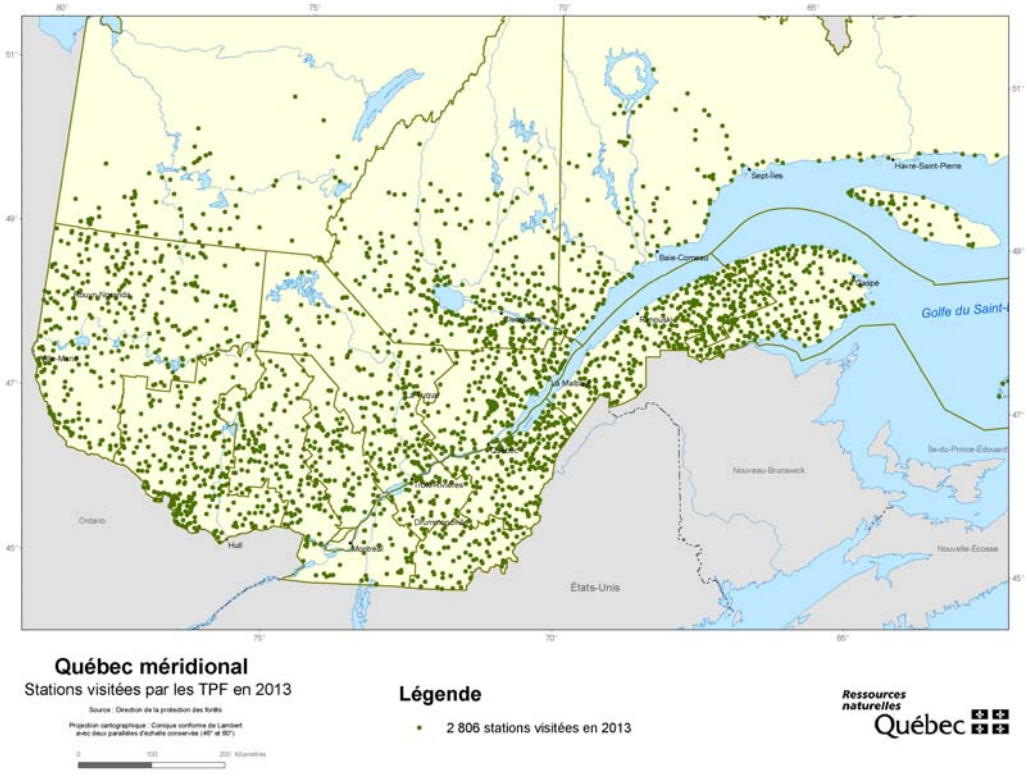
For the second year in a row, a pheromone trapping survey was done for walnut twig beetle (*Pityophthorus juglandis* Blackman), the vector for thousand canker disease (*Geosmithia morbida* sp. nov.). As in 2012, no walnut twig beetles were found in the Ontario traps.

RAPPORT DU QUÉBEC

Louis Morneau, Cédric Fournier, Julie Bouchard, Pierre Therrien, Danièle Pouliot, Louise Innes, Sébastien Bélanger

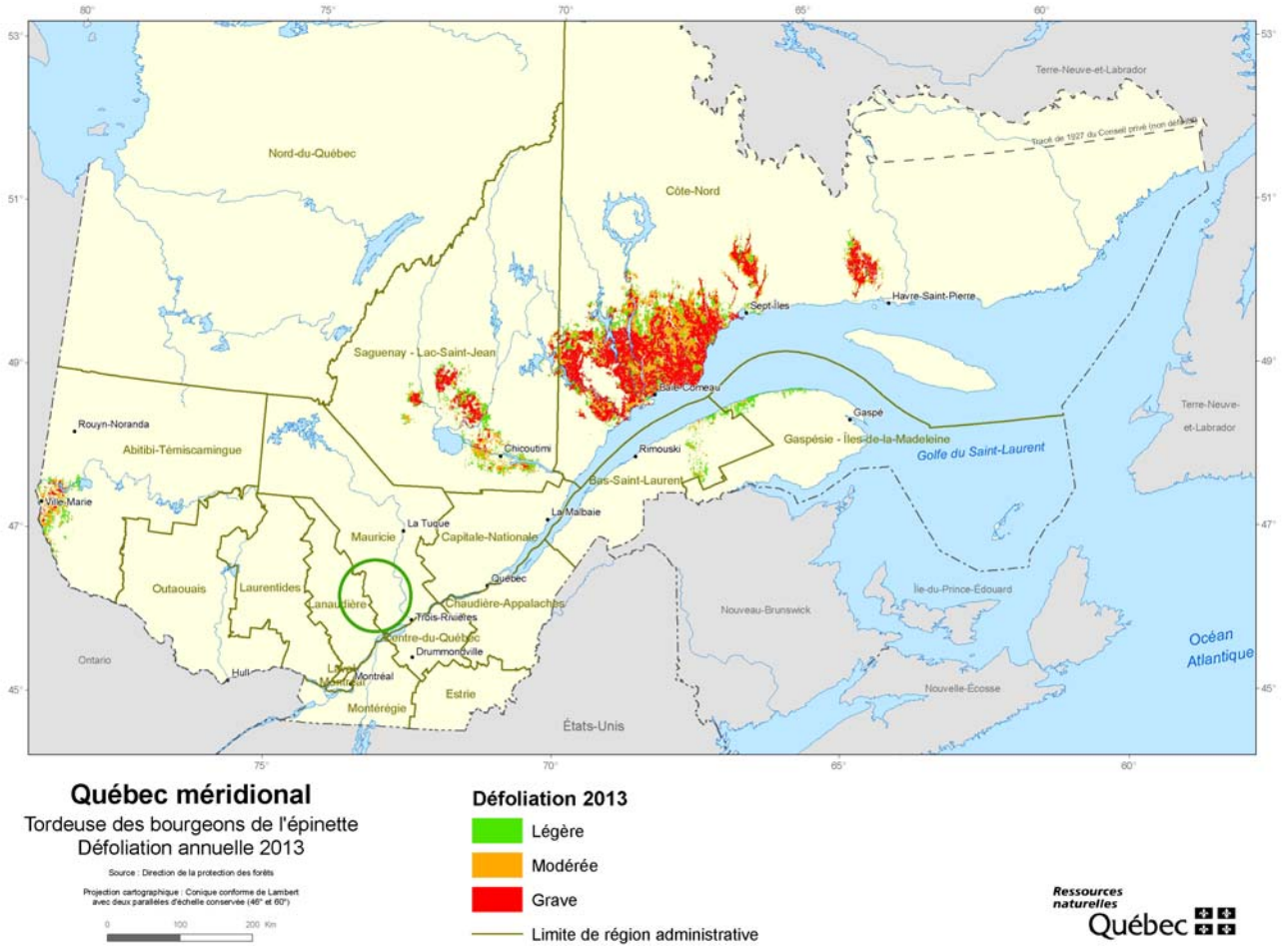
Direction de la protection des forêts
Ministère des Ressources naturelles du Québec
http://www.mrn.gouv.qc.ca/forets/fimaq/insectes/fimaq-insectes-portrait.jsp

Le mandat de détection des insectes et maladies dans les forêts québécoises est assumé chaque année par la Direction de la protection des forêts (DPF) du ministère des Ressources naturelles (MRN). Cette activité permet notamment d'identifier et de localiser les infestations d'insectes forestiers à caractère épidémique et de suivre leur évolution à l'aide de réseaux de surveillance provinciaux et de relevés aériens des dommages. La collecte des données sur les insectes et les maladies est effectuée par 15 techniciens régionaux. La DPF planifie, coordonne et supervise les activités des relevés et fournit le soutien technique aux équipes régionales. Son laboratoire réalise les diagnostics entomologiques et pathologiques pour l'ensemble du Québec. La DPF fournit également son expertise dans les programmes spéciaux d'évaluation de dommages ou de récupération de matière ligneuse mis en place à la suite d'importantes perturbations naturelles (chablis, verglas, feux, etc.). En 2013, les techniciens en protection des forêts ont visité 2 809 sites d'observation (carte 1), dont 525 plantations de pins, d'épinettes, de mélèzes et de feuillus. De plus, le personnel a effectué des relevés aériens afin de détecter et de circonscrire les dégâts causés par la tordeuse des bourgeons de l'épinette, l'arpenteuse de la pruche et la cochenille-tortue du pin, ce qui a requis environ 384 heures de vol. Enfin, 20 pépinières publiques et privées ont fait l'objet d'inspections phytosanitaires. Des lots totalisant quelque 146 millions de plants ont été examinés lors des inspections de certification et quelque 9,6 millions de plants ont fait l'objet d'inspections d'automne.



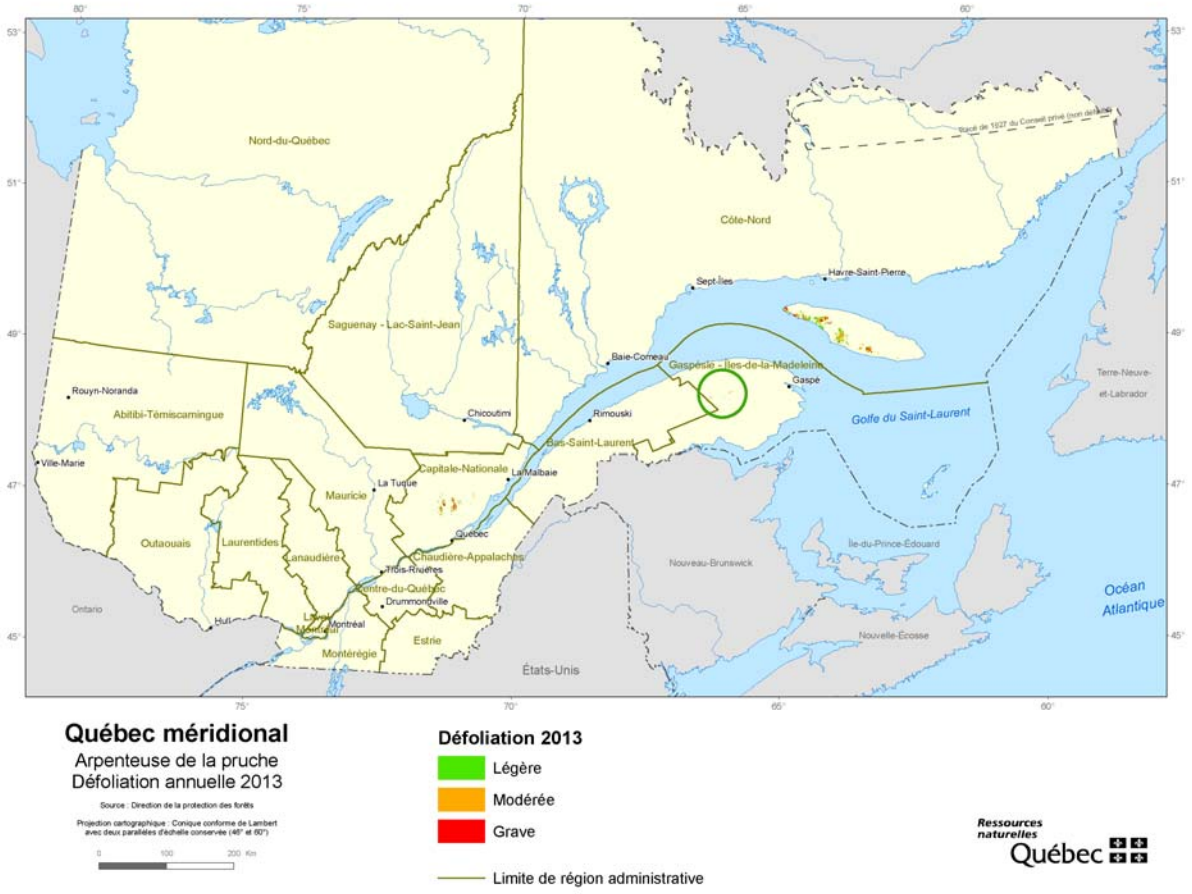
Carte 1. Stations d'observation visitées pour les insectes et maladies des arbres en 2013.

La tordeuse des bourgeons de l'épinette (TBE), *Choristoneura fumiferana*, demeure le principal ravageur des résineux dans la province. Les superficies défoliées par la TBE en 2013 totalisent 3 206 024 hectares (carte 2) comparativement à 2 226 095 hectares en 2012 et à 1 642 957 hectares en 2011. Les régions les plus touchées demeurent la Côte-Nord, le Saguenay–Lac-Saint-Jean et l'Abitibi-Témiscamingue. La répartition des dommages dans ces régions est, respectivement, de 77 %, 15 % et 5 % du total provincial. Depuis 2012, des dommages sont observés lors du relevé aérien dans les régions du Bas-Saint-Laurent et de la Gaspésie–Îles-de-la-Madeleine, vingt ans depuis la fin de la dernière épidémie. Les infestations relevées dans la région de la Mauricie sont minimes. Ailleurs au Québec, aucune aire défoliée n'a été détectée par le survol aérien. Un programme de pulvérisations aériennes contre la TBE a été mis en œuvre en 2013 pour une cinquième année consécutive dans la région de la Côte-Nord et pour une quatrième année dans la région du Saguenay–Lac-Saint-Jean. La Société de protection des forêts contre les insectes et maladies (SOPFIM) est l'organisme mandaté par la ministre pour élaborer et réaliser le plan d'intervention annuel. Des pulvérisations aériennes d'un insecticide biologique, le *Bacillus thuringiensis* var. *kurstaki* (*Btk*), ont été réalisées du 27 mai au 21 juin sur une superficie totale de 120 310 hectares. Le site Internet de la SOPFIM (www.sopfim.qc.ca) contient de plus amples renseignements sur les résultats du plan d'intervention 2013.



Carte 2. Défoliations causées par la tordeuse des bourgeons de l'épinette au Québec en 2013.

L'arpenteuse de la pruche, *Lambdina f. fiscellaria*, est toujours active dans les deux foyers épidémiques relevés en 2012 (carte 3). Dans la région de la Capitale-Nationale, les superficies touchées par la défoliation ont été légèrement supérieures en 2013 atteignant 3 857 hectares comparativement à 3 379 hectares en 2012. Toutefois, elles ont été plus fragmentées et éparpillées sur un plus grand territoire de la réserve faunique des Laurentides, de la forêt Montmorency, du parc national de la Jacques-Cartier et sur les terres du Séminaire. Dans la région de la Côte-Nord, les défoliations causées par l'arpenteuse de la pruche se sont concentrées dans la partie sud de l'île d'Anticosti. Les superficies touchées ont augmenté pour totaliser 25 857 hectares de défoliations dont la majorité sont d'intensité variant de légère à modérée. Un programme de pulvérisations aériennes de *Btk* réalisé par la SOPFIM a permis de protéger 7 196 hectares de peuplements forestiers vulnérables des dégâts de l'insecte. Des défoliations locales sont aussi apparues dans la région de la Gaspésie–Îles-de-la-Madeleine sur une centaine d'hectares. Aucun dommage important n'a été observé ailleurs dans la province.



Carte 3. Défoliations causées par l'arpenteuse de la pruche au Québec en 2013.

Plusieurs insectes forestiers actifs en 2012 ont été significativement moins présents cette année. L'infestation de la tordeuse à tête noire de l'épinette, *Acleris variana*, a chuté dans l'est de la province. Même si de nouvelles plantations de pins gris touchées par les dommages de la cochenille-tortue du pin, *Toumeyella parvicornis*, ont été identifiées, un déclin important des populations est noté sur le terrain dans l'ouest de la province. Les populations de l'arpenteuse de Bruce, *Operophtera bruceata*, qui avaient causés des dommages dans des érablières de plusieurs régions du Québec en 2012, ont chuté en 2013. Enfin, la chenille à houppes rousses, *Orgyia antiqua*, le papillon satiné, *Leucoma salicis*, et l'arpenteuse d'automne, *Alsophila pometaria*, ont été plutôt discrets en 2013 par rapport à l'année précédente.

Aucune défoliation par la tordeuse du pin gris, *Choristoneura p. pinus*, n'a été détectée par le relevé aérien des dommages en 2013 et les captures de papillons dans les pièges à phéromones demeurent faibles. Des dommages locaux par la livrée des forêts*, Malacosoma disstria,* ont été notés pour une deuxième année dans l'ouest de la province (nord-est de Matagami).

L'Agence canadienne d'inspection des aliments (ACIA) a confirmé la présence de l'agrile du frêne, *Agrilus planipennis*, dans la région de la Montérégie en juin 2008. La progression de l'insecte est en constante évolution depuis au Québec. En 2013, la DPF a installé 20 pièges afin de détecter cet insecte en dehors de la zone réglementée de Gatineau. Deux pièges se sont révélés positifs (Shawville, Low). L'ACIA a détecté la présence de l'agrile du frêne en 2013 dans différentes municipalités dans les régions de Lanaudière (Terrebonne), des Laurentides (Boisbriand), de la Montérégie (Granby, Marieville, Mont-Saint-Hilaire, Saint-Jean-sur-Richelieu) du Centre-du-Québec (Laurierville).

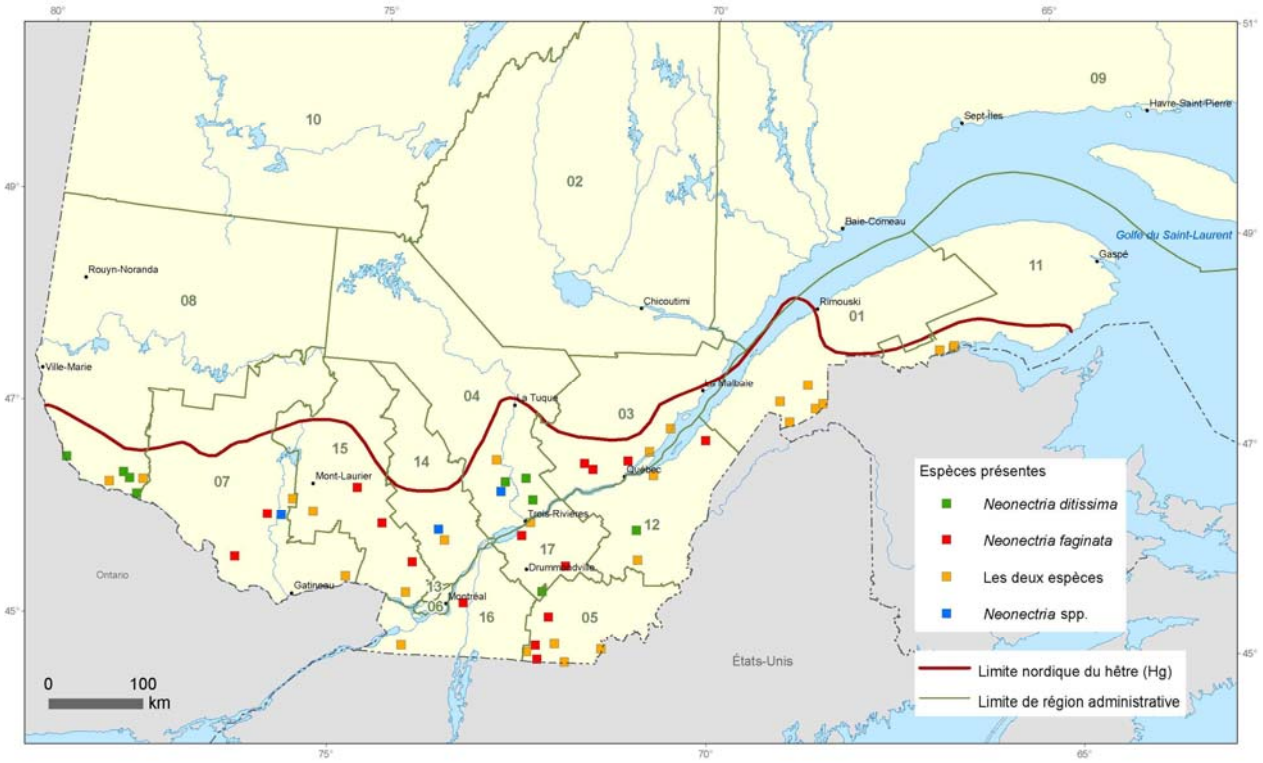
Le printemps et l'été humides de 2013, connus dans plusieurs régions du Québec, ont été très propices à l'infection et au développement de plusieurs maladies fongiques sur le feuillage, les pousses et les branches des conifères et des feuillus. Les maladies qui ont occasionné le plus de pertes au niveau du feuillage, des pousses et des branches des feuillus sont l'anthracnose (*Discula fraxinea*, D*. betulina, D. umbrinella, D. quercina* et *Tubaki dryina*), et certaines taches de feuilles. Un début de la tache goudronneuse de l'érable, *Rhytisma acerinum*, sur l'érable de Norvège et *Rhytisma americanum* sur l'érable à sucre, l'érable rouge et l'érable argenté, était déjà perceptible à la fin de juillet dans plusieurs régions. Ces taches sont devenues de plus en plus noires sur le feuillage des érables à la fin de l'été. Les feuilles d'érable ont également été affectées par une autre tache, la tache septorienne, *Sphaerulina aceris* (*Septoria aceris*), plutôt fréquente cette année sur l'érable rouge et l'érable à sucre.

Sur le feuillage des résineux, on note la présence de la brûlure en bandes brunes, *Lecanosticta acicola*, sur le pin blanc et la brûlure en bandes rouges, *Dothistroma pini,* sur le pin blanc et sur le pin rouge dans la région de l'Outaouais. La brûlure des aiguilles causée par *Lophophacidium dooksii* est également observée sur le pin blanc dans la région de la Capitale-Nationale et dans l'Outaouais. Sur le sapin baumier, les brûlures de pousses (*Sirococcus conigenus* et *Delphinella balsamea*), la rouille des aiguilles causée par les champignons microscopiques *Uredinopsis* spp. et *Milesina* spp. et la présence de plusieurs rouges, dont *Rhizosphaera pini*, *Lirula nervata* et *Lirula mirabilis*, sur les aiguilles du sapin baumier, ont été rapportés dans plusieurs régions.

Les gelures printanières ont touché plusieurs essences et ont été observées dans la majorité des régions. Les essences ayant subi des dommages variant de niveau trace à élevé sont les bouleaux blancs, les chênes (blancs, rouges, à gros fruits), les érables (à sucre, rouge), les frênes (d'Amérique, de Pennsylvanie), les hêtres à grandes feuilles, les peupliers (hybrides, faux-tremble) et les tilleuls, ainsi que les épinettes (blanches, noires, de Norvège), les mélèzes japonais, les pins (blancs, gris) et les sapins baumiers. Les pousses ont parfois été gravement affectées et de nouvelles pousses sont mortes.

La maladie corticale du hêtre (MCH) est une maladie introduite au Québec qui a un impact considérable sur son hôte, le hêtre à grandes feuilles, et, par conséquent, sur la dynamique des peuplements forestiers. La MCH attaque l'écorce du hêtre et le tue. Elle survient lorsque les spores des champignons, *Neonectria ditissima* (indigène) et *Neonectria faginata* (exotique), s'introduisent par des blessures faites à l'écorce entre autres par la cochenille du hêtre, *Cryptococcus fagisuga* (exotique), mais aussi par la cochenille filamenteuse, *Xylococculus betulae*. Les infections fongiques provoquent la nécrose du cambium puis la formation de chancres sur le tronc et les branches principales causant par la suite un dépérissement de la cime suivi de la mort des arbres affectés.

Afin de mettre à jour la distribution des organismes responsables de la maladie corticale du hêtre, un inventaire de détection avaient été réalisé en 2008 et en 2009 dans toutes les régions administratives du Québec comprises dans l'aire de distribution naturelle du hêtre à grandes feuilles. Les données recueillies dans les 128 stations d'observation visaient à acquérir de l'information sur l'abondance relative des deux espèces de champignon et à évaluer la gravité de la maladie dans les peuplements atteints. Les résultats obtenus montraient une progression de la cochenille du hêtre et de l'espèce exotique du champignon, *N. faginata*, sur la rive nord du fleuve Saint-Laurent ainsi que vers l'ouest de la province dans les régions de l'Outaouais et de l'Abitibi-Témiscamingue. Une nouvelle évaluation a été faite sur le terrain en 2013 pour suivre la progression de la MCH au Québec. Sur les 128 stations visitées en 2008-2009, 54 stations réparties dans 12 régions ont de nouveau été évaluées en 2013. La carte 4 présente les espèces de *Neonectria* observées au Québec en 2013.



Carte 4. Présence des champignons associés à la maladie corticale du hêtre en 2013.

Bilans du relevé des insectes et maladies des arbres du Québec :
http://www.mrn.gouv.qc.ca/forets/fimaq/insectes/fimaq-insectes-portrait.jsp

Cartes des relevés aériens de défoliation :
http://www.mrn.gouv.qc.ca/forets/fimaq/insectes/fimaq-insectes-portrait-releves.jsp

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Quebec pest reports:
http://www.mrn.gouv.qc.ca/forets/fimaq/insectes/fimaq-insectes-portrait.jsp

Aerial survey maps:
http://www.mrn.gouv.qc.ca/forets/fimaq/insectes/fimaq-insectes-portrait-releves.jsp

NEW BRUNSWICK REPORT

Executive Summary

This report provides an overview of the status of forest insect and pest conditions in New Brunswick (NB) in 2013, and highlights many of the pest management activities of the NB Department of Natural Resources' Forest Pest Management Group (FPMG). It is not intended to itemize all details for each survey conducted, except where it is needed to provide additional context to a particular pest problem. Where required, the reader can contact FPMG for further information.

From the 1950s to the 1990s, **spruce budworm** was the most serious forest pest in NB, and across many jurisdictions in eastern North America. No defoliation has been detected in NB since 1995. Since 1997, there has been an irregular though gradually increasing trend of populations as indicated by annual changes in moth catches in a pheromone trapping survey, particularly in the northern part of the province. This trend has gained more attention in light of the increasing outbreak in Québec, with defoliation mapped approximately 25km from the NB border in 2012 and 2013. FPMG significantly increased its monitoring effort of spruce budworm in 2012. This was further increased in 2013 with a collaborative overwintering (L2) larval sampling program between FPMG and forest industry, whereby 1152 plots were sampled or resampled, representing 1136 unique locations. This sampling was conducted throughout New Brunswick, regardless of land ownership but was concentrated in the northern half of the province. Defoliation assessments were conducted at >500 ground plots and an aerial defoliation survey was flown. No defoliation was observed and spruce budworm was detected at trace to very low overwintering larval counts at 17% of 1152 plots sampled or resampled, representing 1136 unique locations. Positives (trace to very low counts) were concentrated in, but not exclusive to northern New Brunswick. In light of the proximity of the outbreak in Québec, and based on rising (but still low) L2 counts expectations remain that the first pockets of light defoliation will soon be detected in northern NB, the first time since the collapse of the last outbreak in 1995.

In 2011, a single **brown spruce longhorn beetle** was found in Kouchibouguac National Park, most likely transported to the park in a piece of firewood from Nova Scotia. In the fall of 2011, the Canadian Food Inspection Agency in collaboration with Parks Canada and the Canadian Forest Service collected logs from sixteen trees with symptoms of brown spruce longhorned beetle (BSLB) attack and placed them in facilities where scientists observed for beetles emerging from the logs. No BSLB were detected in these. In 2012, approximately 100 pheromone-based traps hung by federal agencies within Kouchibouguac National Park also failed to catch a single beetle. In 2012, FPMG conducted visual assessments of spruce trees at 282 locations throughout the province looking for signs and symptoms of BSLB attack (in conjunction with pheromone trapping surveys). In 2013, assessments were conducted at 259 locations by FPMG throughout the summer months. No suspect trees were found either year. As such, the current prevailing view is that the single BSLB found in Kouchibouguac back in 2011 was not indicative of an established population, but rather was merely intercepted when it emerged from a piece of firewood.

In 2011, the NB Government conducted a limited aerial biological control program against **balsam fir sawfly** on 7,282 ha of the Crown forest using Abietiv™, a federally- registered biological insecticide that is based on a naturally occurring balsam fir sawfly virus. J.D. Irving, Limited also contracted (separately) to have control applied on some of their freehold land. Coincidently, natural virus was attributed with causing a population collapse that same year. In 2012, a ground-based defoliation survey conducted in south-eastern New Brunswick reconfirmed the previous year's forecast of a population collapse, with only light scattered defoliation detected in a small geographic area between St. Martin and Saint John. As such, no forecast survey was required in 2012; nor was one required in 2013.

Sirococcus shoot blight is a fungal disease affecting primarily red pine. Years with wet weather in May and June often result in intensification of disease symptoms (branch dieback and, after successive attacks, tree mortality). In 2012, appropriate methodology was developed to evaluate the severity and distribution of the disease in red pine stands. Assessments by FPMG and Regional Pest Detection Officers revealed that Sirococcus is widespread and a large portion of assessed stands are at a high risk of experiencing tree mortality within the next five years. In 2013, further assessments were conducted, with an increased proportion assessed from the northern half of the province. Between 2012 and 2013, 455 red pine stands totaling 2819 ha have been assessed. Of this area, 656 ha (23%) were classed as at high risk.

Balsam gall midge has been in an outbreak phase in the province for the last eight years. In 2012, 91% of locations assessed for balsam gall midge injury had detectable levels of damage. In 2013, this dropped to 58% suggesting this insect may now be in the declining phase of its outbreak cycle.

In 2013 many **other insect and disease pests** were monitored through targeted and/or general surveillance surveys. A wet spring and summer led to a higher than normal incidence of foliar diseases such as needle casts and needle rusts. Localized damage from the following pests was also observed in 2013: forest tent caterpillar, balsam gall midge, balsam woolly adelgid, balsam fir tip blight, satin moth, birch leafminer, white pine weevil, fall webworm and pitch nodule makers.

This report also describes the status on several **invasive alien species** that have not been detected in New Brunswick to date but have been found in other jurisdictions in north-eastern North America and which have the potential to cause significant damage to the forests of New Brunswick. While these species spread naturally, human assisted movement through transportation of infested wood commodities (e.g., firewood, logs, landscape nursery stock) is the most important pathway for the long- range dispersal of these pests.

Introduction

Outbreaks of minor and major forest pests occasionally occur and cause variable amounts of growth loss and tree mortality. Besides affecting the natural forest, outbreaks can adversely affect high-value reforestation and tree improvement programs, from nurseries to seed orchards, to plantations and thinned stands. Thus, long-term forest management plans are constantly under threat of possible compromise from unwanted pest outbreak. In addition to timber losses, major effects can be caused to non-timber values such as terrestrial and aquatic wildlife habitat, recreational sites and aesthetics.

Besides native pests, today's global economy brings increased risk from the accidental introduction of insects and diseases from around the world. Such introductions could not only cause direct impacts on natural forests and the environment, but also indirect economic impacts through regulations placed on domestic, national, or international movement of goods. These trade issues can negatively affect the ability of small and large companies to be competitive in local and global markets.

The Department of Natural Resources' (DNR's) Forest Pest Management Group (FPMG) has the mandate of protecting New Brunswick's forests from insects and disease. For regulated, non-native pests, DNR maintains liaison with the Canadian Food Inspection Agency (CFIA) which is responsible, under the federal Plant Protection Act, for preventing the introduction into Canada, spread within Canada, and spread from Canada, of non-native pests.

The first line of defense in any forest pest management program is an effective detection, monitoring and forecasting system. This system not only detects the presence of various forest pests, but it also measures changes in pest populations and damage levels over time. Monitoring and forecasting the status of forest pests requires the use of different techniques that reflect survey objectives, pest population levels, the pest's biology, and knowledge of relationships between numbers of pests and damage.

For some pests these are well established; for others these are not. Aerial surveys provide the means to map damage in various categories to assess the extent and severity of outbreak over vast areas.

For some insects, surveys can be conducted to establish population levels by sampling appropriate locations for eggs or egg masses, depending on the female's egg laying habits. Surveys of larvae can be conducted during the insect's active feeding period, or during periods when they are inactive, such as in the over-wintering stage. Surveys of pupae to estimate insect population levels are less common.

Special odours or scents, called pheromones, are given off by female insects to attract males of the same species for mating. The identification and artificial synthesis of sex pheromones for a number of forest insects has led to the use of pheromone-baited traps as a technique to monitor these pests. This is especially true when populations are very low and not detectable by traditional survey sampling intensity for other life stages.

Because these artificial lures are often very potent, they sometimes offer the opportunity to detect subtle increases that might not be as easily detected by the other means. In other instances, they might still be under development and results have to be interpreted with caution. Depending on trap catch thresholds or yearly trends, these surveys could trigger the implementation of other methods to forecast levels of damage expected the ensuing year.

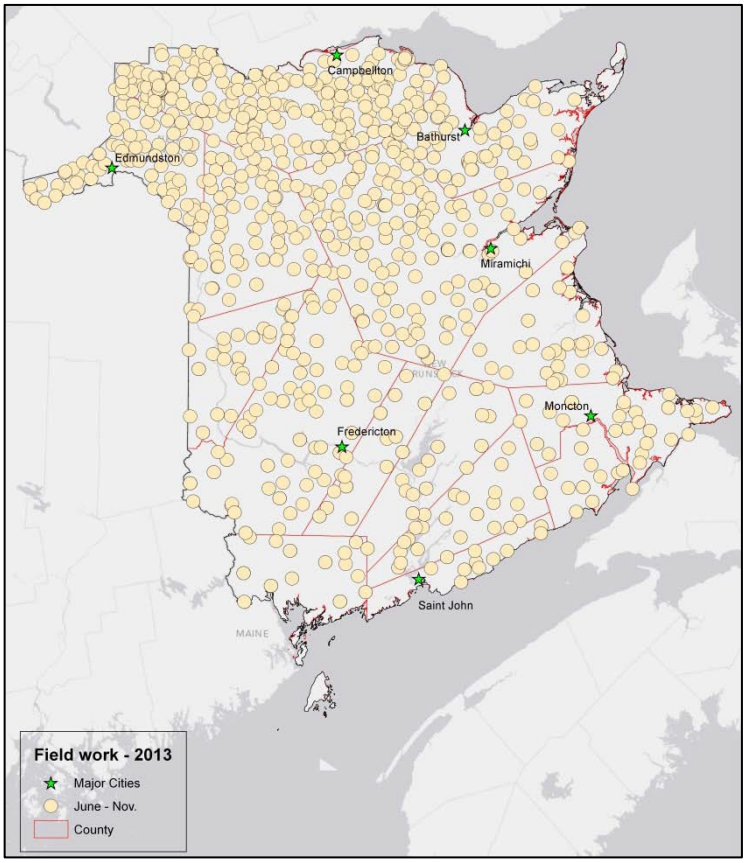

Figure 1. Distribution of locations assessed for forest insect and diseases in 2013 by FPMG. Field crews were also vigilant in watching for any signs of pest damage as they drove from location to location. Not depicted are the numerous assessments conducted by DNR Regional Pest Detection Officers and forest industry.

One of the cornerstones of the FPMG's pest monitoring program is the use of such pheromone traps for the early detection of changes in population levels of many softwood and hardwood forest pests, before they increase to potential outbreak status. It is important, however, to be aware that the number of insects captured in a trap is greatly influenced by the type of lure used, its concentration, the trap design and the insect species itself. Therefore, a moth count considered to be biologically significant for one species may be insignificant for another by several orders of magnitude. Consequently, the absolute number of insects in a trap is not as important as the trends between years and over time.

As a consequence of finite resources, formal monitoring and forecast surveys are only conducted for a limited number of targeted pests on an annual basis. General surveillance of forest conditions while conducting targeted surveys, and collaboration with other DNR staff (e.g., Regional Pest Detection Officers), members of forest industry, and the general public greatly enhance FPMG's ability to detect pest outbreaks and respond as needed. These collaborative efforts are further facilitated by an improved process to log inquiries and observations from other agencies and individuals, including documentation of photos and samples collected to aid in pest identification. This tracking system has enabled, where needed, the timely follow-up by FPMG staff. Worth noting is the fact that since insect and disease pests do not respect ownership boundaries, survey activities conducted by FPMG are done on crown land, industrial freehold and private woodlots (Figure 1).

This report provides an overview of the status of forest insect and pest conditions in New Brunswick in 2013, and highlights many of the pest management activities of FPMG. It is not intended to itemize all details for each survey conducted, except where it is needed to provide additional context to a particular pest problem. Where required, the reader can contact FPMG for further information.

Pests of softwoods

Balsam fir Sswfly (*Neodiprion abietis* [Harris]): Balsam fir sawfly is a native insect found in southern Canada and northern United States. Its main host is balsam fir. The larvae feed on older needles leading to reduced volume increment, weakened trees and sometimes tree mortality. A major concern is the loss of wood volume due to reduced growth increment from sawfly defoliation in balsam fir stands already thinned to maximize tree growth. In 2011, the NB Government conducted a limited aerial biological control program against balsam fir sawfly on 7,282 ha of the Crown forest using Abietiv™, a federally- registered biological insecticide that is based on a naturally occurring balsam fir sawfly virus. J.D. Irving, Limited also contracted (separately) to have control applied on some of their free hold land. Coincidently, natural virus was attributed with causing a population collapse that same year. In 2012, a ground-based defoliation survey conducted in south- eastern New Brunswick reconfirmed the previous year's forecast of a population collapse, with only light scattered defoliation detected in a small geographic area between St. Martin and Saint John. As such, no forecast survey was required in 2012; nor was one required in 2013.

Balsam fir tip blight (*Delphinella balsameae* [Waterman] E. Müller): This fungal disease kills the needles and current year's shoots, with generally only a few branches per tree affected. In 2012, balsam fir tip blight was common on scattered balsam fir trees throughout the province, with several isolated stands having more severe symptoms in northern New Brunswick. Symptoms could still be seen in scattered locations in 2013, especially in the north-west part of the province, with at least one Christmas tree grower experiencing severe damage symptoms on his trees for several years in succession.

Balsam gall midge (*Paradiplosis tumifex* Gagné): This insect is not considered a significant forest pest, but like the balsam twig aphid it can be a very serious problem for Christmas tree growers as it kills the current year's needles, causing them to drop off, rendering Christmas trees unsightly for sale. As such, FPMG annually evaluates the severity and distribution of this insect pest while conducting other operational surveys. The insect was in an outbreak phase for 7 years, persisting into 2012 when 91% of the 281 fir plots assessed throughout the province had detectable levels of damage from this pest. In 2013, the percentage of fir plots with gall midge damage dropped to 58% at 309 plots assessed.

Assuming this trend continues, gall midge populations have likely started the declining phase of the current outbreak.

Balsam twig aphid (*Mindarus abietinus* Koch): This insect is also not considered a significant forest pest, but like the balsam gall midge, can be a very serious problem for Christmas tree growers. Like the balsam gall midge, feeding damage by this insect pest renders Christmas trees unsightly for sale. Like the balsam gall midge, FPMG examines sampled branches for the presence or absence of symptoms of feeding damage caused by this insect. In 2012, only 13% of the 281 fir plots assessed throughout the province had detectable levels of damage from this pest. In 2013 this increased to 30% at 309 fir plots assessed throughout the province, suggesting populations may be once again increasing, after remaining relatively low for several years.

Balsam woolly adelgid (*Adelges piceae* [Ratzeburg]): This insect, of European origin, was first found in the Maritimes in the early 1900s and in Québec in 1964. It only attacks true firs of the genus *Abies*. Symptoms of attack on balsam fir, especially gouty tops, are noticeable in southern New Brunswick where local tree mortality, severe in some cases, has been reported. Although galling and distorted tops are common, stem attack – a condition that is more associated with tree mortality - has only been observed in one location (Kingsclear). A survey that rated adelgid damage at 83 stands in southern NB in 2002 was again repeated in 2010. Moderate-severe damage was found in only six of these stands, and in both years, only ~0.5% of balsam fir trees assessed had moderate-severe damage. FPMG field staff and DNR Regional Pest Detection Officers did not report any significant areas of damage by balsam woolly adelgid in 2012 or 2013.

Brown spruce longhorn beetle (*Tetropium fuscum* [Fabricius]): This non-native insect was confirmed present in Nova Scotia in the spring of 2000 and it was subsequently revealed that it had been present at least since 1990, but had mistakenly been misidentified as a similar native species. In Nova Scotia, it has attacked red spruce, as well as white, black and Norway spruce. The CFIA manages this pest by reducing the risk of the beetle spreading outside of the area it now exists using a strategy that regulates movement of specified high-risk spruce materials along with annual surveys and research.

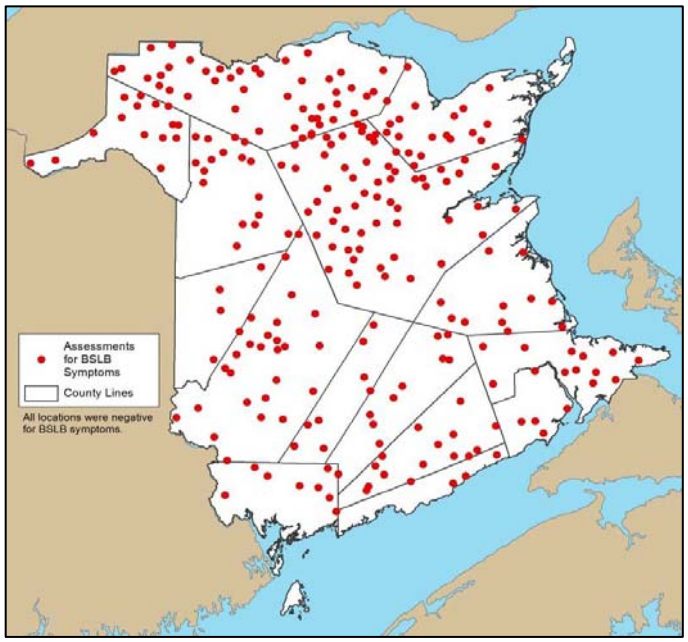

Figure 2. Distribution of FPMG plots assessed for symptoms of brown spruce longhorned beetle attack on spruce in 2013. All plots were negative for the beetle.

In 2011, a single beetle was found in a trap in Kouchibouguac National Park, most likely transported to the Park in a piece of firewood from NS. In the fall of 2011, CFIA in collaboration with Parks Canada and the Canadian Forest Service collected logs from sixteen trees with symptoms of brown spruce longhorned beetle (BSLB) attack and placed them in facilities where scientists observed for beetles emerging from the logs. No BSLB's were detected in these. In 2012 and 2013, approximately 100 pheromone-based traps placed within Kouchibouguac National Park by federal agencies failed to catch a single beetle. Also in 2012, FPMG conducted visual assessments of spruce trees at 282 locations throughout New Brunswick for signs and symptoms of BSLB attack (in conjunction with pheromone trapping surveys). FPMG again conducted assessments in 2013 with 259 locations being inspected for BSLB attack (Figure 2). No suspect trees were found in either 2012 or 2013. As such, the current prevailing view is that the single BSLB found in Kouchibouguac back in 2011 was not indicative of an established population, but rather was merely intercepted when it emerged from a piece of firewood.

European larch canker (*Lachnellula willkommii* [Hartig] Dennis): This non-native disease was first found by the CFS in New Brunswick in 1980. It is capable of killing mature and immature larch trees. It is present mostly throughout the southern half of the Province and quarantine regulations are in place administered by the CFIA under the federal Plant Protection Act.

Flower crops and cone production: Some years, abundant flowering or cone production on conifers can at first glance appear to be insect defoliation. Given the heightened concerns about the current spruce budworm outbreak in neighboring Quebec, it was not unexpected that the number of such inquiries increased in 2013.

Hemlock looper (*Lambdina fiscellaria* [Guenée]): This insect is a menacing pest primarily of hemlock and balsam fir. It can kill trees within a single year due to its wasteful feeding habits. Besides consuming entire needles, it also partially eats many needles causing them to die. Severe outbreaks are common in Newfoundland & Labrador and Québec. The only reported outbreak of hemlock looper in New Brunswick occurred from 1989-1993.

A pheromone trapping network of 60 traps distributed throughout the province indicated that looper populations still remained low. However, while the average trap catch doubled over the previous year (145 vs. 70), populations are still not sufficiently high to expect any defoliation in 2014. J.D. Irving, Limited also maintains a second pheromone trapping network on their freehold lands.

Jack pine budworm (*Choristoneura pinus* Freeman): This insect is a potentially significant pest of jack pine as evident by periodic severe outbreaks in Ontario and Manitoba. Defoliation by jack pine budworm in New Brunswick has not been reported since 1983; however, monitoring had been conducted annually at a network of pheromone traps since 1997. Overall, the survey results up to 2010 had indicated that jack pine budworm populations remained at very low levels throughout the zones being monitored. Since 2010, no pheromone trapping survey has been conducted due to other priorities; however, general monitoring efforts throughout the province in 2011, 2012 and 2013 indicated populations remain at undetectable levels.

Larch casebearer (*Coleophora laricella* [Hubner]): Damage by this defoliator of larch includes the discoloration of newly flushed needles in late May and early June. Tree growth can be impacted, but risk of tree mortality from defoliation by this pest is low. Defoliation from larch casebearer was widespread throughout southern, and especially, southeast New Brunswick in 2012. No observations or inquiries were made about this insect in 2013.

Needle casts, needle rusts and other foliar diseases: In 2013 there was a higher than usual frequency of reports of foliar diseases on conifers and deciduous trees, likely due at least in part from a wet spring and summer.

Red flag of balsam fir (*Fusicoccum abietinum* [R. Hartig] Prill. & Delacr.): This fungal disease was observed at incidental levels throughout New Brunswick in 2012 and in 2013. The disease typically only attacks a few branches on isolated balsam fir trees, causing a constriction on affected twigs, resulting in red flags. From a

distance, the symptoms look similar to that caused by white-spotted sawyer beetle (*Monachamus scutellatus* [Say]) feeding damage.

Scleroderris canker of pine (*Gremmeniella abietina*): The North American race (*var. NA* [Lagerberg] Morelet) of this disease causes cankers and mortality of seedlings of jack pine and red pine, and has been associated with plantation failures in other jurisdictions. It seldom causes mortality to trees over 2m tall, though branches up to this height are affected. On the other hand, the European race (*var. Eu* [Lagerberg] Morelet) is capable of causing mortality to red pine and Scots pine trees taller than 2m. The European race of Scleroderris has been confirmed at three sites in north-western New Brunswick within a few kilometres of each other. Two sites contain Scots pine and the other contains red pine. In 2008, dead trees and trees with dead and dying tops were easily seen at the second site (Scots pine). At the third site, the red pine looked remarkably healthy. Quarantine regulations are in place under the federal *Plant Protection Act* administered by the CFIA. No specific surveys have been conducted in more recent years.

Sirococcus shoot blight on red pine (*Sirococcus conigenus* [Dc.] Cannon & Minter): *S. conigenus* is a fungal disease affecting primarily red pine. Beyond contributing to the native biodiversity of NB forests, red pine provides the raw material for the creation of utility poles for electric power transmission, which are high value forest products. Years with wet weather in May and June often result in intensification of disease symptoms (branch dieback and, after successive attacks, tree mortality).

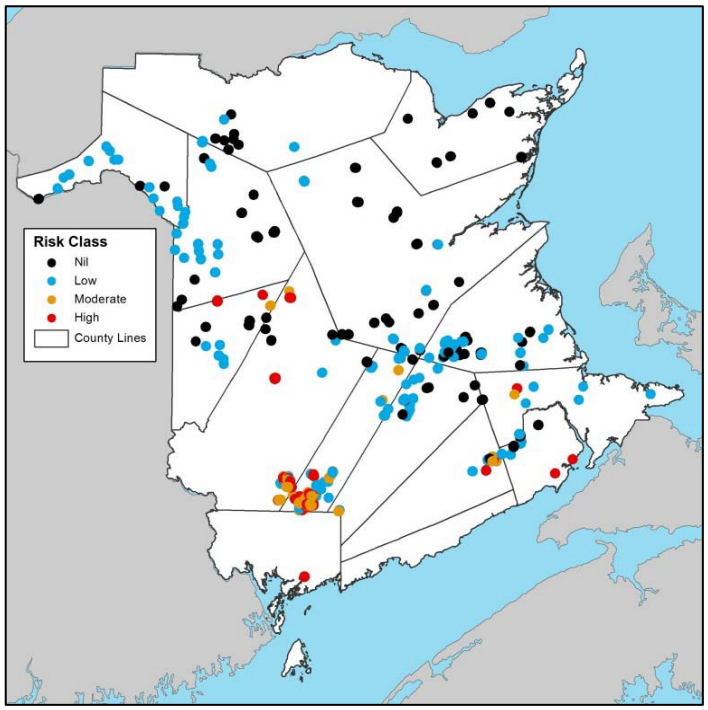

Figure 3. Risk of near-term tree mortality from *Sirococcus conigenus* in red pine stands assessed by DNR in 2012 and 2013.

In 2012, a survey methodology was developed to evaluate the severity and distribution of Sirococcus disease in the province, after a review of the scientific literature and many on-site visits to refine the approach. A two-person crew did a walk-through of red pine stands delineated on maps from forest inventory information, looking for symptoms of Sirococcus disease and its distribution in the stand, and rated the overall crown and tree condition. Digital photos were taken in each stand, to allow the option of revisiting a subset of stands in future years in order to monitor the progression of the disease and rate of stand deterioration. Finally, each stand was categorized into a risk class, and identified as to whether it had a high risk of mortality within 3-5 years. Efforts were concentrated in southern New Brunswick, in those geographic areas where harvesting was planned or being conducted, in order to provide information to forest industry and DNR for prioritizing stands to harvest. Two hundred and eighteen (218) stands were initially visited, with stands low in red pine content removed from the analysis, leaving 190 stands for a risk rating provided to forest industry and DNR management foresters. Forty percent (40%) of these stands were rated as having a high risk of tree mortality within the next five years.

Regional Pest Detection Officers (PDO's) reported *S. conigenus* damage on an additional eight red pine stands scattered throughout southern NB. Sirococcus symptoms were widespread, particularly in southern NB.

In 2013, the same detailed methodology used in 2012 was again conducted. That year 371 stands were initially visited by PDO's and FPMG, with stands low in red pine content removed from the analysis, leaving 265 red pine stands, to rate risk. Based on the assessments from both 2012 and 2013, 455 red pine stands totaling 2819 ha were evaluated, with 656 ha (23%) classed as at high risk (Figure 3).

Spruce budworm (*Choristoneura fumiferana* [Clemens]): Spruce budworm is a notorious pest of balsam fir and various species of spruce. From the 1950s to the 1990s, it was a perennial pest of the softwood forests of New Brunswick and many other jurisdictions in eastern North America. The last year spruce budworm defoliation was detected in New Brunswick in 1995. Since 1997, there has been an irregular though gradual increasing trend of populations in New Brunswick as indicated by annual changes in moth catches in the pheromone trapping survey.

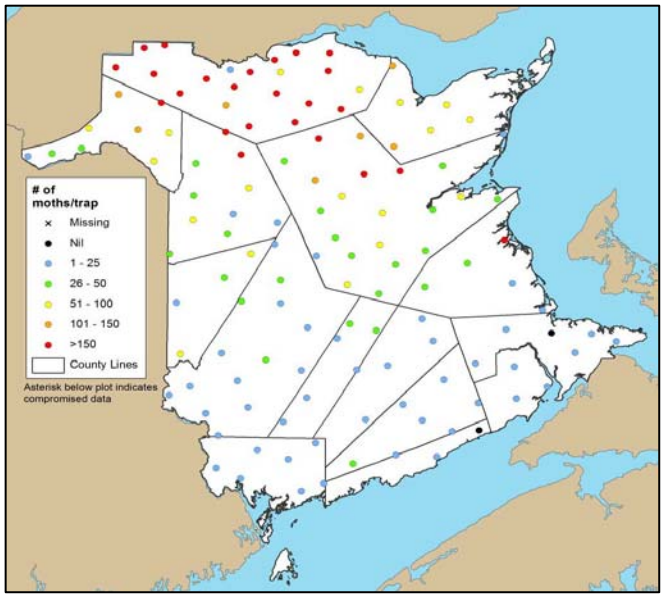

Figure 4. Distribution of spruce budworm pheromone traps and results of the 2013 survey conducted by FPMG.

One hundred and thirty-two traps were hung in 2013, with the tendency of annual trap catches to be highest in the northern part of the province (Figure 4) and this trend has gained more attention in light of the increasing outbreak in Québec, including light and moderate defoliation mapped in 2012 and 2013 on the south-side of the Saint Lawrence River as close as 25 km to the NB border. J.D. Irving, Limited also maintains a second pheromone trapping network on their freehold lands.

In response to growing concerns of an imminent outbreak in New Brunswick, FPMG annually increased its level of overwintering larval (L2) sampling in the province, going from 102 plots in 2010 to 169 plots in 2011 to 422 plots in 2012. The latter year was a two-tiered sampling system, whereby an initial forecast was conducted at 303 plots, followed up by supplemental sampling at an additional 119 plots, concentrated in those geographic zones where spruce budworm was detected. All years, FPMG sampling was conducted throughout the province, regardless of land ownership; and further supplementary sampling was also conducted by J.D. Irving, Limited on its own freehold lands.

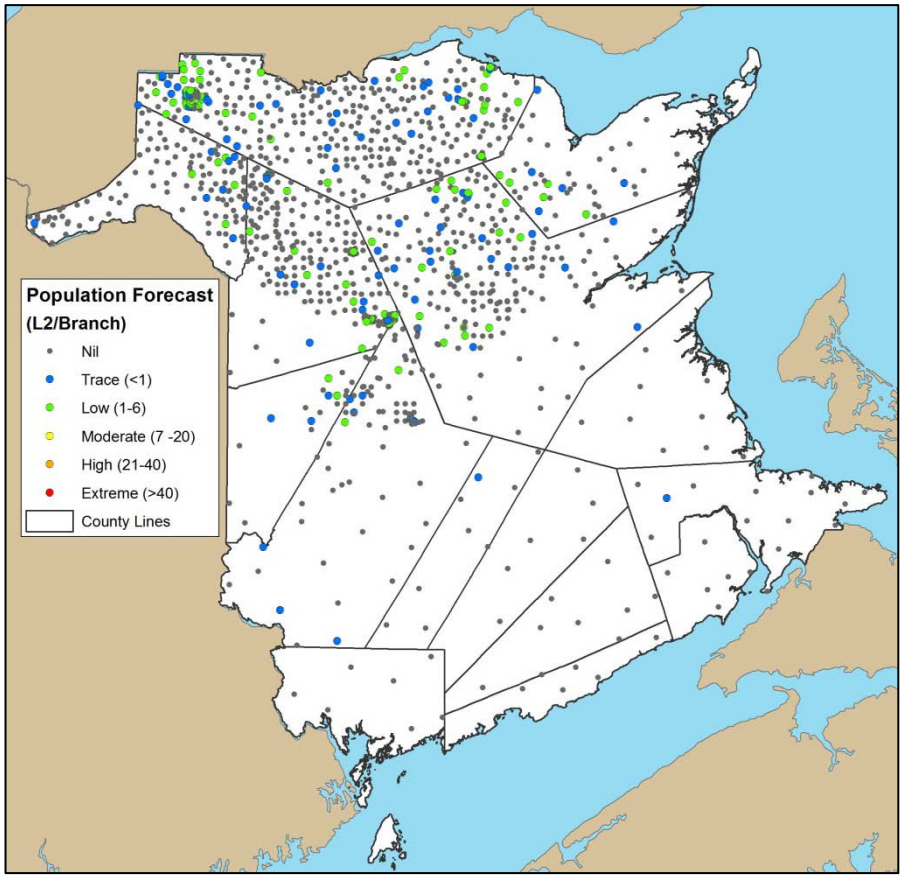

Figure 5. Distribution of plots sampled for overwintering spruce budworm (L2) larvae during the 2013 field season by FPMG and Crown licensee staff.

In 2013, over escalating concerns of a looming spruce budworm outbreak on the horizon, DNR and forest industry embarked on a highly collaborative spruce budworm overwintering (L2) survey with the purpose of not only generating a population forecast for 2014, but attempting to identify pockets of L2 counts, while still very low, sufficiently high to consider as candidate areas for research and development trials focused on an early intervention strategy. Sampling protocol was to remove one, 75-cm mid-crown branch from each of three trees/plot. Whenever the L2 counts averaged ≥2 L2/branch (a very low count) the procedure was to resample three more trees at the original plot, as well as sample additional plots throughout the area of interest. If the additional sampling detected anything further, another level of sampling was then initiated. This led to as many as four stages of sampling within any one geographic area. Ultimately, 612 plots were sampled (or occasionally resampled) by J.D. Irving Limited, AV Cell Inc., Fornebu Lumber Company Inc. and Acadian Timber; and another 540 plots sampled (or resampled) by FPMG. This resulted in 3,456 branches being collected during 1,152 plot visits, representing 1,136 unique locations (Figure 5). Foliage was then processed in the laboratory by FPMG, with assistance from staff of the Canadian Forest Service and Forest Protection Limited. Spruce budworm was detected at trace to very low overwintering larval counts at 17% of the 1,152 plot visits. Positive were concentrated in, but not exclusive to northern New Brunswick.

Also in 2013, foliage was assessed at more than 500 plots during 585 site visits and revisits, looking for any signs of defoliator feeding activity; and field crews looked for signs of budworm activity while conducting other survey activities throughout the province. Finally, FPMG flew 50 survey hours in an aerial defoliation survey across the province from June 25 to July 7, coinciding with the time when reddish defoliated needles would be most evident from the air. Ground and aerial surveys did not detect any budworm defoliation in 2013.

Surveillance activities tentatively planned for 2014 include the continuation of a pheromone trapping network throughout the province, maintaining an enhanced overwintering (L2) larval survey, continued general monitoring for detection of feeding larvae (3rd-6th instar stages) or pupae, and aerial and ground-based defoliation surveys.

Whitemarked & rusty tussock moths: Both of these pests feed on many species of hardwood and softwood. Most significant damage occurs on balsam fir, and under extreme populations, trees can be killed in a single season. The last outbreak of whitemarked tussock moth (*Orgyia leucostigma* [J. E. Smith]) happened in the 1970s when defoliated area peaked in 1976 at approximately 200,000 ha. In contrast, rusty tussock moth (*Orgyia antiqua* [L.]) outbreaks are usually small and of short duration.

A pheromone trapping network at 73 plots were maintained to monitor and analyze population trends of these two insects, and population levels are tracked through a general monitoring program conducted throughout the province. In 2013, not a single whitemarked tussock moth or rusty tussock mother were detected in pheromone traps. While detection of larvae or cocoons of either tussock moth species was infrequent over the field season, it was considered very unusual that moths of neither species were captured in a single trap. This unusual phenomenon raises the question of the quality of the lures purchased.

Pests of hardwoods

Birch skeletonizer (*Bucculatrix canadensisella* Chambers): The larvae of this insect pest produce oval-shaped white silken moulting webs on the leaves, and skeletonize birch leaves, causing them to turn brown, dry out and prematurely drop off the trees. The larvae then drop to the ground to pupate and spend the winter. Populations tend to build up fairly quickly and then decline within a couple of years. Since the insects are late (September) feeders, trees have already produced their food for the year and so the trees' general health is not threatened. In 2012, defoliation on white and other birch species was detected in southern New Brunswick in the Fredericton-Oromocto area. No damage from birch skeletonizer was reported in 2013.

Bruce spanworm (*Operophtera bruceata* [Hulst]): This pest will defoliate many hardwood species, but sugar maple, aspen and beech are favoured hosts. Damage is observed in the spring and early summer. Damage by the Bruce spanworm rarely results in tree mortality. Regional Pest Detection Officers reported that several stands of sugar maple were defoliated by this pest in northern NB in 2012. No damage from bruce spanworm was reported in 2013.

Butternut canker (*Ophiognomonia clavigignenti-juglandacearum* [N.B. Nair, Kostichka & J.E. Kuntze] Broders & Boland): This non-native disease is causing severe mortality of butternut trees throughout their range. It was first confirmed present in New Brunswick in 1997, and has since been found at 27 locations by the Canadian Forest Service, and is thought to be more widespread. Butternut is not a major component of our native forests, nor is it of major economic importance, but the disease could pose a threat to our natural forest biodiversity. In 2005, butternut was added to the List of Wildlife Species at Risk under the Canadian *Species at Risk Act*, partly because of the presence of butternut canker.

European gypsy moth (*Lymantria dispar* [L.]): The European gypsy moth is an exotic forest pest regulated by the CFIA under the federal *Plant Protection Act*. This insect is capable of feeding on several hundred different species of plants and shrubs ranging from ornamentals to forest trees. Many hardwoods, such as oak, 191 poplar and birch are favoured hosts. The northern counties of Victoria, Madawaska, Restigouche, Gloucester and the north-western part of Northumberland County are the only parts of New Brunswick in which European gypsy moth has not become established and, therefore, are the only parts of the Province not regulated for this pest. There was no pheromone trapping network for this insect in 2013; however, general detection efforts by FPMG, as well as reports from industry, colleagues and the public suggest populations remained low in the regulated part of the province. A small isolated pocket of defoliation was reported in Rockwood Park, Saint John.

Fall webworm (*Hyphantria cunea* [Drury]): This insect creates unsightly silken webs in the late summer on many species of hardwood trees including apple, ash, alder, beech, birch, cherry, elm and oak. However, because the damage is caused toward the end of the growing season, there is little long-term damage to the trees. Fall webworm webs were common throughout the Lower Saint John River Valley in 2012. Significantly less public inquiries were logged in 2013.

Forest tent caterpillar (*Malacosoma disstria* Hubner): This insect generally defoliates poplar, but will attack numerous hardwood species during an outbreak. The last two major outbreaks (1979-84 and 1991-96) of forest tent caterpillar in New Brunswick lasted about six years each and covered hundreds of thousands of hectares. Severely defoliated trees can produce another crop of leaves within the same growing season, and therefore can withstand the infestation fairly well. In 2011, the total area defoliated by forest tent caterpillar was ~7,500 ha in areas around Bathurst. Pheromone trap catches in 2011 suggest an increase in forest tent caterpillar populations throughout most of New Brunswick, particularly in the eastern half of the province. However, ground surveillance in 2012 only detected defoliation mostly confined to the Bathurst area of north-eastern New Brunswick except for one small pocket near Escuminac, also in north-eastern NB. Aerial and ground surveillance in 2013 detected 4,000 ha of defoliation primarily on aspen, again in the areas of Bathurst and Escuminac. Elsewhere, monitoring efforts by FPMG as well as reports from industry, colleagues and the public suggest populations remained low. While average pheromone trap catch at the network of 85 plots was slightly elevated over 2012 numbers, expectations are that population status will not be significantly different in 2014.

Satin moth (*Leucoma salicis* [L.]): This insect, originally from Europe and first observed in the Maritimes in 1930, primarily feeds on leaves of poplar and willow. Outbreaks are generally localized and of short duration and it rarely kills trees. In 2012, two pockets of satin moth defoliation were found on aspen in north-west New Brunswick.

One of these pockets was first detected by Acadian Timber in an area north of Sisson Brook/Plaster Rock; the 2nd pocket (mapped and reported by J. D. Irving, Limited) was geographically adjacent to the 1st location and was ~250 ha in size. A 3rd pocket of satin moth defoliation was detected by FPMG on aspen and white birch in north-east New Brunswick, in an area east of Bathurst Mines. Four hundred hectares east of Bathurst Mines was again defoliated in 2013, as well as a 20 ha stand of trembling aspen west of Tracadie.

Hickory tussock moth (*Lophocampa caryae* Harris): This insect is found from Nova Scotia to the North Carolina Mountains, Ontario, Wisconsin, and Texas. The caterpillars feed on the leaves of several hardwoods, including: ash, elm, oak, willow and others; but hickories, walnut and butternut are preferred. Populations may occasionally cause local defoliation but do not persist long and control is usually not necessary; hence, the insect is not regarded locally as a pest of concern to the forest industry. The main concern is due to the numerous hairs on the caterpillar's body (and pupae) that cause allergic reactions such as itchy rashes to some people who handle them, especially children. Heightened media coverage on this insect in New Brunswick and the neighbouring State of Maine in 2011 and 2012 spurred FPMG to track the insect's status and provide factual background details to health and education professionals, who were receiving numerous inquiries from concerned parents in those school districts in southern New Brunswick where localized pockets of hickory tussock moth were observed. While the public and field crews did report seeing this insect in 2013, population levels were for the most part "incidental" when compared to the previous two years.

Large aspen tortrix (*Choristoneura conflictana* [Walker]): Outbreaks of this insect occur periodically throughout the range of its preferred host, trembling aspen. High populations are rare in the Maritimes and when they do occur they are usually associated with localized outbreaks of short duration. In 2010, small pockets of defoliation caused by large aspen tortrix were observed in western New Brunswick in the vicinity of Woodstock and near Florenceville. In 2011, the total area of defoliation was mapped over 785 ha near Canterbury and Meductic in south-central New Brunswick. Light defoliation was detected on the tip of the panhandle (Glassier Lake) in northwest New Brunswick in 2012. Defoliation from the insect was not detected in 2013.

Seed orchard pests

Spruce cone maggot (*Strobilomyia neanthracina* Michelsen): As part of its nursery seedling production requirements, DNR was projecting a need for viable seed from its white spruce seed orchards in 2013. As such, staff of FPMG and Tree Improvement sampled and assessed spruce cones at Kingsclear and Queensbury for the presence of spruce cone maggot eggs. Based on forecasted seed losses, pesticides were applied to one field at Kingsclear to protect the white spruce cone crop.

Miscellaneous observations

Most of the pest-targeted surveys conducted by FPMG, and much of the general surveillance activities conducted by FPMG, DNR's Regional Pest Detection Officers, forest industry and other collaborators are incorporated within this report. The benefit of many trained eyes in the woods greatly enhance the forestry community's ability to detect and where needed, respond to pest problems as they occur. Beyond their ongoing contributions to general pest surveillance, Regional Pest Detection Officers also specifically conducted pest assessments in 225 high-value plantations and thinned stands on Crown Land (Figure 6). Plantations and thinning remain generally healthy. The most common damage encountered was caused by white pine weevil (white pine, jack pine, Norway spruce, white spruce, black spruce), Sirococcus shoot blight (red pine, black spruce), and pitch nodule makers (*Petrova* spp., jack pine). Sites damaged by these pests were distributed around the province. In Region 1 (Bathurst), snow and ice damage in softwood plantations and drought damage of sugar maple was often observed. In Region 2 (Miramichi), light damage from the collection of balsam fir branch tips for production of

Christmas wreaths was commonly found. In Region 3 (Fredericton), balsam woolly adelgid symptoms were prevalent on a small percentage (<30%) of the fir trees in softwood thinnings. Venturia leaf blight of trembling aspen was reported from several sites in Region 4 (Edmundston).

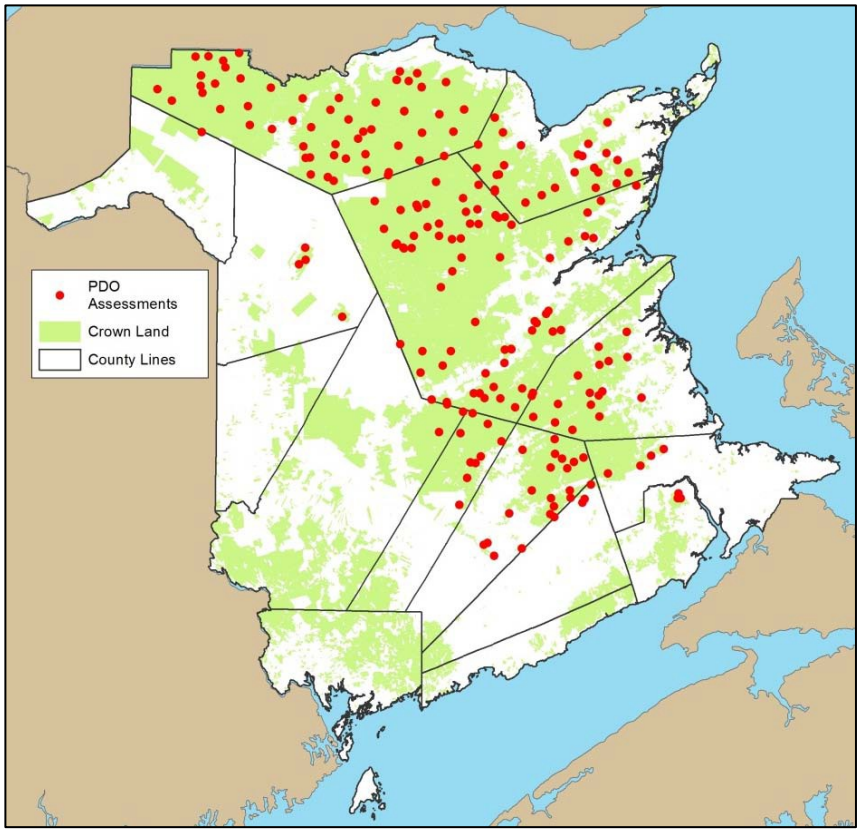

Figure 6. Plantations and thinnings assessed by DNR's Regional Pest Detection Officers in 2013. Note: this figure does not include red pine stands assessed by Region 3 staff as part of the Sirococcus risk rating survey.

Invasive alien species of concern

There are several invasive alien species that have not been detected in New Brunswick to date but have been found in other jurisdictions in northeastern North America and that have the potential to cause significant damage to the forests of New Brunswick. While these species spread naturally, human assisted movement through transportation of infested wood commodities (e.g., firewood, logs, landscape nursery stock) is the most important pathway for the long-range dispersal of these pests.

Asian longhorned beetle (*Anoplophora glabripennis* [Motschulsky]*:* This destructive wood-boring pest of maples and other hardwoods was first discovered in North America at Brooklyn, NY in 1996, likely transported in wood pallets or wood packing material from Asia. The ALHB was detected in Toronto, Ontario in 2003 which triggered an aggressive eradication effort led by the CFIA. Another detection was made near Pearson International Airport in 2013 where there are efforts underway to eliminate the pest. The closest US detection is the City of Boston as well as Worcester County, Massachusetts where control efforts are currently underway. The CFIA conducts annual monitoring for Asian longhorned beetle within New Brunswick.

Beech leaf-mining weevil (*Orchestes fagi* [L.]): This native insect of Europe was recently detected in Halifax, NS where it appears to have been causing severe defoliation of American beech for a number of years and some of the trees are beginning to die. Surveys by the CFIA in 2013 found it in several areas throughout Nova Scotia, but it was not detected in New Brunswick. In Europe, it is a common pest of beech trees but is rarely an important forest pest. The CFIA is currently assessing the significance of this pest to Canada.

Emerald ash borer (*Agrilus planipennis* Fairmaire): This beetle was first discovered in Canada and the USA in 2002 and has since killed millions of ash trees throughout Ontario, Quebec and the US. It poses a significant economic and environmental threat to urban and forested areas. The closest detection to New Brunswick within Canada has been near the city of Granby, Quebec (approximately 60 km east of Montreal). The closest detection within the US has been in Concord, New Hampshire. The CFIA conducts annual monitoring for emerald ash borer within New Brunswick.

European wood wasp (*Sirex noctilio* Fabricius): This insect was reported as established in New York State in 2005 and has caused mortality of pines in several Southern Hemisphere countries, though it has not caused significant damage in north-eastern North American forests. It has been found in southern Ontario, western Quebec, southern Connecticut, western Vermont and northern Pennsylvania.

Hemlock woolly adelgid (*Adelges tsugae* [Annand]): This pest was introduced to eastern North America from Asia in 1950 and has since caused extensive mortality and decline of hemlock trees in the eastern US. Hemlock decline and mortality typically occur within four to ten years of infestation with stressed trees succumbing more quickly. The closest population of hemlock woolly adelgid to New Brunswick is currently within Maine where it has become established as far north as Lincoln County. In Canada, two detections of this pest have been made in southern Ontario within the last two years. Surveys of hemlock stands in southern New Brunswick conducted in 2005 and 2007 by FPMG failed to detect the adelgid. The CFIA also conducts monitoring for hemlock woolly adelgid within New Brunswick every two to three years.

Pine shoot beetle (*Tomicus piniperda* L.)**:** First discovered in Ohio, US in 1992, this non-native insect has gradually spread into Québec and western Maine. In Ontario, it has been found in association with mortality in Scots, red, white and jack pines. It is considered a pest of quarantine significance and is regulated by the CFIA under the federal *Plant Protection Act*. The CFIA conducts monitoring for pine shoot beetle in New Brunswick.

NOVA SCOTIA REPORT

Gina Penny

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The **spruce budworm (*Choristoneura fumiferana*)** has caused more damage to Nova Scotian softwood forests than any other insect. In 2013 Forest Health staff deployed 147 pheromone traps province wide of which 92% were positive, up from 71% recorded in 2012. Over the last three years trap catches have been on the rise. In 2013, maximum and mean moths per trap were 206 and 19 respectively versus 89 and 6 in 2012. The highest trap catches were found in the Eastern and Central regions of the Province. Spruce budworm was detected at low overwintering larval counts (1-2 L2's per site) at five sites in the Central and Eastern Regions. This is the first time we have found L2's since 1994.

Jack pine budworm (*Choristoneura pinus pinus*) defoliation was first detected in 2005 within a mature white pine stand in the Western Region of the province. In 2013 Forest Health staff monitored 32 pheromone traps in the Central and Western Regions of which 88% were positive up from 30% in 2012. The average number of moths per trap has increased from 1.0 in 2012 to 5.6 in 2013. Twenty-one sites were surveyed in 2013 for overwintering second instar larvae (L2's). At each survey site a single mid-crown branch is sampled from each of three representative mature white pines. Nine percent of sites surveyed were positive for Jack pine budworm, down from 67% in 2012. The mean L2/m^2 bark is also down from 40 in 2012 to 23 in 2013.

The last **Eastern blackheaded budworm (*Acleris variana*)** outbreak erupted in 2004; covering approximately 114,000 hectares, in the Cape Breton Highlands. In 2013, an overwintering egg survey was conducted at 66 sites in the Eastern Region. Eggs were detected at 82% of sites surveyed down from 94% in 2012. Egg numbers remain low but have increased from the maximum of 10 found in 2012 to 15 in 2013. A pheromone trial was also conducted in 2013. Working in collaboration with researchers from the Canadian Forest Service a pheromone was synthesized and deployed in 40 multipher traps throughout the Cape Breton Highlands. All traps were positive with a maximum trap catch of 144 moths and an average of 39 moths per trap.

In Nova Scotia, **spruce beetle (*Dendroctonus rufipennis*)** activity has been both chronic and widespread. We're seeing mortality of mature and over-mature white spruce throughout the province. Our 2013 aerial overview survey detected a total of 4650 hectares of spruce beetle caused mortality in all three provincial regions: Eastern - 2300 hectares, Central - 1580 hectares, and Western - 770 hectares.

Since 1961 the **hemlock looper (*Lambdina fiscellaria fiscellaria*)** has defoliated approximately 135,000 hectares in Nova Scotia. Control programs were conducted in portions of Victoria and Inverness counties 1996 and 1997. Forest Health staff deployed 132 pheromone traps province wide in 2013. Of these traps 96% were positive up from 89% in 2012. Mean trap catch has also increased to 41 moths per trap from 23 moths per trap in 2012. Follow up egg surveys are conducted around pheromone traps with the highest moth catches. In 2013 branch samples were taken at 40 sites in the Eastern Region. Eggs were detected at 15% of sites sampled, down from 24% in 2012 and 28% in 2011.

In Nova Scotia recorded outbreaks of the **balsam fir sawfly (*Neodiprion abietis*)** date back to 1942. In 2013 an overwintering egg survey was conducted at 148 sites in the Eastern and Central Regions; 33% of sites were positive, down from 46% in 2012.

Abstracts / Résumés

The last **whitemarked tussock moth (*Orgyia leucostigma*)** outbreak occurred in 1998 covering 1.4 million hectares in Central and Northern Nova Scotia. Since that time two mini population eruptions have occurred; Cape Breton in 2005 and Guysborough in 2007. An overwintering egg mass survey was conducted at 309 sites province wide in 2013. The percentage of sites where egg masses were detected has risen slightly to 10% from 3% in 2012. Our provincial aerial overview survey also detected 100 hectares of whitemarked tussock moth defoliation in the Eastern and Central Regions.

Forest Health staff monitor **balsam twig aphid (*Mindarus abietinus*)** and **balsam gall midge (*Paradiplosis tumifex*)** populations in a general way by assessing their presence on balsam fir branch samples collected for our balsam fir sawfly survey. This is not a predictive survey; it simply quantifies the damage that occurred the previous summer. Each branch is visually inspected for balsam twig aphid and gall midge damage. Of the 148 sites surveyed in 2013, seven had balsam twig aphid affected shoots and 13 sites had balsam gall midge affected shoots.

Damage due to **balsam woolly adelgid (*Adelges piceae*)** can be found throughout the province. Results from the spring overwintering survey at 18 permanent monitoring sites showed increases in populations from 2012 at four sites, decreases at four sites and no change at the remaining 10 sites. Mortality of overwintering nymphs occurs below -20^{o}C. Examining the minimum recorded temperatures at these sites indicated that temperatures fell below -20^{o}C on multiple days during the winter of 2012-2013 so the population decreases found at four of our plots were not unexpected. We also monitor balsam woolly adelgid populations in a general way. All branch samples from our balsam fir sawfly survey are visually inspected for balsam woolly adelgid damage (a.k.a. gouting) as well as dormant nymphs in buds. In 2013, overwintering nymphs were found at 24% of the 148 sites surveyed, up from 13% in 2012. Sites with gouted branches increased to 2% from 1.3% in 2012.

Forest Health staff, in cooperation with the Canadian Food Inspection Agency, conduct detection surveys for the **hemlock woolly adelgid (*Adelges tsugae*)**. A native of Asia this insect is a threat to eastern hemlock forests. In 2013, ten remote hemlock stands were surveyed in the Western Region. All were negative for this pest.

The **gypsy moth (*Lymantria dispar*)** pheromone survey is conducted in two parts. Individual multipher traps are deployed at designated sites province wide to monitor population trends; while delta traps are placed in towns outside of the Canadian Food Inspection Agencies regulated zone to determine if the population is spreading into new areas. In 2013, 20 multipher traps were deployed province wide; 67% of these were positive, down slightly from 70% in 2012. Average moths per trap are up with 220 moths captured in 2013 versus 173 in 2012. Delta traps were deployed in nine towns. Average trap catches in all towns were less than one moth per trap. Other than a large increase in the town of Cheticamp in 2002 trap averages have remained below two moths per trap for the last 13 years.

The **brown spruce longhorn beetle (*Tetropium fuscum*)**, native to north and central Europe, arrived in Halifax in the 1990's. As part of a joint effort, the Nova Scotia Department of Natural Resources, the Canadian Food Inspection Agency, and the Canadian Forest Service monitor the spread of the beetle within the province. The 2013 detection survey involved extensive pheromone trapping throughout the Atlantic Provinces and Quebec. In Nova Scotia, there were nine new positive sites detected outside of the brown spruce longhorn beetle containment area located in the counties of Colchester, Guysborough, Halifax, Hants, and Pictou. These new finds brings the total number of positive sites outside of the containment area to 102. All of the traps deployed in Newfoundland and Labrador, Prince Edward Island, New Brunswick, and Quebec were negative for brown spruce longhorn beetle.

The **beech leaf-mining weevil (*Orchestes fagiis*)** is native to Europe where it is a common and widespread pest of beech. In 2012, surveys conducted by the Canadian Forest Service and the Canadian Food Inspection Agency, found it to be well established in Nova Scotia. This is the first record of this pest in North America. The Canadian Forest Service and the Canadian Food Inspection Agency are collaborating on surveys to determine the weevil's distribution and risk to beech in North America. A detection survey was completed by the Canadian Food Inspection Agency in Eastern Canada in 2013. Beech stands in both forested and urban environments were targeted. In Nova Scotia eight new positive locations were detected in the counties of Inverness, Victoria, Cape Breton, Richmond, Halifax, and Kings along with suspect sites in the counties of Annapolis, Lunenburg, and Inverness. Our 2013 provincial aerial overview survey also recorded 51 hectares of beech leaf-mining weevil damage near the City of Halifax.

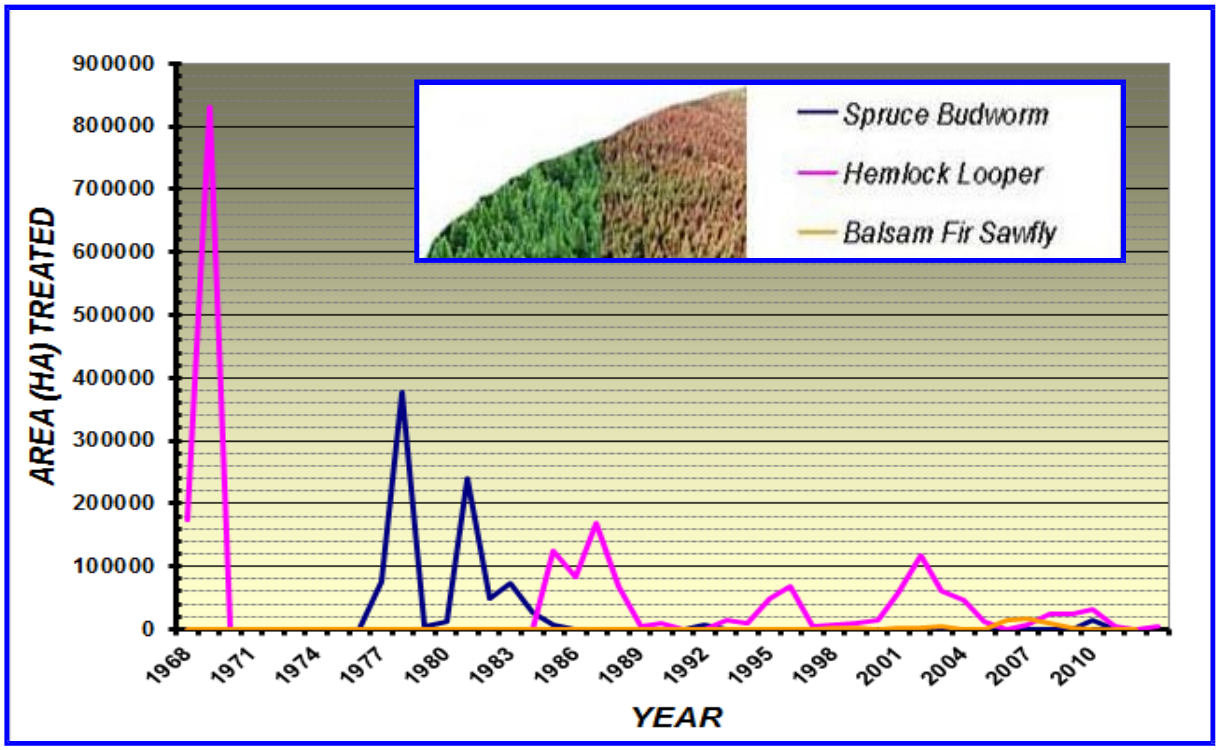
During the 2013provincial aerial overview survey **maple anthracnose** damage totaling 1390 hectares was detected in the Western Region and a total of 945 hectares of moderate to severe **Sirococcus shoot blight (*Sirococcus conigenis*)** damage was detected in the Central (892 ha) and Western (53 ha) Regions.

NEWFOUNDLAND AND LABRADOR REPORT

Summary of 2013 forest pest control and monitoring activities and outlook for 2014

A brief summary of the forest pest control and monitoring activities conducted by the Newfoundland and Labrador (NL) Department of Natural Resources in 2013 and the outlook for 2014 is provided.

Controls

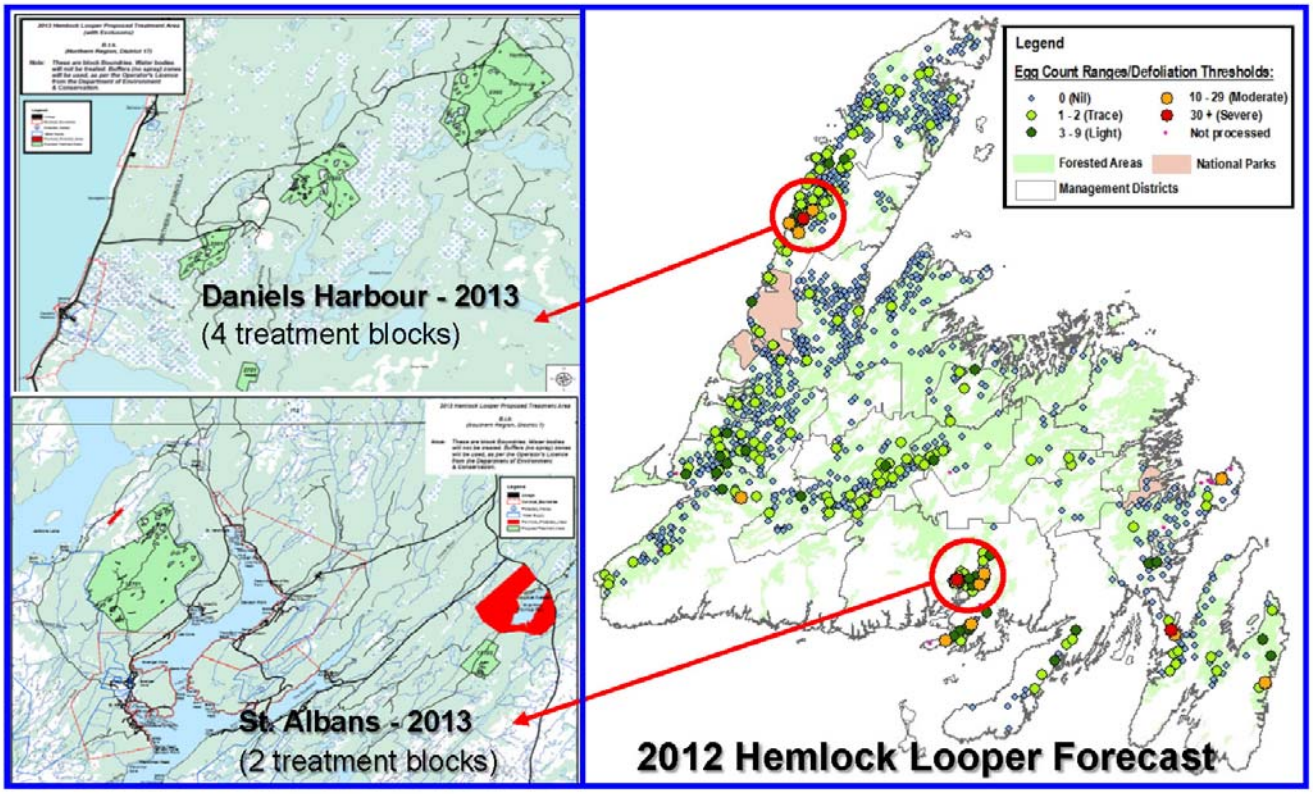


The above graph provides a historical summary of the areas (ha) treated to control major forest pests in NL. Controls for hemlock looper (HL) were conducted on the island in the late 1960s, as well as, following the collapse of the spruce budworm (SBW) outbreak in the mid 80's. Treatments for this insect pest occurred in Labrador for the first time in 2007 to 2009. Treatments to control populations of the SBW occurred on the island from the late 1970s until the mid-1980s. Small areas were also treated on the island (Codroy Valley) in 1992 and in Labrador in 2010 (Mud Lake – Goose Bay area). Treatments for balsam fir sawfly (BFS) began in the Province in the late 90's, with populations collapsing in 2009. As indicated there has been a long history of forest pest control operations in the Province. Since 1977, there has been only two years (1991, 2012) without treatments.

Hemlock looper – In 2012, HL fall forecast results detected two areas (Daniels Harbour, St. Albans) where populations were expected to cause moderate-severe defoliation in 2013. Supplementary sampling and evaluation of potential impacts led to the identification of 2,661 and 2,030 ha of forest in the Daniel's Harbour and St. Albans areas requiring treatment in 2013. The overall treatment goal was to suppress populations and minimize defoliation in these areas to prevent their spread and reduce impacts. In the St.

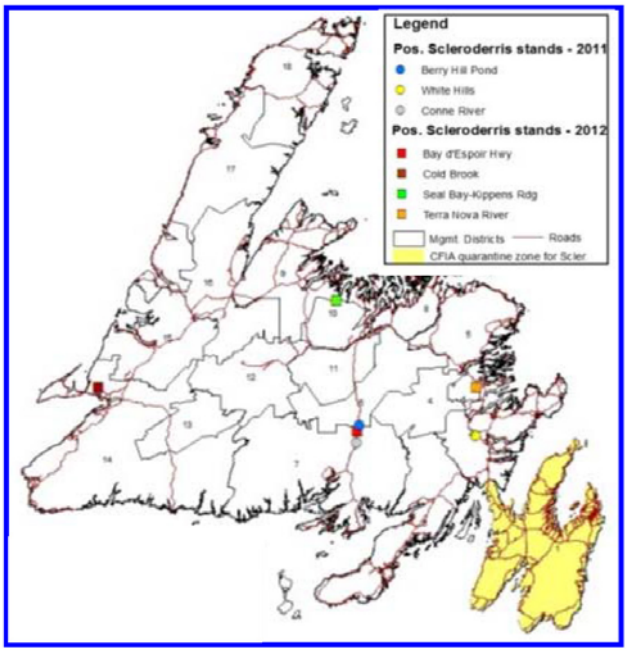
Albans area, BFS populations were also forecast to be moderate-high in the same areas in 2013, causing additional concerns about the combined effects of defoliation from both of these insect pests.

Treatments were conducted using an M-18 Dromader aircraft equipped with Micronair AU5000 rotary atomizers, and an AG NAV GPS navigational system with Auto Cal Flow Meter and Auto Boom. A single application of Btk (Foray 76 B) was applied at a rate of 2 L/ha or 40 BIU/ha at a swath width of 76 m. Treatments were timed for peak 2nd instar and favourable weather allowed treatments to be completed over a two period (July 7-8) in the St. Albans area. In contrast, high winds in the Daniel's Harbour area delayed treatments for 5-7 days. Treatments were eventually conducted on July 16 and 19; however, 300 ha was left untreated due to weather.



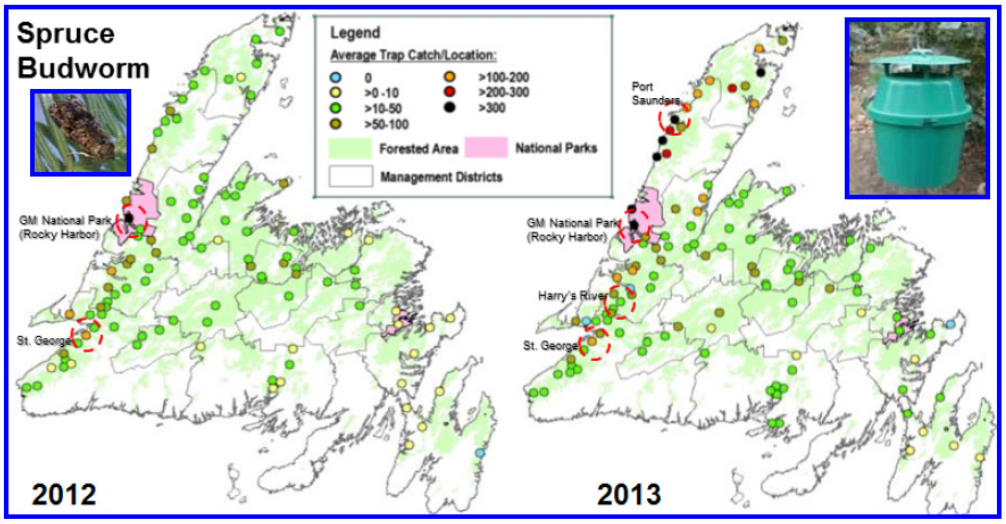
Overall, treatment were successful with 67-94% larval mortality observed in treated blocks versus 17-26% in untreated sites in the St. Albans area. In the Daniel's Harbour area, treated blocks had 63-76% larval mortality compared to 15-27% in untreated sites. In treatment blocks, percent current defoliation was a quarter to half that observed in untreated sites.

European Scleroderris canker – Results from monitoring conducted in 2011 and 2012 detected seven new sites with European Scleroderris canker outside of the existing quarantine zone (Avalon Peninsula). This is an invasive disease that is regulated by the Canadian Food Inspection Agency (CFIA) under the federal Plant Protection Act. It is a serious disease of hard pines, with red pine particularly impacted. As such it poses a serious risk to red pine plantations and, indigenous red pine stands on the island. The hope was to begin control/eradication of infected pine at these sites in 2013; however, work was unable to proceed as the Provincial Department of Environment required an application be provided as part of a 45-day environmental assessment process to review the work being proposed. The application was approved in 2013 with some conditions; however, it has delayed control/eradication efforts until 2014.

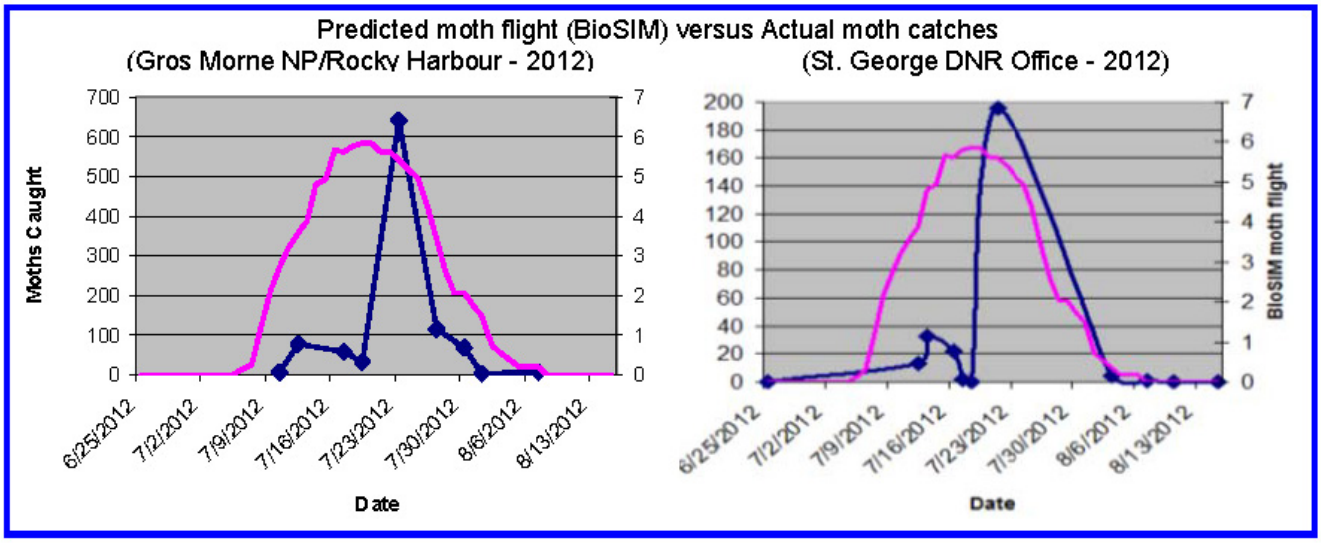


Monitoring results

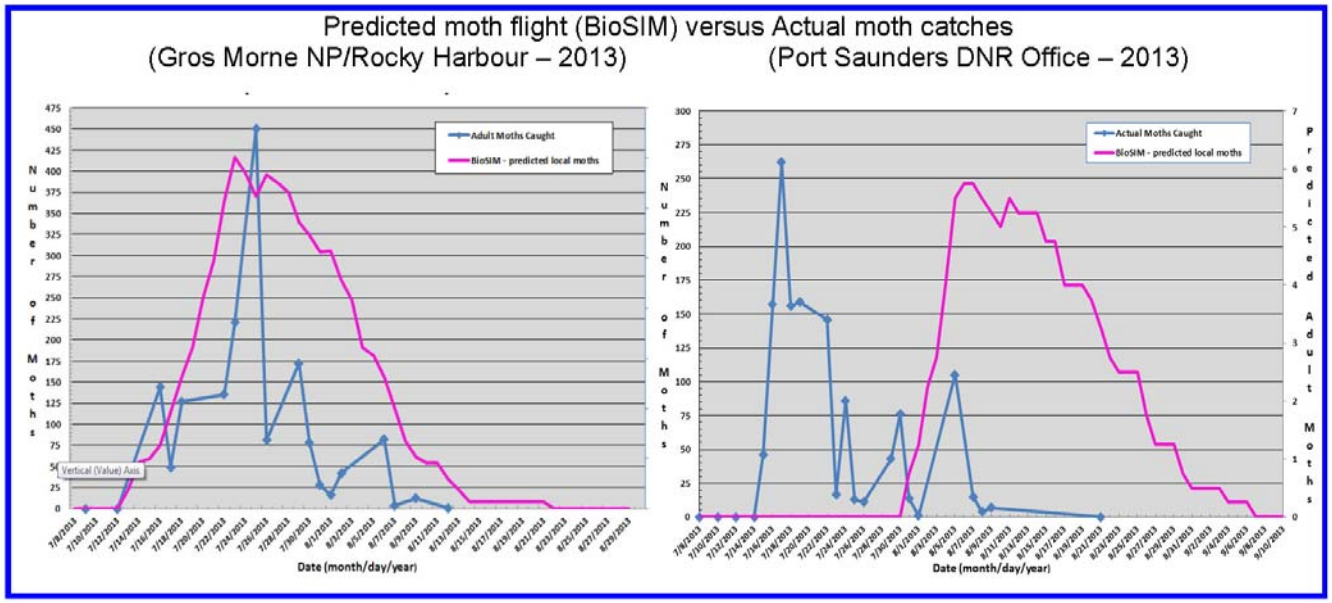
Pheromone trapping results – With increasing SBW populations in the province of Quebec and increased threats in Atlantic Canada, and the collapse of HL population in NL, the network of traps used to monitor low density populations of spruce budworm and hemlock looper in NL has been increased over the last several years. In Labrador, a small number of SBW and HL trapping locations have also been established in areas where populations of these pests are or have been active. At each location two non-saturating traps are placed with traps placed ca. two-weeks prior to the adult flight period and retrieved at the end of this period. To monitor trend or annual changes in the average numbers of moths caught per trap at each location, trapping results are placed in arbitrary trap catch ranges.



For SBW, in 2013 a dramatic increase of two to four classes was noted in trap catches on the northern peninsula. Elsewhere on the island trap catches remained similar to those observed in 2012. Overall, the average number of moths/trap on the island increased for a third consecutive year: 19.6 in 2011, 34.6 in 2012, and 86.3 in 2013. In Labrador, trap catches in areas with active spruce budworm populations also increased with trap catches ranging from 408-867 in 2012 to 819-2151 moths/trap in 2013. Similar to conducted in 2012 a number of traps (i.e. those circled in red in the figure below) on the west coast and northern peninsula were routinely monitored for moths along the leading edge closest to SBW populations in Quebec. The hope was to detect moths immigrating into the province. In 2012, a sudden peak in trapping

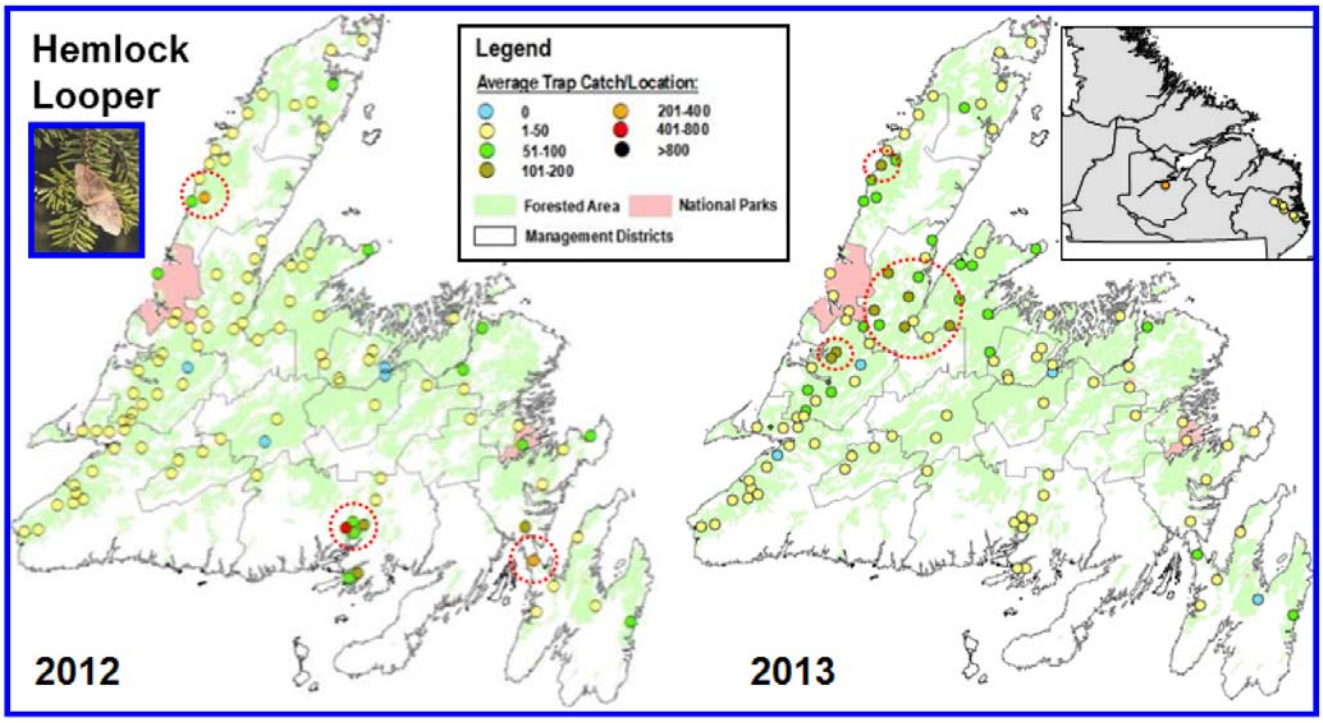


results at two separate sites on the same date suggested that a moth immigration event may have occurred during the third week of July. In 2013, the presence of high numbers of moths and no noticeable defoliation from SBW in several areas, and the presence of moths in traps several weeks prior to local moth emergence at one location suggested immigration occurred once again in 2013. In this one site, the first peak moth

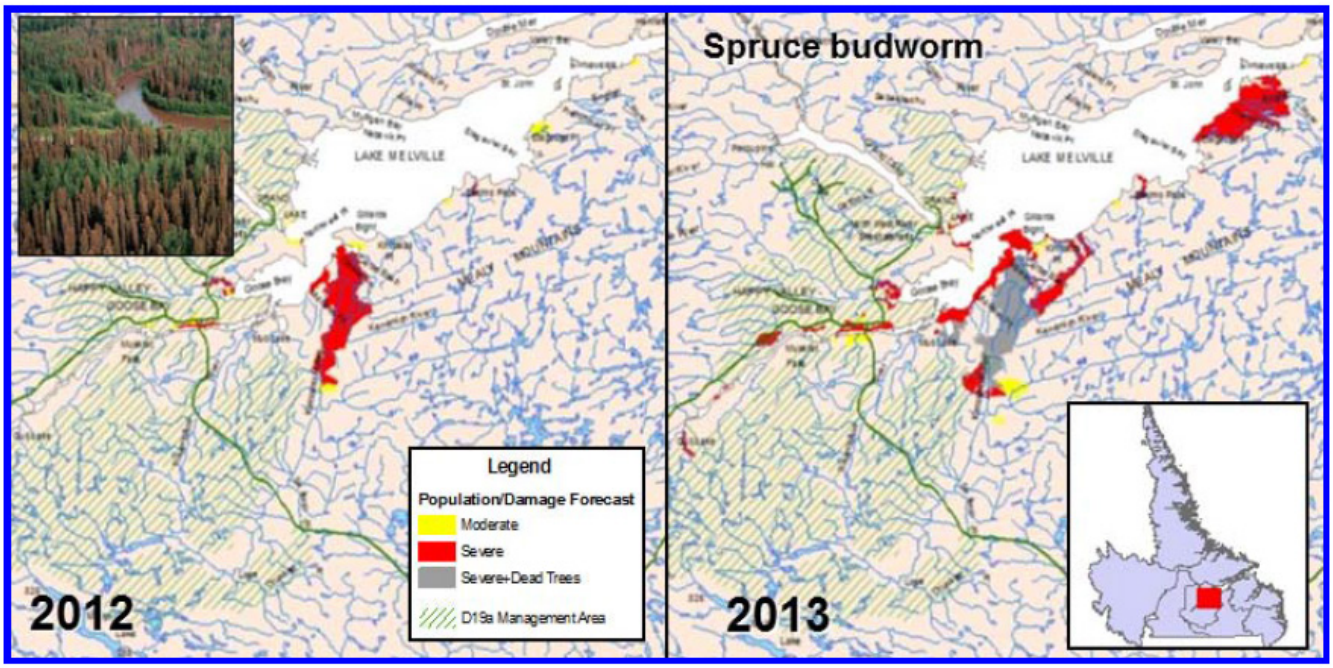


catches were around the same time that mass SBW moth flights were observed in Quebec in mid-July. Haze and smoke from on-going fires in Quebec were also observed in the Port Saunders areas during this first peak in trap catches suggesting weather conditions were favourable for the movement of moths in air masses from the west to the east. The obvious concern over moth immigration is the increase in number of eggs that are laid with the combination of those laid by both local and immigrating moths eventually overwhelming natural controls leading to another outbreak. During the last SBW outbreak an estimated 50 million m^3 of wood was lost. At that time this was equivalent to a 25-year wood supply to the forest industry.

HL pheromone trapping results indicate that populations of this insect remain at low levels. Overall trap catches on the island which decreased from 60.4 moths/trap in 2011 to 37.6 moths/trap in 2012 remained virtually unchanged at 38.0 moths/trap in 2013. As one would expect, notable decreases in trap catches were also observed in the areas treated (St. Albans, Daniels Harbour) in 2013. In contrast, increases of two arbitrary classes were observed in the Hampden-Whites Bay, Goose Arm, and Bad Bay areas, however, populations appear to still be below levels where damage is expected. In Labrador, excluding one trap south of Goose Bay with 201.5 moths/trap, the remaining traps had only 1.5 to 18 moths/trap compared to 1 to 8 moths/trap in 2012.

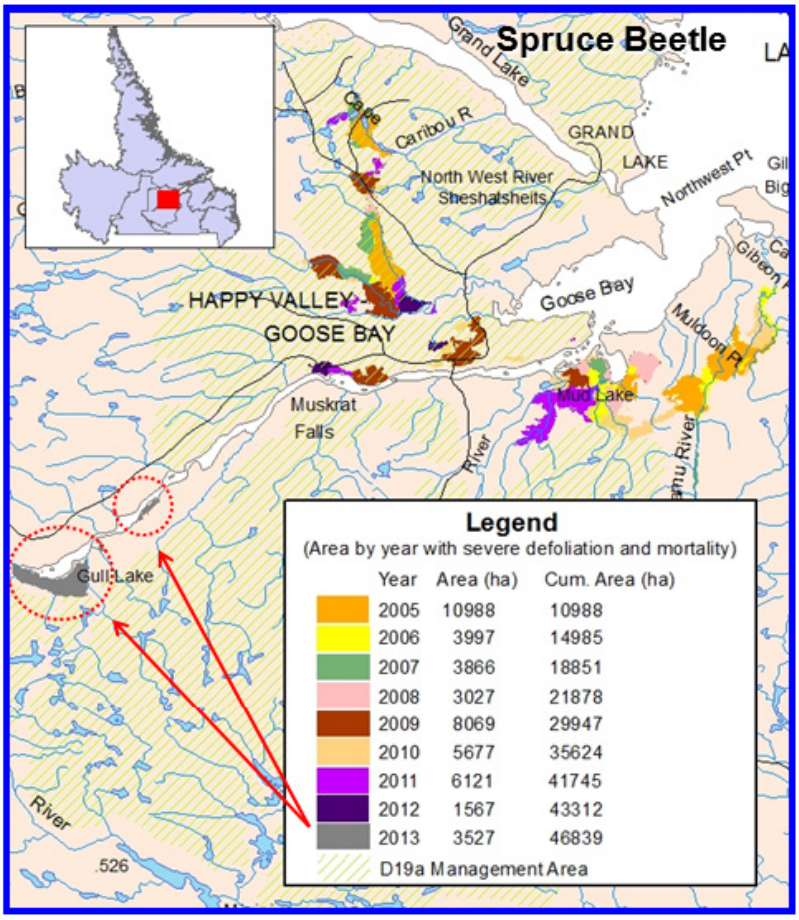


Aerial Defoliation Survey Results – In Labrador, the area of moderate-severe defoliation caused by the SBW increased from 33,255 ha in 2012 to 82,231 ha in 2013. This is the largest area to date defoliated by the SBW during its seven consecutive years in the Goose Bay area. Defoliation was again evident and expanded in the Kenamu River and Carter Basin areas with dead trees now observed along the Kenamu River. Small pockets of damage were also observed again in North West River and Sheshatshiu areas and along the Churchill and Goose Rivers. A large area of damage around the mouth of the English River on the south shore of Lake Melville which was evident in 2011 and then disappeared in 2012 reappeared in 2013. Most of the areas with damage fall outside of the District 19a management zone. No SBW defoliation was observed on the island.

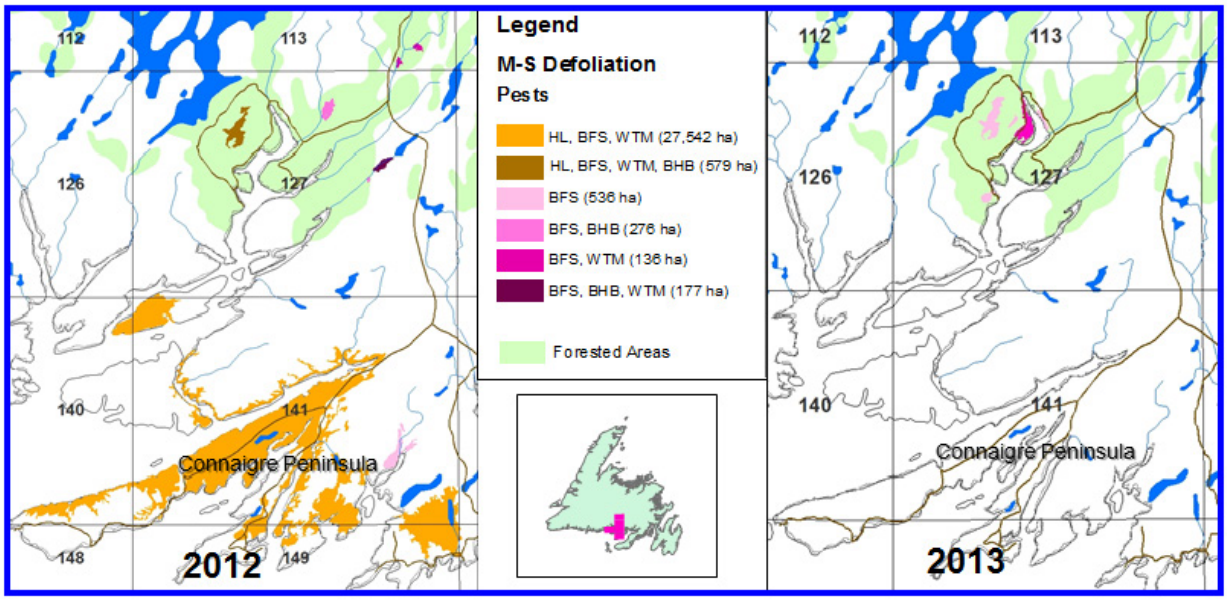


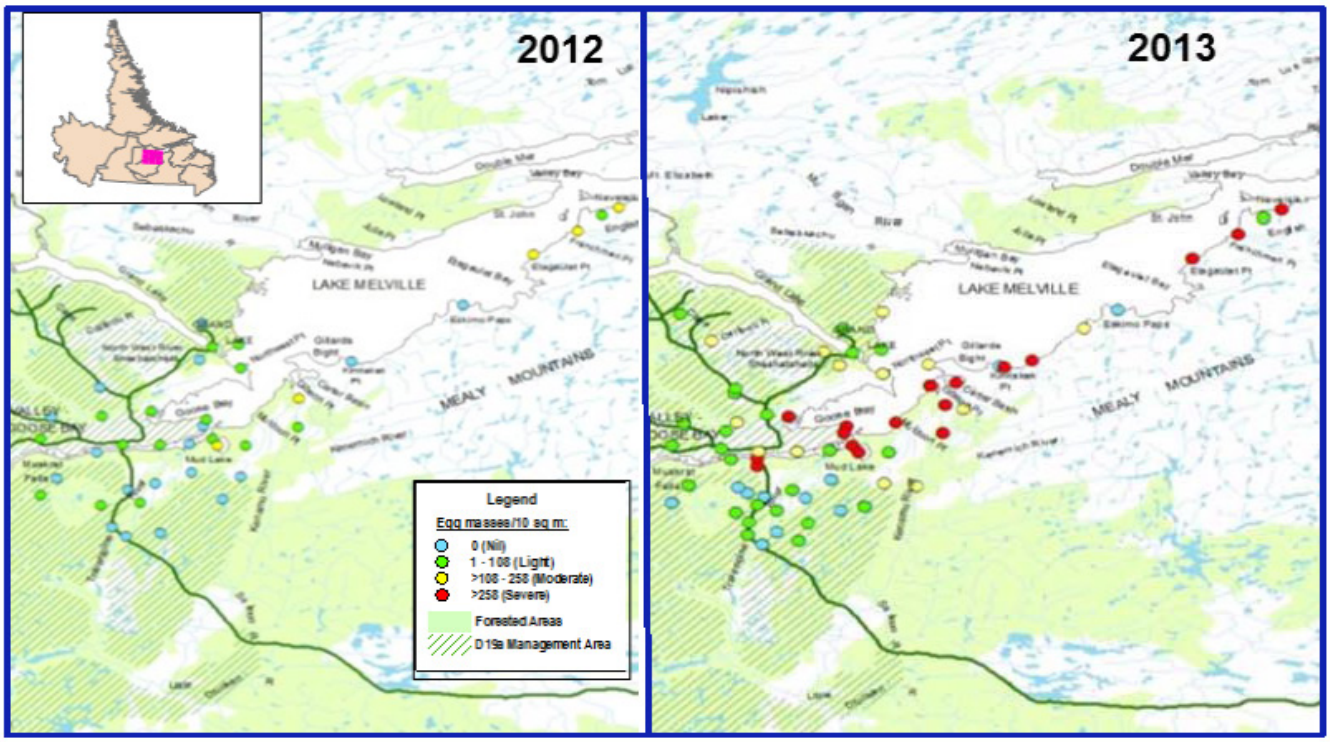
In 2013, the area of spruce beetle damage increased by another 3,527 ha with the discovering of beetle damaged trees in the Gull Lake area. This now brings the total area damaged by spruce beetle in Labrador to 46839 ha – ca. 15,000 ha falls within the District 19a management area. Most of the area with spruce beetle damage is now older mortality characterized by grey trees and fallen timber and there are fewer trees with yellow and red flagging indicating earlier attack from this insect. On the island scattered spruce beetle damage continues to be found in mixed wood stands along the Humber River valley from Corner Brook to Deer Lake.

Unlike in 2012 where a complex of defoliators (HL, BFS, whitemarked tussock moth) caused 28,077 ha of moderate-severe defoliation along the Connaigre Peninsula on the southern shore of the island, no widespread defoliation was observed in 2013. Some mortality, however, was observed in this area which is mainly comprised of scrub forest. In contrast in the St. Albans area, defoliation was observed for a second year with 1,492 ha of moderate-severe BFS defoliation and another 500 ha of defoliation caused by a combination of BFS and whitemarked tussock moth). This is up from the 1,167 ha of defoliation observed in the St. Albans area in 2012.

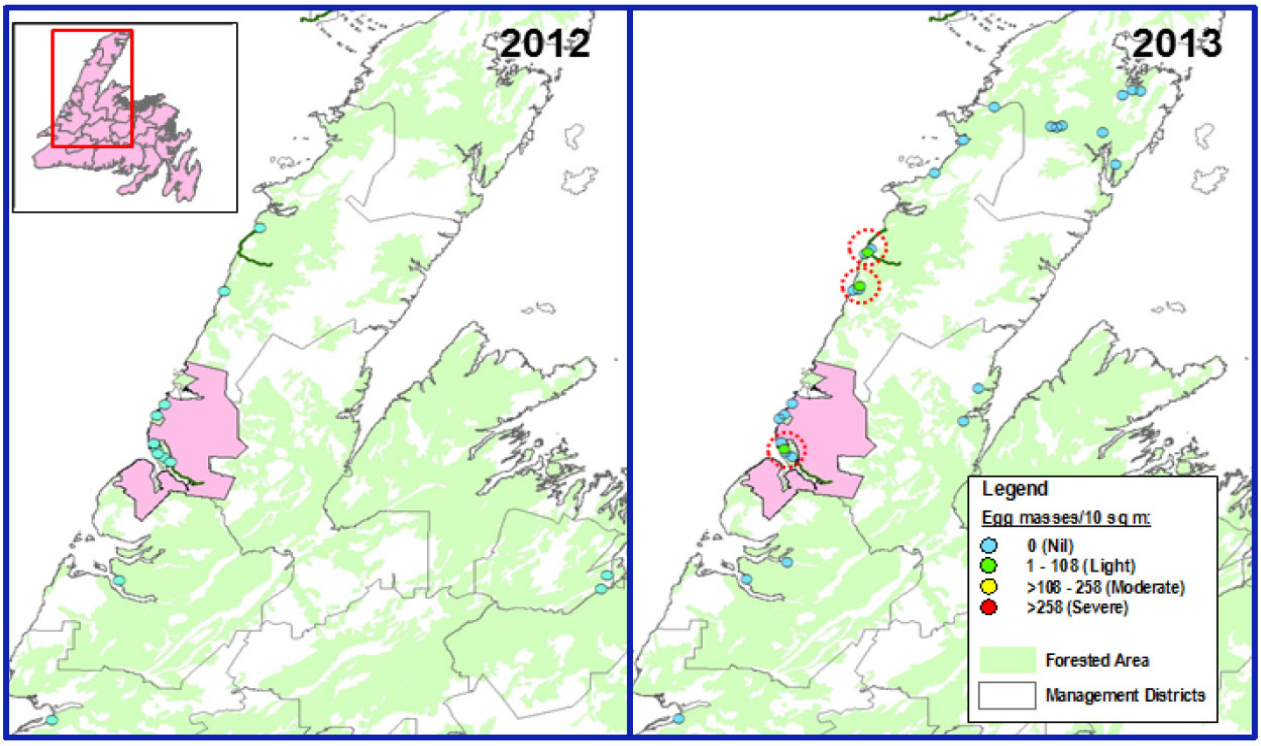


Fall forecast survey results – Spruce budworm (egg mass survey) – Whole branches collected from sixty-six locations (one branch/tree; 3 trees/location) in early September in the Goose Bay area in Labrador were used to determine the number of egg masses found per 10 m^2 of foliage. Populations capable of causing moderate-severe defoliation are forecast for 2014. This is the eighth consecutive year that SBW populations have been active in this area of Labrador. Fortunately the majority of points forecast to have moderate–severe defoliation fall outside of the District 19a management zone. A map of the 2012 results indicated populations of SBW would again be active in the Goose Bay area in 2013, however, as anticipated based on a 2012 study to compare egg mass densities from branches sampled in late August versus mid-October, due to the natural degradation of hatched eggs the 2012 forecast under forecasted the actual levels of damage expected. This was born out by the moderate-severe defoliation observed during the 2013 aerial survey in the Goose Bay area.



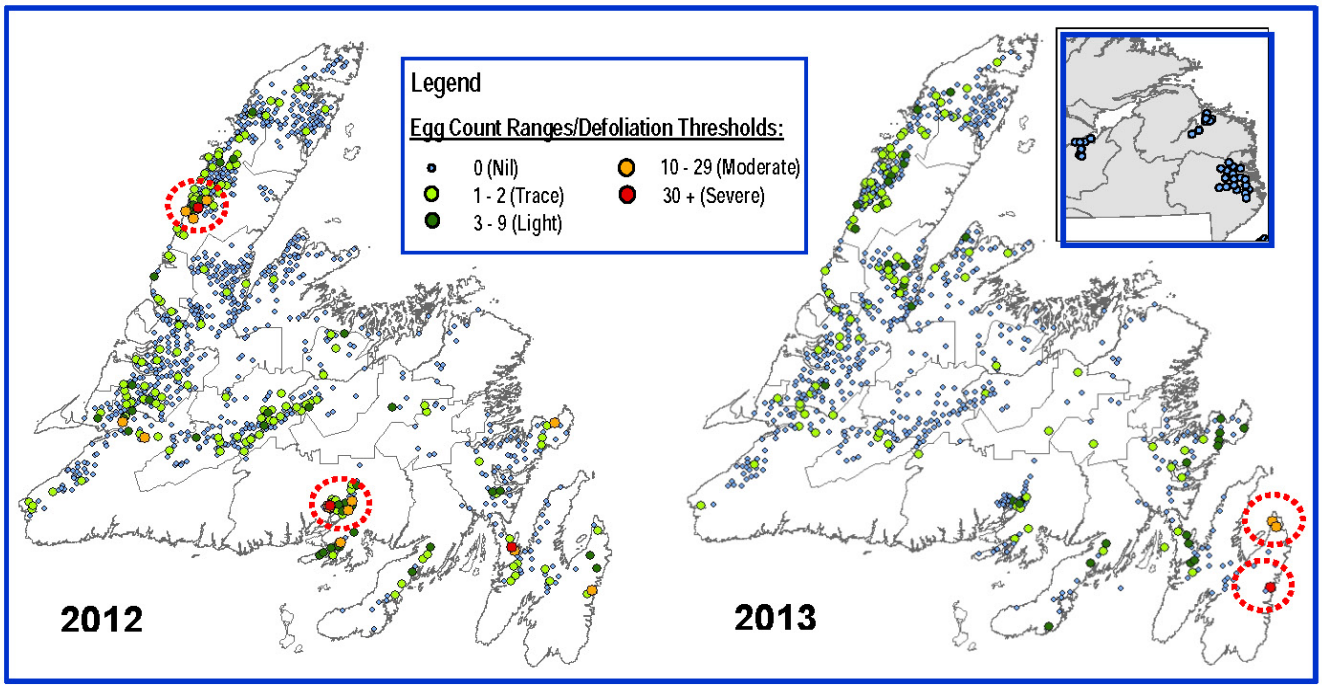


On the island, the increase in pheromone trap catches on the northern peninsula led to egg mass sampling being conducted at 28 locations at or near these plots. In 2012 sampling was also conducted around plots with higher pheromone trap catches, however, unlike the negative results in 2012, in 2013 a small number

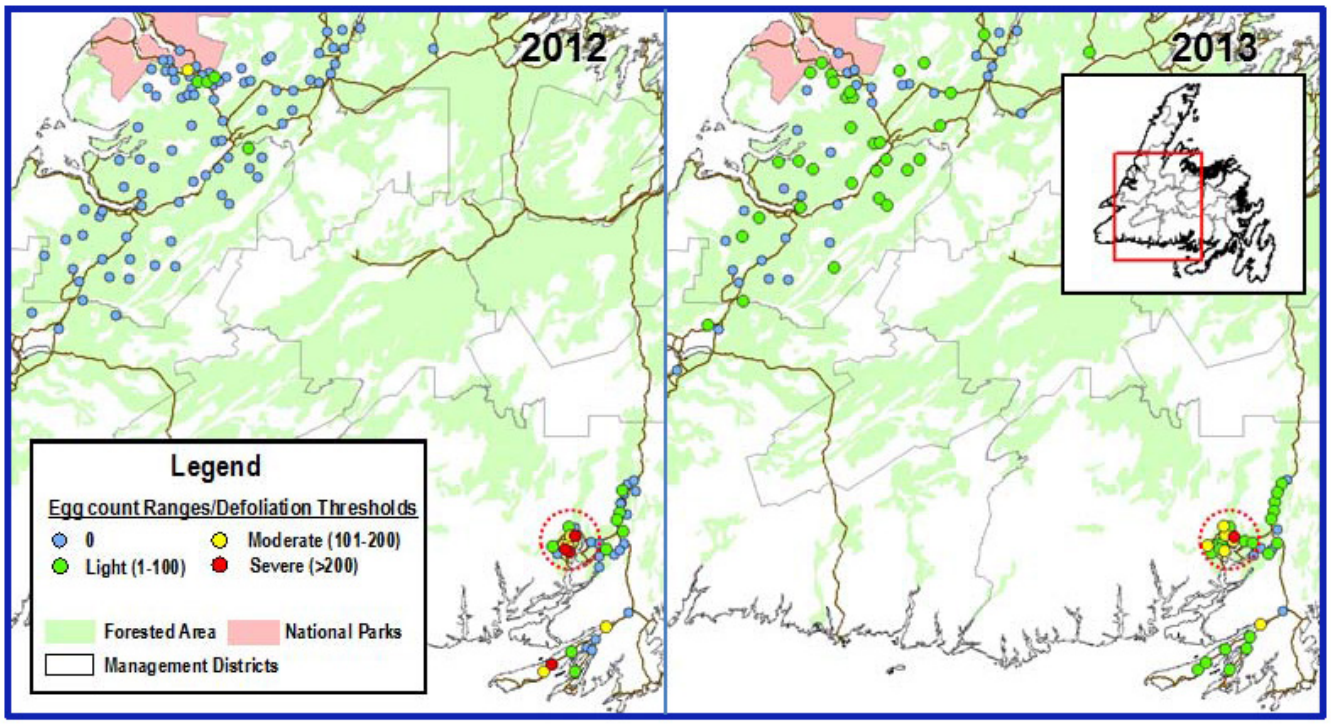


of egg masses were found at three locations (Rocky Harbour, Daniels Harbour, Belburns). This is the first time that SBW egg masses have been observed on the island since the isolated outbreak in the Codroy Valley in 1992.

Hemlock looper (egg survey) – Branch samples (one 100-cm branch/tree; 3 trees/location) collected and processed from 735 locations on the island indicate that HL populations remain at low levels. Only three locations on the east coast of the Avalon Peninsula (two north of and one south of St. John's) have populations forecast to cause moderate and severe defoliation in 2014. Supplementary sampling has been conducted in these areas to better determine the extent of damage expected. As hoped, HL egg counts in areas treated in 2013 were all reduced. No HL eggs were found at the thirty-two locations assessed in Labrador.



Balsam fir sawfly (egg survey) – 50-cm branches collected from 100 locations (5 trees/location; one branch/tree) on the island were examined for BFS eggs and used to forecast population/damage levels for 2014. Results confirmed that populations continue to decline on the Connaigre Peninsula and will remain active again in the St. Albans area in 2014 – this will be the third consecutive years that moderate-severe populations have been forecast in this area. Of greater interest, however, was the three-fold increase (17.5% - 2012; 60.0% in 2013) in the number of positive sites with BFS eggs, particularly sites on the west coast. This is the first indication that BFS population may be starting to build again in this part of the island. Fortunately the majority of positive sites are forecast to only have light damage (40 Nil, 53 Light, 6 Moderate, 1 Severe), with moderate- severe damage only forecast in the St. Albans area.



Please note: The above provides a summary of the initial results from the 2013 Insect & Disease Control and Monitoring program conducted by the Newfoundland and Labrador Department of Natural Resources – final results will be provided in the province's annual status report which is available upon request or through the Province of Newfoundland and Labrador's website at http://www.nr.gov.nl.ca/nr/forestry/insect_disease/.

Dan Lavigne – Supervisor, Insect & Disease Control Section Forest Engineering & Industry Services Division
January 21, 2014

PRINCE EDWARD ISLAND REPORT

David Carmichael, S. Christie, D. Kelly, B. MacLean

P.E.I. Department of Agriculture and Forestry, J. Frank Gaudet Tree Nursery
173 Upton Road, Charlottetown, P.E.I. C1A 7N8

Forest surveyed via trapping

Japanese beetle

Japanese beetles were originally trapped by CFIA in a campground south east of the Town of Cornwall in 2008. Suspect original entry into the Province as a "hitch hiker." Japanese beetle is found feeding on Virginia Creeper, American Mountain Ash, Apple, Birch Hawthorn Roses and Blackberry. There has been no obvious turf damage in areas of concentrated beetle populations. Beetle populations on P.E.I. are localized and found within the City of Charlottetown and south east of the Town of Cornwall. The beetle populations for Charlottetown are generally unchanged at 700 captures per trap. Beetle populations in Cornwall have more than doubled from 8,000+ beetles trapped in 2012 to 20,000+ beetles trapped in 2013. The trap in Cornwall was retrofitted to accommodate larger numbers of beetles.

Gypsy moth

Gypsy moth trap survey results are from the central regulated area on the Island. Victoria Park, in downtown Charlottetown had the highest capture of moths per trap, totaling 69 in a delta trap. This was certainly beyond saturation point for this trap. Captures in the perimeter of the City of Charlottetown ranged from mid-teens to mid-30s per delta trap. The species composition included predominately American beech with a smaller component of sugar maple, white birch, red oak, English oak and Norway maple.

Eastern spruce budworm

No significant population changes in the 2012 vs 2013 eastern spruce budworm surveys. Populations continue to remain low with trap captures ranging from 0 to 4 moth captures per Multipher trap in the western half of the Province to 0 to 17 captures per Multipher trap in the eastern half of the province. There has been no documentation of any significant defoliation in 2013.

Ground surveys

Balsam wooly adelgid

There are localized moderate to heavy populations of balsam wooly adelgid across the Island. Adult balsam wooly adelgid winter/spring survey results have dropped slightly from 2012 to 2013. Adults identified per site in 2012 included 13 in the western third of the province, 43 in the central part of the province and 1 in the eastern third of the province. Comparative results for 2013 included 2 adults in the western third of the province, 6 in the central part of the province and 0 in the eastern third of the province.

European larch canker

P.E.I. has not surveyed for European larch canker the past two years. The last survey was in 2011, with no positive confirmation of presence beyond or within the regulated area.

Forest tent caterpillar

There has been no viable forest tent caterpillar egg masses found in provincial egg mass surveys for 2013. Viable forest tent egg masses have not been found since 2006.

Gypsy moth

The province continues to move forward with an annual egg mass survey in the regulated area of the province. There is a correlation of adult male moths trapped versus egg masses found in the survey area. Areas in the outskirts of the City of Charlottetown had Delta captures in the mid-30s, this was followed by an egg mass survey identifying 3 egg masses. Victoria Park, a park in the core of the City of Charlottetown, had Delta captures of 69 followed by an egg mass survey identifying 19 egg masses.

General observations

Dutch elm disease

The province of P.E.I. is not involved in Dutch elm disease surveys. Dutch elm disease was first confirmed on P.E.I. in 1979 and in Charlottetown in 1996. The City of Summerside removed 6 elm trees in 2013, of the six trees removed four trees had been treated in previous years with Dutch trig. The City of Summerside has had a significant reduction in their elm population over the past 10 years due to Dutch elm disease. The City of Charlottetown had removed 48 diseased trees in 2013. A small component the infected elms were also treated with Dutch trig in previous years.

White pine blister rust

White pine blister rust is quite common throughout the Island, in particular in dense medium aged plantations. P.E.I. has four native species of *Ribes* spp., potential alternate hosts to this disease. Recent sivicultural practices improving air circulation have kept the advancement of this pest issue to a minimum.

Beech bark disease

Beech bark disease is quite widespread. There is some tolerance/resistance in the populations of beech as small percentages of our population have little if any presence of this pest.

Tar spot of Norway maple

Tar spot of Norway maple is generally an urban/residential issue. The heaviest infestations are in urban areas where heavy populations of Norway maple clones and inoculum exist. Tar spot infections lead to heavy defoliation in August of 2009, with levels of infections localized and moderate to high since. Very little tar spot has been found on indigenous stands of maples in recent years.

Spruce bark beetle

Spruce bark beetle populations remain elevated on older white spruce stands and hedgerows in localized areas across the Island. To date there has not been a survey for spruce bark beetle. There is a planned survey for this pest for the 2014 survey season.

Yellow headed spruce sawfly

Yellow headed spruce sawfly populations are low to moderate with localized higher defoliating populations where black spruce was planted in dry sites.

Bronze birch borer

Bronze birch borer has maintained a modest population, in particular in urban areas where soil volumes are limited and dry. Grey and European birch species are most susceptible, white birch less susceptible.

Elm leafminer

Elm leafminer populations are consistently high in urban areas. American elm is significantly affected, Scotch elm is most susceptible.

Ash rust

A moderate level of ash rust was present in 2013. It has been 3 years since the last outbreak on P.E.I. Marsh grass/cord grass is an alternate host to this disease and quite common on P.E.I.

Oak leaf skeletonizer

Oak leaf skeletonizer is present in moderate to high populations in a localized stand in central P.E.I. called Royalty Oaks. This stand is on the outskirts of the City of Charlottetown.

Sirrococcus on red pine

Sirrococcus tip blight of red pine hedgerows and plantations is significant and considered to be moderate to high in localized areas across the island. This issue continues to elevate with each passing year.

White pine weevil

White pine weevil has maintained a modest population in most plantations across the island with the exception of the upland central areas of Queen's County where there is little to any presence.

****Other common pests seen on the island in modest localized populations include, spruce needle cast, balsam fir tip blight, larch case bearer, bruce spanworm and oak leaf blister.

INVASIVE SPECIES CENTRE: HIGHLIGHTS AND OPPORTUNITIES

Dilhari Fernando, Executive Director

Invasive Species Centre
1219 Queen Street East, Sault Ste. Marie, Ontario P6A 2E5

The Invasive Species Centre (ISC) is a partnership-based organization. Its focus is on addressing threats from invasive species by facilitating collaboration and communication between the wide range of stakeholder groups involved in prevention, detection and response activities.

The ISC operates in three key areas: facilitating linkages between government and non-government agencies working in invasive species; functioning as a clearinghouse for information and knowledge exchange; and funding and managing projects that promote a coordinated, evidence-based approach to invasive species. The projects the ISC undertakes become part of the information and knowledge resources we offer through our network of partners. In addition, these initiatives will help contribute to our ongoing efforts at communication and outreach about invasive species.

Ms. Fernando, the new Executive Director of the ISC, will highlight ISC accomplishments, opportunities, challenges and discuss strategic plans for the future.

SESSION VII: SCIENCE POLICY IN PEST DIAGNOSTIC/DETECTION AND MONITORING TOOL APPLICATIONS

Chair: *Lise Caron*
Natural Resources Canada, Canadian Forest Service

SÉANCE VII : SCIENCE ET POLITIQUES DANS LE DIAGNOSTIC ET LA DÉTECTION DES RAVAGEURS, ET APPLICATION DES OUTILS DE SURVEILLANCE

Présidente : *Lise Caron*
Ressources naturelles Canada, Service canadien des forêts

THE FOREST PATHOLOGY WORKING GROUP: AN EXAMPLE OF INTEGRATION

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Native and invasive forest pathogens are important disturbance agents affecting the health and sustainability of Canada's forests. Federal agencies such as the Canadian Forest Service (CFS), the Canadian Food Inspection Agency and the Pest Management Regulatory Agency each have roles and responsibilities in the identification, understanding and/or management of biotic agents impacting forests, including pathogens. Beginning in 2010 and to enhance collaboration amongst the three agencies, an *Action Plan for Research Needs in Forest Pathology* was developed. The first action of the Plan was to set up an interdepartmental Forest Pathology Working Group (FPWG) to implement the remaining nine actions proposed by the Plan. Activities of the FPWG to date will be discussed, including progress on identifying proposed priority pathogens and development of a platform (PathPort) for sharing information. Progress on recent FPWG discussions with CFS Policy Specialists, including enhanced integration of policy needs with research priorities plus proposed future activities of the FPWG also will be presented.

LE GROUPE DE TRAVAIL SUR LA PATHOLOGIE FORESTIÈRE : UN EXEMPLE D'INTÉGRATION

Les pathogènes forestiers indigènes et envahisseurs sont des agents perturbateurs importants qui influent sur la santé et la durabilité des forêts canadiennes. Les organismes fédéraux comme le Service canadien des forêts (SCF), l'Agence canadienne d'inspection des aliments (ACIA) et l'Agence de réglementation de la lutte antiparasitaire (ARLA) ont chacun des rôles et des responsabilités à l'égard de l'identification, de la compréhension ou de la gestion des agents biotiques influant sur les forêts, y compris les pathogènes. Afin d'améliorer la collaboration entre les trois organismes, un *Plan d'action pour les besoins en matière de recherche sur la pathologie forestière* a été élaboré dès 2010. La première mesure du Plan consistait à émettre sur pied un Groupe de travail sur la pathologie forestière (GTPF) interministériel chargé de mettre en œuvre les neuf autres mesures proposées par le Plan. On discutera des activités réalisées à ce jour par le GTPF, y compris les progrès accomplis en matière d'identification des pathogènes prioritaires proposés et d'élaboration d'une plateforme (PathPort) d'échange de renseignements. On présentera également les progrès accomplis lors des récentes discussions du GTPF avec les spécialistes des politiques du SCF, entre autres sur une meilleure intégration des besoins stratégiques dans les priorités de recherche, de même que les activités futures proposées du GTPF.

SCIENCE AND POLICY INTEGRATION AT THE CANADIAN FOREST SERVICE: THE FOREST PATHOLOGY WORKING GROUP EXAMPLE

Richard Parfett, Rona Sturrock, Christiane Arsenault, Lise Caron

Natural Resources Canada, Canadian Forest Service

One of the most significant challenges that science-policy based organizations such as the Canadian Forest Service (CFS) must address is how to ensure that the best and most current science is used to inform policy and decision-making, and conversely, how to ensure that the strategic direction the organization has chosen informs what science is undertaken.

In 2013, an internal working group was created to look at the CFS forest pathology scientific research, and help guide research priorities moving forward. Through an inclusive approach and the development of a suite of policy questions, the Working Group made great strides in articulating the contribution of forest pathology research to government priorities.

Beyond direct results, broad lessons can be learned from the experience of the Forest Pathology Working Group. Among the challenges that the group faced, taking into consideration the inherent differences in activity time scales emerged as central to the success of the initiative. Science occurs over relatively long periods of time and often adopts a long-term perspective, and communicating uncertainty around the current state of knowledge is important to ensuring scientific credibility. Communicating uncertainty to policy makers can be a challenge, and developing a common understanding of how to do this amongst policy analysts and scientists can prove to be difficult. When rapid changes occur in the policy environment, the organization's activities may need to be realigned, which can cause difficulties for scientists engaged in longer term research.

The experience has confirmed that the process greatly matters. Science and policy integration requires a multi-disciplinary approach that includes the natural sciences, economists, social scientists and policy analysts. Moreover, maintaining dialogue over time has proven critical to building trust and a greater understanding among participants. Ensuring that everyone "speaks the same language" and fully understands each other's needs has proven to be our greatest success.

L'INTÉGRATION DES SCIENCES ET DES POLITIQUES AU SERVICE CANADIEN DES FORÊTS: L'EXEMPLE DU GROUPE DE TRAVAIL EN PATHOLOGIE FORESTIÈRE

L'un des défis les plus importants pour les organisations à vocation scientifique consiste à s'assurer que les meilleures et plus récentes connaissances scientifiques soient utilisées pour le développement de politiques et la prise de décisions, et inversement, que l'orientation stratégique de l'organisation guide les activités scientifiques.

En 2013, un groupe de travail interne a été créé afin d'examiner la recherche scientifique du SCF en pathologie forestière, et de guider les priorités de recherche pour l'avenir. Grâce à une approche inclusive et le développement d'une série de questions de politiques, le Groupe de travail a réalisé de grands progrès, notamment en articulant la contribution de la recherche en pathologie forestière aux priorités du gouvernement.

Au-delà des résultats directs, des leçons générales peuvent être tirées de l'expérience du Groupe de travail en pathologie forestière. Parmi les défis rencontrés par le groupe, la prise en compte des différences inhérentes au niveau de l'échelle temporelle est apparue comme la clé de la réussite de l'initiative. Les activités scientifiques se

déroulent sur des périodes de temps relativement longues, et adoptent souvent une perspective à long terme. Communiquer l'incertitude entourant l'état actuel des connaissances scientifiques est important pour assurer leur crédibilité. Il peut être difficile de communiquer l'incertitude auprès des décideurs, et développer une compréhension commune de la façon d'y arriver parmi les analystes de politiques et les scientifiques peut s'avérer un défi de taille. Lorsque des changements rapides se produisent au niveau des politiques, il peut être nécessaire de réaligner les activités de l'organisation, ce qui peut entraîner des difficultés pour les scientifiques qui ont entrepris des recherches à long terme.

L'expérience a permis de confirmer que le processus est un élément d'une grande importance. L'intégration des sciences et des politiques requiert une approche multidisciplinaire qui comprend sciences naturelles, économie, sciences sociales et politiques. De plus, maintenir le dialogue au fil du temps est apparu essentiel pour instaurer la confiance entre les participants et favoriser une meilleure compréhension. S'assurer que tous « parlent la même langue » et comprennent pleinement les besoins de l'autre s'est avéré être notre plus grand succès.

IMPACT OF DNA DETECTION ON MANAGEMENT DECISIONS: EXAMPLE OF THE POLAR CANKER

Harry Kope, Philippe Tangay

British Columbia Ministry of Forests, Lands and Natural Resource Operations

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DIAGNOSTIC CHALLENGES: ELEVEN YEARS OF TESTING FOR *PHYTOPHTHORA RAMORUM* IN CANADA

Stephan C. Brière

Plant Pathology Laboratory, Ottawa Plant Laboratory, Canadian Food Inspection Agency

Sudden Oak Death (SOD) which is caused by the Stramenophile *Phytophthora ramorum*, has become increasingly important in Europe and North America since it was first intercepted and characterized in Germany and the Netherlands in 1993. Beginning in November 2001, Canada acted to limit imports of soil and known hosts of *P. ramorum* from affected areas of the world including the infested areas in western U.S states. In conjunction with this regulatory action, the Canadian Food Inspection Agency (CFIA) started conducting surveys and focused import inspections in 2002. The CFIA has since received and tested more than 185,000 plant, soil and water samples to support Canadian nursery surveys and eradication activities. Over 2,000 plant import samples have also been tested for the presence of *P. ramorum*. All Canadian positive detections have been limited to approximately a dozen nurseries in the Vancouver and Victoria (British Columbia) areas. Eradication and surveillance activities were conducted under the CFIA nursery protocol at all affected nurseries and released from regulatory control following consecutive negative testing results. The testing scheme also evolved during this same period. Early testing activities employed ELISA prescreening followed by culture, morphological identification and confirmation by conventional PCR. The current testing scheme is based on a high-throughput molecular assay with a three gene realtime PCR with culture and morphological identification for confirmation and strain characterization.

INTERNATIONAL TRADE AND GENOMICS

Adnan Uzunovic

FPInnovations

International trade in forest products continually grows, together with the potential transfer and establishment of dangerous forest pests. Wood commodities consist of different tree parts with a variety of intended uses and destinations, all associated with different pest risks. International phytosanitary standards are being developed through coordinated international action (International Plant Protection Convention) to prevent pest movement while supporting trade. Pest detection methods based on genomics are increasingly being developed and used by plant protection organisations, especially for pathogens, however international standardisation of these is well behind. These tools are very useful for some commodities and scenarios, e.g., seeds or plants for planting, and able to detect targeted or unknown pathogens in asymptomatic material. The results may, however, be misleading for other commodities, e.g., round wood, sawn wood, wood chips, fuel wood, bark, wood packaging material, and manufactured wood products etc. where the knowledge on biology and pathways and dead-live status are crucial in predicting the risk of establishment. Lack of standardised diagnostic protocols and interpretation of the results may lead to unnecessary and unjustified trade barriers and oversensitivity. In this context this paper discusses current phytosanitary updates, knowledge gaps, and policy making.

LE COMMERCE INTERNATIONAL ET LA GÉNOMIQUE

Le commerce international des produits forestiers ne cesse de croître, et il en est de même avec les risques de transfert et d'établissement de ravageurs forestiers. Les produits du bois sont faits à partir de différentes parties de l'arbre et destinés à diverses utilisations et destinations. Ils sont tous liés à différents risques au niveau des ravageurs. Des normes phytosanitaires internationales sont en cours d'élaboration par la coordination de mesures internationales (Convention internationale pour la protection des végétaux) dans le but d'empêcher le déplacement des ravageurs tout en appuyant le commerce. Des méthodes de détection basées sur la génomique sont continuellement développées et utilisées par les organismes de protection des végétaux, particulièrement pour les pathogènes. Toutefois, la standardisation de ces méthodes sur le plan international accuse un retard considérable. Ces outils de détection sont très utiles pour certains produits et scénarios, comme les graines ou les végétaux destinés à la plantation, car ils peuvent détecter des pathogènes ciblés ou inconnus dans des matériaux asymptomatiques. Cependant, les résultats peuvent être trompeurs pour d'autres produits comme le bois rond, le bois débité, les copeaux de bois, les matériaux d'emballage à base de bois et les produits de bois fabriqués, etc. Dans ces cas, une bonne connaissance de la biologie, des trajectoires de propagation et de l'état de mortalité de l'arbre est cruciale pour permettre de prévoir les risques d'établissement. L'absence de protocoles de diagnostic normalisés et l'interprétation des résultats peuvent mener à la mise en place d'obstacles inutiles et injustifiés pour le commerce ainsi que de l'hypersensibilité. Dans ce contexte, l'étude aborde les mises jour phytosanitaires actuelles, les lacunes en matière de connaissances et l'élaboration des politiques.

WHITE PINE BLISTER RUST: SHOULD A NEW VIRULENT RACE CHANGE POLICY?

Philippe Tanguay

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White pine blister rust is caused by a pathogen that was introduced to North America at the turn of the 20th century. Before infecting and killing white pine, it must complete part of its life cycle on the *Ribes* species. This disease was recently observed on previously immune varieties of black currant plants. Observations of this disease have been made in Connecticut (2008), Prince Edward Island (2009), Quebec (2011), New Hampshire (2012), New Brunswick and Nova Scotia (2013). Our work has confirmed that this is a new species emerging from the northeastern American population. This new species has undone single-gene resistance that has introgressed for over 60 years among black currant varieties. After suspending certificates for *Ribes* planting in 2002, New Hampshire has just reviewed its policy on allowed varieties and has banned immune varieties. Together with the MAPAQ and the MRN, a preliminary Canadian initiative will be introduced to guide the phytosanitary establishment and monitoring of *Ribes* productions to reduce the impacts of the disease.

LA ROUILLE VÉSICULEUSE DU PIN BLANC — UNE NOUVELLE RACE VIRULENTE DEVRAIT-ELLE MODIFIER LES POLITIQUES?

La rouille vésiculeuse du pin blanc est causée par un agent pathogène qui a été introduit en Amérique du Nord au début du 20^{e} siècle. Il doit compléter une partie de son cycle vital sur les espèces du genre *Ribes* avant d'infecter et de tuer les pins blancs. Récemment, cette maladie a été observée sur des variétés de cassissiers auparavant immunisées. Des observations ont été faites au Connecticut (2008), à l'Île-du-Prince-Édouard (2009), au Québec (2011), au New Hampshire (2012), puis au Nouveau-Brunswick et en Nouvelle-Écosse (2013). Nos travaux ont confirmé qu'il s'agissait d'une nouvelle race, issue de la population du Nord-est américain. Cette nouvelle race a brisé une résistance monogénique introgressée depuis plus de 60 ans dans les variétés de cassissiers. Après avoir suspendu l'émission de certificat pour la plantation de *Ribes* en 2012, le New Hampshire vient de revoir sa politique sur les variétés permises et a banni les variétés immunisées. De concert avec le MAPAQ et le MRNQ, une première initiative canadienne est à voir le jour et devrait guider l'implantation et le suivi phytosanitaire des productions de *Ribes* afin de réduire les impacts de la maladie.

SESSION VIII: URBAN TREES AS A BRIDGEHEAD FOR NEW INVASIONS

Chair: *Jean Bérubé*
Natural Resources Canada, Canadian Forest Service

SÉANCE VIII : LES ARBRES URBAINS COMME TÊTE DE PONT POUR LES NOUVEAUX ENVAHISSEURS

Président : *Jean Bérubé*
Ressources naturelles Canada, Service canadien des forêts

EARLY DETECTION OF EMERGING FUNGAL DISEASES FROM SPORES IN URBAN CENTRES

Jean Bérubé

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Urban trees are often the first target of forest invasive alien pests due to their proximity to transport nodes, ports, storage yards and tree nursery retailers. Early detection of emerging diseases after introduction but before their establishment is often difficult due to their inconspicuous nature and thus represents an important risk to Canadian forests. We developed an early warning method based 454 pyrosequencing to detect new potential alien fungal pests. We made 32 weekly aerial spore collections in four Canadian urban centres and sequenced the PCR-amplified fungal nuclear ribosomal internal transcribed spacer (ITS) DNA present to reveal fungal diversity. Many hundred fungal species were found and those with potential impact on Canadian forest will be presented. As prevention is probably the best and cheapest control measure against emerging forest diseases, this method shows the potential of early detection and eradication before establishment as a management tool.

DÉTECTION HÂTIVE DES MALADIES FORESTIÈRES ÉMERGENTES À PARTIR DE SPORES AÉRIENNES

Les arbres urbains sont souvent les premiers affectés par les ravageurs forestiers émergents à cause de leur proximité avec les nœuds routiers, les ports, les lieux d'entreposage et les jardineries. La détection hâtive suite à leur introduction, mais avant leur établissement est souvent difficile à cause de leur nature cryptique. Pour cette raison, ils sont un risque important pour les forêts canadiennes. Nous avons développé une méthode d'alerte précoce basée sur le pyroséquencage 454 pour détecter des champignons étrangers à potentiel pathogène. Nous avons traité 32 collections hebdomadaires de spores aériennes dans quatre grands centres urbains et séquencé les ADN ribosomiques nucléaires amplifiés par PCR pour révéler la biodiversité fongique. Plusieurs centaines d'espèces fongiques ont été trouvées et nous présenterons celles ayant un potentiel d'impact sur les forêts canadiennes. La prévention est probablement la meilleure et plus économique méthode de contrôle contre les maladies émergentes. Cette méthode propose la détection hâtive et l'éradication avant la phase d'établissement comme méthode de gestion des ravageurs exotiques.

NEW TECHNOLOGIES FOR PEST DETECTION

Guillaume Bilodeau

Canadian Food Inspection Agency

For detection of plant pathogens, visual inspection and culture plating have been the traditional way to identify plant pathogens. Sometimes no symptoms are visible in a diseased plant, which illustrates the importance of having the improved sensitivity of molecular methods to detect pathogens. Molecular detection tools aid us in detecting different organisms that are important for phytosanitary export certification. DNA sequence information and genomic resources are important in the development of detection and identification assays. In the last decade, several genomes of plant pathogens have been made available and a new generation of sequencing technology has enabled lower cost genome and metagenomic sequencing. Moreover, multiple rapid, sensitive and sometimes portable detection technologies have increased the possibility of getting quick diagnosis and our ability to process high numbers of samples in a few hours. Next generation sequencing, real-time PCR, droplet digital PCR, isothermal amplification, and sample prep processing using new tools such as microfluidics are just a few examples of new tools that will facilitate diagnostic work for pest detection in the future.

NOUVELLES TECHNOLOGIES POUR LA DÉTECTION DE RAVAGEURS

Pour la détection d'agents phytopathogènes, les inspections visuelles et la culture sur milieu de croissance sont les méthodes traditionnelles d'identification des agents pathogènes. Parfois, les symptômes ne sont pas visibles sur les plants malades, démontrant ainsi l'importance d'avoir des méthodes de détection moléculaire des agents pathogènes associés aux essences forestières. Pour le développement de tests de détection et d'identification, les séquences d'ADN et les ressources génomiques sont très importantes. Dans la dernière décennie, plusieurs génomes d'agent phytopathogènes ont été mis à notre disposition et la technologie de séquençage de nouvelle génération a réduit les coûts de séquençage des génomes et de métagénomiques. De plus, les multiples technologies de détection rapides, sensibles et parfois portables ont augmenté les possibilités de diagnostic rapide et de pouvoir traiter un nombre élevé d'échantillons en quelques heures. Le séquençage de nouvelle génération, la PCR en temps réel, la PCR digitale de gouttelettes, l'amplification isothermale et la préparation de matériel avec la microfluidique sont seulement quelques exemples de nouveaux outils qui vont faciliter le travail de diagnostic pour la détection des ravageurs.

TREEAZIN AS A SYSTEMIC INSECTICIDE FOR POTENTIAL USE AGAINST ASIAN LONGHORNED BEETLE – WHAT WE KNOW AND WHAT WE NEED TO KNOW

Dean Thompson and Amanda Tonon

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The Asian Longhorn Beetle (ALB) poses an unprecedented risk to multiple economic, ecological and aesthetic values associated with the southern deciduous forests of Canada. The recent re-occurrence of ALB in the Toronto area, coupled with the plethora of potential points of entry associated with international trade occurring throughout the Great Lakes-St. Lawrence region, and extant infestations in several northeastern United States, emphasize the risk and the need for a comprehensive strategic response in Canada. As part of such a strategic response, TreeAzin, a natural systemic insecticide specifically developed for use against wood boring beetles, stands out as the non-destructive option with the greatest likelihood of success and public acceptance in Canada. Results of recently completed and ongoing studies that support continued focus on development of TreeAzin as part of an integrated response strategy for ALB will be described. Proposed research that meets critical needs for efficacy and potential use in high value sugar bush scenarios will also be discussed.

LE TREEAZIN COMME INSECTICIDE SYSTÉMIQUE ÉVENTUEL POUR LA LUTTE CONTRE LE LONGICORNE ASIATIQUE – CE QUE NOUS SAVONS ET CE QU'IL NOUS FAUT SAVOIR

Le longicorne asiatique présente un risque sans précédent à de nombreuses valeurs économiques, écologiques et esthétiques associées aux forêts caducifoliées du sud du Canada. La récente réapparition du longicorne asiatique dans la région de Toronto, de pair avec l'abondance de points d'entrée associés avec le commerce mondial qui a lieu dans la région des Grands Lacs et du Saint-Laurent, et les fortes infestations dans plusieurs états dans le nord-est des États-Unis, accentue le risque et le besoin d'un plan d'intervention stratégique complet au Canada. Dans le cadre d'un tel plan d'intervention stratégique, TreeAzin, un insecticide naturel systémique spécifiquement conçu à être utilisé contre les buprestidés, ressort comme étant l'option non destructive avec la plus grande probabilité de succès et d'acceptation du public au Canada. Les résultats d'études en cours et récemment terminées qui appuient les efforts soutenus pour le développement de TreeAzin dans le cadre d'un plan d'intervention stratégique intégré pour le longicorne asiatique seront décrits. Les recherches proposées qui satisfont les besoins essentiels pour l'efficacité et l'utilisation potentielle dans les cas d'érablières à grande valeur seront aussi discutées.

MEASURING WIND SPEED DURING AERIAL APPLICATIONS OF PESTICIDE

Peter Keddy

Forest Protection Limited

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RESEARCH INTO DETECTION AND MONITORING FOR EMERALD ASH BORER: HIGHLIGHTS OF SUCCESSFUL COLLABORATION WITH URBAN FORESTERS

Robert Lavallée and Krista Ryall

Natural Resources Canada, Canadian Forest Service

EAB is having a devastating impact on ash trees located in urban areas. The success of research into novel detection and sampling methods has been greatly enhanced through successful and productive collaborations with urban foresters in both Ontario and Quebec. In this presentation, we highlight two major recent CFS research innovations (development of a branch sampling method and of pheromone-baited traps) whose success was greatly enhanced through significant collaborations with several major cities. Our research results provide novel and improved methods for both early detection and management of this damaging invasive pest in urban areas.

RECHERCHES SUR LA DÉTECTION ET LA SURVEILLANCE DE L'AGRILE DU FRÊNE : FAITS SAILLANTS D'UNE COLLABORATION FRUCTUEUSE AVEC LES FORESTIERS DES MILIEUX URBAINS

L'agrile du frêne a un impact dévastateur sur les frênes qui croissent en milieu urbain. Les succès obtenus dans la recherche de meilleures méthodes de détection et d'échantillonnage ont été grandement favorisés par des collaborations fructueuses et productives avec les forestiers des milieux urbains, à la fois en Ontario et au Québec. Au cours de cette présentation, nous mettrons en évidence deux innovations récentes issues de la recherche au SCF (développement de la technique d'échantillonnage de branches et les pièges avec phéromones) dont la réussite est grandement attribuable à une importante collaboration avec plusieurs grandes villes. Nos résultats de recherche proposent des méthodes innovantes et améliorées pour à la fois détecter plus rapidement l'agrile du frêne et mieux gérer cet insecte exotique envahissant en milieu urbain.

ESTIMATES OF THE POTENTIAL COST OF EMERALD ASH BORER (*AGRILUS PLANIPENNIS* FAIRMAIRE) TO CANADIAN MUNICIPALITIES

Daniel W. McKenney, John H. Pedlar, Denys Yemshanov, D. Barry Lyons, Kathy Campbell and Kevin Lawrence

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We estimated the economic costs associated with EAB-related mortality of street and backyard trees in Canadian municipalities over a 30-year time horizon. Our approach employed a simple spread model to approximate EAB arrival times at each community based on 3 ‘‘maximum spread rates’’: slow (~10 km/year), medium (~30 km/year), and fast (~50 km/year). Costs were estimated for four discount rates (0, 2, 4, and 10%) and three treatment rates (0, 10, and 50% of trees treated with an insecticide). Ash density along urban roads was estimated from a variety of sources, including a recently developed survey that allows rapid assessments of street tree composition. Based on the 30 km/year spread rate, a 4% discount rate, and 10% treatment rate, the present value of EAB-related costs was estimated to be $524 million; this value increased to roughly $890 million when costs associated with backyard trees were included. Our estimates are conservative because they focus only on damage to street (and backyard) trees; nonetheless, their magnitude suggests considerable justification for investments to slow the spread of EAB in Canada.

ESTIMATION DES COÛTS POTENTIELS LIÉS À L’AGRILE DU FRÊNE (*AGRILUS PLANIPENNIS* FAIRMAIRE) POUR LES MUNICIPALITÉS CANADIENNES

Nous avons estimé les coûts économiques attribuables à la mortalité des arbres de rue et d’arrière-cour causée par l’agrile du frêne dans les municipalités canadiennes, sur une période de 30 ans. Notre approche a été d’utiliser un modèle de propagation simple pour estimer les moments d’arrivée de l’agrile du frêne dans chaque communauté. Nous nous sommes basés sur trois « vitesses maximales de propagation » : lente (~ 10 km/an), moyenne (~ 30 km/an), et rapide (~ 50 km/an). Les coûts ont été estimés par rapport à quatre taux d’escompte (0, 2, 4, et 10 %) et trois taux de traitement (0, 10, et 50 % des arbres traités avec un insecticide). La densité des frênes le long des voies urbaines a été estimée selon une variété de sources, dont un relevé récent permettant d’estimer rapidement la composition des arbres de rue. Selon une vitesse de propagation de 30 km/an, un taux d’escompte de 4 %, et un taux de traitement de 10 %, la valeur actuelle des coûts liés à l’agrile du frêne a été estimée à 524 millions de dollars. Cette valeur s’élève à près de 890 millions de dollars si l’on inclut les coûts des arbres d’arrière-cour. Nos estimations sont prudentes, car elles se concentrent seulement sur les arbres de rue et ceux d’arrière-cour. Néanmoins, l’ampleur de ceux-ci peut s’avérer une justification importante des investissements pour ralentir la propagation de l’agrile du frêne au Canada.

AGRILUS PLANIPENNIS, OR HOW ASHES ARE TURNING TO ASHES

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The highly destructive wood-boring emerald ash borer (EAB, *Agrilus planipennis*), since its introduction to America in 2002, killed millions of ashes. The estimate value of present costs caused by this beetle in Canada is almost $ 900 million. All efforts to stop its spreading are unsuccessful and this year the capital Ottawa has been heavily devastated with the loss of third urban trees. EAB has more than 3000 close relatives across the world with the same destructive potential. Should we be worried and how can we protect?

OUT OF THE CITIES AND INTO THE FOREST: URBAN ENVIRONMENTS AS SOURCE POPULATIONS FOR INVASIVE FOREST PESTS

Lee Humble

Natural Resources Canada, Canadian Forest Service

NOT AVAILABLE / NON DISPONIBLE

SESSION IX: FIREWOOD AS A PATHWAY: WORKING COLLABORATIVELY TO HELP MITIGATE THE SPREAD OF NATIVE AND INTRODUCED FOREST PESTS

Chair: *Stephan Brière*
Canadian Food Inspection Agency

SÉANCE IX : LE BOIS DE CHAUFFAGE COMME VOIE D'ENTRÉE – TRAVAILLER EN COLLABORATION POUR AIDER À ATTÉNUER LA PROPAGATION DES RAVAGEURS FORESTIERS INDIGÈNES ET INTRODUITS

Président : *Stephan Brière*
Agence canadienne d'inspection des aliments

INTRODUCTION – FIREWOOD : A COLLABORATIVE MANAGEMENT APPROACH

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There is compelling evidence that invasive and native forest pests can readily move with untreated firewood. The Emerald Ash Borer, Asian Longhorned Beetle and Thousand Cankers Disease are prime examples of pests that can easily be transported over medium to long distances in firewood. Efforts to reduce the risk of spread of these pests have focused on the establishment and enforcement of regulated areas to control the movement of infested wood and firewood to non-infested areas. However the effectiveness of these regulatory actions can be greatly enhanced with successful outreach efforts that are primarily focused on commercial firewood vendors, municipalities and the general citizen population. All of these efforts are essential components of a collaborative management approach to help mitigate the risk and spread of forest pests in our cities, provinces and across our borders. The CFIA is revising Canada's existing firewood policy in collaboration with the US to harmonize our regulatory approach to the import and domestic movement of firewood. As part of this policy revision the CFIA will be initiating a stakeholder discussion with emphasis at empowering all stakeholders to help contribute to an organizational and grassroots based collaborative management approach to mitigate the risks associated with the movement of firewood in Canada.

INTRODUCTION – LE BOIS DE CHAUFFAGE, UNE APPROCHE DE GESTION COOPÉRATIVE

Il existe des preuves contraignantes selon lesquelles les ravageurs forestiers envahissants et indigènes peuvent facilement se déplacer avec le bois de chauffage non traité. L'agrile du frêne, le longicorne asiatique et la maladie des mille chancres sont d'excellents exemples de parasites qui peuvent être facilement transportés sur de moyennes ou longues distances dans le bois de chauffage. Les efforts déployés pour réduire le risque de propagation de ces ravageurs se sont concentrés sur l'établissement de zones réglementées et sur les mécanismes d'application dans ces zones pour contrôler le déplacement de bois et de bois de chauffage infestés vers des zones non infestées. Or, on peut grandement accroître l'efficacité de ces mesures réglementaires en déployant des efforts de sensibilisation principalement axés sur les fournisseurs de bois de chauffage commercial, les municipalités et la population générale. Tous ces efforts sont les éléments essentiels d'une approche de gestion coopérative pour aider à atténuer le risque de propagation des ravageurs forestiers dans nos villes, nos provinces et à nos frontières. L'ACIA est en train de réviser la politique actuelle du Canada sur le bois de chauffage en collaboration avec les États-Unis afin d'harmoniser notre approche de réglementation avec l'importation et le transport en territoire canadien du bois de chauffage. Dans le cadre de la révision de cette politique, l'ACIA amorcera une discussion avec les intervenants qui mettra l'accent sur l'habilitation de tous les intervenants pour aider à contribuer à une approche de gestion coopérative organisationnelle et locale visant à atténuer les risques associés au déplacement du bois de chauffage au Canada.

INVASIVE FOREST PESTS AND MOVEMENT OF INFESTED FIREWOOD: NEW ASSESSMENT APPROACHES AND DATA SOURCES

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Long-distance movement of forest invasive pests with infested firewood has long been recognized as a key contributor to the expansion of invasive pest populations in North America. We present an overview of new risk assessment approaches that make use of the pathway modelling concept to predict the long-distance movement of forest pests, carried by travellers to national / provincial parks and campgrounds in Canada, in infested firewood. Pathway-based models describe the spread of an organism via a lattice of spread vectors connecting a network (such as a set of parks, campgrounds, cities and other human settlements) and prioritize the degree of connectivity, so the amount of an organism's movement along a vector is more important than the spread distance when determining the likelihood of spread. We demonstrate this new approach by analyzing pathways of the human-assisted spread of the emerald ash borer (*Agrilus planipennis* Fairmaire), a major pest of ash trees in North America, in infested firewood carried by campground visitors. Overall, the new methodology offers a workable strategy for dealing with the typical lack of knowledge about the movement of invasive forest pests with infested firewood and provides a way to incorporate the indicators of human-mediated spread (such as campground reservations databases maintained by provincial ministries of natural resources and U.S. state departments of natural resources) into final estimates of pest invasion risk. Overall, the approach better incorporates available information about known vectors of human-mediated spread of invasive forest pests and helps prioritize the geographic areas that need to be targeted by surveillance or public outreach activities.

LES RAVAGEURS FORESTIERS ENVAHISSANTS ET LE DÉPLACEMENT DE BOIS DE CHAUFFAGE : NOUVELLES MÉTHODES D'ÉVALUATION ET SOURCES DE DONNÉES

Depuis longtemps, le déplacement sur de longues distances de ravageurs forestiers envahissants dans le bois de chauffage est reconnu comme un facteur-clé dans la propagation de ces populations en Amérique du Nord. Nous présentons un survol de nouvelles approches d'évaluation des risques, faisant appel au concept de modélisation des trajectoires de propagation, afin de prévoir le déplacement sur de longues distances des ravageurs forestiers dans du bois de chauffage par l'entremise de visiteurs de parcs provinciaux et nationaux et de terrains de camping au Canada. De tels modèles présentent la propagation d'un organisme au moyen d'une grille de vecteurs d'étalement liant un réseau (notamment un ensemble de parcs, de terrains de camping, de villes et d'autres établissements humains) et établissent la priorité du degré de connectivité; ainsi, l'importance du mouvement d'un organisme le long d'un vecteur entre davantage en ligne de compte que la distance d'étalement dans la détermination de la probabilité de

propagation. Nous démontrons cette nouvelle approche par l'analyse de trajectoires de propagation anthropique de l'agrile du frêne (*Agrilus planipennis* Fairmaire), un ravageur important de frênes en Amérique du Nord, dans le bois de chauffage infesté et transporté par des visiteurs de terrains de camping. Globalement, les nouvelles méthodes offrent une stratégie exploitable pour composer avec le manque courant de connaissances sur le mouvement de ravageurs forestiers envahissants dans du bois de chauffage. C'est également une façon d'intégrer les indicateurs de propagation anthropique (obtenus notamment des bases de données de réservations de terrains de camping, maintenues par les ministres provinciaux de ressources naturelles et les ministères de ressources naturelles d'États américains) dans les estimations définitives des risques d'envahissement par des ravageurs. En général, cette approche permet de mieux intégrer les informations disponibles sur les vecteurs connus de propagation anthropique de ravageurs forestiers envahissants et de mieux déterminer les zones géographiques qu'il faut cibler en priorité au moyen de surveillance ou d'activités de sensibilisation auprès du public.

A PROACTIVE APPROACH TO FIREWOOD REGULATION IN MANITOBA

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The management of forest invasive species is a priority for Manitoba. As firewood is widely recognized as a source for the introduction of new invasive species, the movement of firewood is seen as an unnecessary risk to the province of Manitoba. To mitigate this risk the provinces has increased education, placed wood drop off boxes at its provincial boundaries and enacted legislation – *the Forest Health Protection Act* – to help stop the spread and introduction of forest invasive pest through the movement of firewood

UNE APPROCHE PROACTIVE DE LA RÉGLEMENTATION SUR LE BOIS DE FEU AU MANITOBA

La gestion des espèces envahissantes forestières est une priorité pour le Manitoba. Comme le bois de feu est largement reconnu comme une source d'introduction de nouvelles espèces envahissantes, le déplacement du bois de chauffage est perçu comme un risque inutile pour la province du Manitoba. Pour atténuer ce risque, la province a augmenté les efforts déployés pour informer la population à cet égard, a placé des boîtes de dépôt de bois à ses frontières provinciales et a promulgué une loi – la *Loi sur la protection de la santé des forêts* – pour aider à mettre un frein à la dissémination et à l'introduction des ravageurs envahissants forestiers causées par le déplacement du bois de feu.

PARK VISITORS AND THE FIREWOOD ISSUE: LESSONS LEARNED FROM THE CASE OF BROWN SPRUCE LONGHORN BEETLE AT KOUCHIBOUGOUAC NATIONAL PARK

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In 2008, the Parks Canada Agency (PCA) developed a draft Directive on the Management of Alien Species in Canada's National Parks. The Directive contains the principles to allow for strict control on importing firewood that park managers have the power to implement. Since the mountain pine beetle infestation in Banff National Park, PCA's reservation system has a message to all visitors reserving campsite sites in National Park not to move firewood. Despite public education campaigns, in July 2011, the Brown Spruce Longhorn Beetle (BSLB, *Tetropium fuscum*) was detected in Kouchibouguac National Park (KNP) within a lure trap deployed by the Canadian Food and Inspection Agency. BSLB was most likely introduced via firewood. KNP is the first national park with a confirmed occurrence of BSLB. In Nova Scotia since 1999, BSLB is native to Europe where it typically attacks dead or dying trees. In Canada BSLB attacks healthy red, white, black and Norway spruces, putting forests at risk. Better controls on the importation of firewood are being implemented or explored, including targeted education programs and fire permits. A national guidance document will also be developed to define a consistent approach across the network of National Parks of Canada.

LES VISITEURS DES PARCS ET LA PROBLÉMATIQUE DU BOIS DE CHAUFFAGE : LE CAS DU PARC NATIONAL DE KOUCHIBOUGOUAC ET LE LONGICORNE BRUN DE L'ÉPINETTE

En 2008, l'Agence Parcs Canada (APC) a préparé une ébauche de directive sur la gestion des espèces exotiques dans les parcs nationaux du Canada. Cette directive comprend les principes qui donnent aux gestionnaires des parcs le pouvoir de contrôler l'importation de bois de chauffage. Depuis l'infestation de dendroctone du pin ponderosa au Parc national de Banff, le système de réservation en ligne de l'APC affiche un message avertissant les visiteurs réservant un site de camping dans un parc national au Canada de ne pas transporter ou déplacer de bois de chauffage. Malgré les campagnes d'éducation auprès du public, le longicorne brun de l'épinette (LBE, *Tetropium fuscum*) fut détecté, en juillet 2011, au Parc national de Kouchibougouac (PNK) dans un piège installé par l'Agence canadienne d'inspection des aliments. Le LBE a fort probablement été introduit dans le parc dans du bois de chauffage. Le PNK est le premier parc national ayant confirmé une occurrence du LBE. Connu en Nouvelle-Écosse depuis 1999, le LBE est indigène en Europe où il s'attaque ordinairement aux arbres morts ou sénescents. Au Canada, le LBE s'attaque aux individus sains d'épinette rouge, blanche, noire, et de Norvège, menaçant ainsi la santé des forêts. Des moyens de contrôler l'importation de bois de chauffage sont présentement mis en œuvre ou examinés, y compris des programmes d'éducation ciblés, et un système de permis de feux de camp. Un document d'orientation nationale sera aussi préparé pour définir une approche concertée à travers le réseau des PNC.

MANAGING THE RISKS ASSOCIATED WITH FIREWOOD AT PARCS QUÉBEC

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Campers transporting firewood creates a potential vector for the introduction of unwanted insects and diseases in Quebec's parks, whose primary mission is the conservation of ecosystems. To address this risk, Sépaq (a governmental organisation mandated to manage the national parks of Quebec south of the 50th parallel) has adopted various measures for the management and awareness of this issue. Parks first ensured that the wood supply sold to campers was itself free from diseases and unwanted insects, while finding the right approaches to sell this wood to campers. Some communication activities were put in place to inform visitors of the dangers of transporting wood. Parks at higher risk carry out monitoring projects to detect the presence of the emerald ash borer, currently the most worrying invasive species. Selected managers also participate annually in workshops and information sessions on this species. So far no park has been affected by the Emerald Ash Borer. Despite some effectiveness of those measures, vulnerability of parks will still remain high as long as no global provincial or federal regulations are put in place.

GESTION DES RISQUES ASSOCIÉS AU BOIS DE CHAUFFAGE À PARCS QUÉBEC

Le transport du bois de chauffage par les campeurs représente un vecteur potentiel d'introduction d'insectes et de maladies indésirables dans les parcs du Québec dont la mission première est la conservation des écosystèmes. Pour faire face à ce risque, la Sépaq (Société d'État mandatée pour gérer les parcs nationaux du Québec au sud du 50e parallèle) s'est dotée de différentes mesures de gestion et de sensibilisation. Les gestionnaires des parcs doivent d'abord s'assurer que l'approvisionnement en bois qui sera vendu aux campeurs est lui-même exempt de maladies et d'insectes indésirables, tout en trouvant les bonnes approches afin de vendre ce bois aux campeurs. Certains éléments de sensibilisation ont été mis en place afin d'informer les visiteurs des dangers que peut représenter le transport du bois. Les parcs à plus haut risque sont aussi l'objet de suivis afin de détecter la présence de l'agrile du frêne, l'espèce la plus préoccupante actuellement. Les gestionnaires de ces parcs participent d'ailleurs annuellement à des ateliers et des séances d'information sur cette espèce. Jusqu'à présent, aucun parc n'a été affecté par l'agrile du frêne. Malgré une certaine efficacité des mesures prises, la vulnérabilité des parcs restera tout de même grande tant qu'une réglementation provinciale ou fédérale plus globale ne sera pas mise en place.

POSTER SESSION

SÉANCE D'AFFICHES

AUTOCONTAMINATION AND AUTODISSEMINATION OF *BEAUVERIA BASSIANA* (BB) AGAINST THE EMERALD ASH BORER (*AGRILUS PLANIPENNIS*) (EAB)

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Since 2002, the EAB has been spreading throughout eastern North America. To slow the spread of this insect, entomopathogenic fungi can play a significant role. Fungi constitutes an important group of natural organisms who silently help to regulate insect species. In the past year, we have demonstrated the virulence of native Bb isolates against the EAB. We have also demonstrated that it was possible to, locally, introduce Bb in the EAB population using an autocontamination and autodissemination strategy. An innovative way to use Bb was realized when the EAB, attracted by a green Lindgren trap, walked on a pouch containing the actively growing entomopathogen fungi and became contaminated with deadly conidia. Three-year results are presented.

AUTOCONTAMINATION ET AUTODISSEMINATION AVEC *BEAUVERIA BASSIANA* (BB) CONTRE L'AGRILE DU FRÊNE (*AGRILUS PLANIPENNIS*) (AF)

Depuis 2002, l'AF se disperse dans le nord-est de l'Amérique du Nord. Pour ralentir cet insecte, le contrôle biologique avec des champignons entomopathogènes peut jouer un rôle important. Les champignons sont des régulateurs naturels et discrets des insectes. Au cours des dernières années, nous avons démontré la virulence de différents isolats contre l'AF. L'autre étape de notre recherche est de démontrer s'il est possible d'introduire localement un champignon dans la population de l'AF par la stratégie d'autocontamination et d'autodissemination. Une méthode innovatrice pour utiliser Bb a été développée où l'AF, attiré dans un piège Lindgren, marche sur une pochette ayant du champignon entomopathogène croissant activement et se contamine avec les conidies mortelles. Trois années de résultats sont présentées.

IMPACT OF REARING DENSITY ON THE ENCAPSULATION CAPACITY OF THE SPRUCE BUDWORM

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Spruce budworm (SBW) populations rise to outbreak levels approximately every 30-40 years. In high density populations, larvae are restricted in food while in endemic populations individuals are isolated and are not restricted in the amount of foliage available. The diversity and abundance of parasitoids show high variation depending on SBW population density. The objective of this study was to evaluate the impact of the rearing density on the immune capacity of the SBW. The immune capacity of insects depends on different factors, such as stress, food availability and quality as well as population density. The hypothesis is that the immune system, more precisely the encapsulation capacity, could vary with population density, and that this variation could influence the SBW susceptibility to natural enemies. However, the results do not show any impact of the rearing density on the encapsulation capacity of the SBW. Results are discussed in the context of natural conditions, and on the methodology used.

IMPACT DE LA DENSITÉ D'ÉLEVAGE SUR LA CAPACITÉ D'ENCAPSULATION DE LA TORDEUSE DES BOURGEONS DE L'ÉPINETTE

Les populations de tordeuses des bourgeons de l'épinette (TBE) atteignent des niveaux épidémiques tous les 30 à 40 ans environ. Dans les populations à forte densité, les larves font face à une quantité restreinte de nourriture tandis que dans les populations naturelles, les individus sont isolés et la quantité de feuillage mise à leur disposition n'est pas restreinte. La diversité et l'abondance de parasitoïdes révèlent une variation élevée selon la densité de la population de TBE. La présente étude a pour but d'évaluer l'impact de la densité d'élevage sur la capacité immunitaire de la TBE. La capacité immunitaire des insectes est tributaire de différents facteurs, tels que le stress, la disponibilité et la qualité de nourriture ainsi que la densité de la population. L'hypothèse est que le système immunitaire, plus précisément la capacité d'encapsulation, pourrait varier selon la densité de population, et que cette variation pourrait influencer la vulnérabilité de la TBE aux ennemis naturels. Cependant, les résultats n'indiquent aucun impact de la densité d'élevage sur la capacité d'encapsulation de la TBE. Les résultats sont discutés dans le contexte des conditions naturelles, mais aussi au regard de la méthodologie utilisée.

INCREASING SCIENCE CAPABILITY IN INSPECTIONS OF WOOD PACKAGING MATERIALS

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Wood packaging material (WPM) is a pathway that allows many insects to move and establish outside their native range. Canada has adopted the International Standard for Phytosanitary Measures (ISPM) No. 15 "to reduce the risk of introduction and/or spread of quarantine pests associated with WPM". While the CFIA remains responsible for policy development and science program delivery of the WPM Program, the inspection and commercial enforcement of WPM at designated points of entry are among the designated responsibilities that were transferred to the CBSA in 2005. As a result of one of the recommendations put forth in the WPM Inspections Feasibility Study (conducted under the Beyond the Border Action Plan), the CBSA and the CFIA are working together to improve the wood-pest recognition capabilities of the CBSA and to enhance industry compliance with North American WPM requirements. Short-term funding will be used to implement a joint Action Plan centred on four Focus Areas, including enhanced inspections, expedited sample submission and tracking, more meaningful wood-pest statistical reporting, and improved risk analysis and mitigation.

ACCROISSEMENT DE LA CAPACITÉ SCIENTIFIQUE DANS LES INSPECTIONS DES MATÉRIAUX D'EMBALLAGE EN BOIS

Les matériaux d'emballage en bois (MEB) constituent une voie d'entrée qui permet à de nombreux insectes de se déplacer et de s'établir à l'extérieur de leur aire de répartition naturelle. Le Canada a adopté la Norme internationale pour les mesures phytosanitaires (NIMP) numéro 15 « afin de réduire le risque d'introduction ou de dissémination d'organismes de quarantaine associés aux MEB ». Bien que l'ACIA demeure responsable de l'élaboration des politiques et de la prestation des programmes scientifiques du programme des MEB, l'inspection des MEB et la mise en application dans le secteur commercial aux points d'entrée désignés comptent au nombre des responsabilités désignées qui ont été transférées à l'ASFC en 2005. Par suite d'une des recommandations formulées dans l'étude de faisabilité sur les inspections des MEB (effectuée dans le cadre du Plan d'action par-delà la frontière), l'ASFC et l'ACIA travaillent ensemble pour améliorer les capacités de reconnaissance des parasites du bois de l'ASFC et pour rehausser la conformité de l'industrie aux exigences nord-américaines concernant les MEB. Le financement à court terme servira à mettre en œuvre un plan d'action commun centré sur quatre aspects, notamment les inspections approfondies, la présentation d'échantillon et le suivi accéléré, des rapports statistiques des parasites du bois plus significatifs et une analyse et une atténuation des risques améliorées.

MORTALITY OF EMERALD ASH BORER IN URBAN POPULATIONS IN ONTARIO, CANADA

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Effective pest management strategies take into account the influence of natural mortality on the population dynamics of the target insect. Therefore an integrated management plan for emerald ash borer (EAB) requires the development of a stage-specific mortality schedule that quantifies the contribution of natural enemies in causing the death of larval EAB. We quantified the causes of mortality in larval EAB from three early and mid-stage infestations in urban trees from three cities in Ontario, Canada. Between 2010 and 2011 we sampled 9 to 12 trees in each city. An additional 9 trees were sampled in one city in 2012. Sampling consisted of removing the bark from the sampled trees on all pieces > 10 cm in diameter and collecting all EAB larvae that were found. For each larva we determined the stage and cause of mortality. Half the wood from all trees was stored for 6 weeks after sampling but before peeling to investigate the temporal effects of natural enemies. We found that the most larval mortality occurred in medium sized larvae (third and fourth instars) and appeared to be caused by interactions with the tree. There was little mortality caused by natural enemies. We observed a negative relationship between mortality and density, mortality decreased as density increased, but this relationship was mediated by the location within the tree where the larvae were developing. The results of this study can be used to model the impact of control measures on EAB populations in urban trees and to suggest what larval stages can be targeted to maximize the effect of suppression.

LA MORTALITÉ DE L'AGRILE DU FRÊNE DANS LES POPULATIONS URBAINES DE L'ONTARIO, CANADA

Les stratégies efficaces de lutte antiparasitaire tiennent compte de l'influence de la mortalité naturelle sur la dynamique des populations de l'insecte cible. Par conséquent, un plan intégré de lutte contre l'agrile du frêne nécessite l'élaboration d'un calendrier de mortalité propre au stade qui quantifie la mesure dans laquelle les ennemis naturels causent la mort de l'agrile du frêne sous sa forme larvaire. Nous avons quantifié les causes de mortalité des larves de l'agrile du frêne à partir de trois infestations, aux stades précoces et intermédiaires, sur des arbres urbains dans trois villes en Ontario, au Canada. Entre 2010 et 2011, nous avons échantillonné entre 9 et 12 arbres dans chaque ville. Neuf autres arbres ont été échantillonnés dans une seule ville en 2012. L'échantillonnage a consisté à retirer l'écorce des arbres échantillonnés sur tous les morceaux d'un diamètre supérieur à 10 cm et à recueillir toutes les larves de l'agrile du frêne qui ont été trouvées. Pour chaque larve, nous avons déterminé le stade et la cause de la mortalité. La moitié du bois provenant de tous les arbres a été entreposée pendant six semaines après l'échantillonnage, mais avant l'écorçage, pour étudier les effets temporels des ennemis naturels. Nous avons constaté que dans la plupart des cas, la mortalité s'est produite chez les larves de taille moyenne (troisième et quatrième stade) et semblait être attribuable aux interactions avec l'arbre. Peu de mortalité a été causée par les ennemis naturels. Nous avons observé une relation négative entre la mortalité et la densité, la mortalité diminuait alors que la densité augmentait, mais cette relation était liée à l'emplacement dans l'arbre où les larves se développaient. Les résultats de cette étude peuvent être utilisés pour modéliser l'impact des mesures de contrôle sur les populations d'agrile du frêne dans les arbres urbains et pour indiquer les stades larvaires qui peuvent être ciblés pour maximiser l'effet de la suppression.

SUSCEPTIBILITY OF EASTERN LARCH BEETLE, *DENDROCTONUS SIMPLEX* LECONTE (CURCULIONIDAE: SCOLYTINAE), TO ENTOMOPATHOGENIC FUNGI

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The Eastern Larch Beetle, *Dendroctonus simplex* LeConte, is a species indigenous to North America that uses tamarack, *Larix laricina* (Du Roi) K. Koch, as a host. During this study, a rearing technique was developed to assure the availability of insects for diverse experiments. Susceptibility of *D. simplex* adults to different isolates of hypocrealean fungi was then evaluated by using a screening test. Among isolates tested, two fungal isolates, INRS-242 of *Beauveria bassiana* and INRS-704 of *Metarhizium anisopliae*, caused the highest mortality of *D. simplex*, with 64.4% and 55.7% respectively. The results provide some evidence that support the development of microbiological strategies to control *D. simplex* populations.

SUSCEPTIBILITÉ DU DENDROCTONE DU MÉLÈZE, *DENDROCTONUS SIMPLEX* LECONTE (CURCULIONIDAE : SCOLYTINAE), AUX CHAMPIGNONS ENTOMOPATHOGÈNES

Le dendroctone du mélèze, *Dendroctonus simplex* LeConte, est un insecte indigène de l'Amérique du Nord qui utilise le mélèze laricin, *Larix laricina* (Du Roi) K. Koch, comme hôte principal. Durant cette étude, une technique d'élevage a été développée afin d'assurer la disponibilité d'insectes pour les diverses expériences. La susceptibilité des adultes de *D. simplex* vis-à-vis des différents isolats de champignons de l'ordre des Hypocreales a ensuite été évaluée en utilisant un test de criblage. Parmi les isolats testés, INRS-242 de *Beauveria bassiana* et INRS-704 de *Metarhizium anisopliae* induisent une forte mortalité chez les adultes de *D. simplex*, avec respectivement 64,4 % et 55,7 %. Ces résultats permettent d'envisager leur utilisation dans des stratégies de lutte microbiologique contre les populations de *D. simplex*.

PATHMAP: UNLOCKING FIDS FOREST PATHOGEN DISTRIBUTION DATA FOR THE ENHANCED UNDERSTANDING AND PREDICTION OF FUTURE FOREST CHANGE

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The spatial distribution of forest pathogens in Canada has important implications for productivity in forests managed for timber production and for forest biodiversity in protected areas. Under climate change, it is expected that the spatial distribution of forest pathogens will be altered, with consequent impacts on the provision of ecosystem goods and services, which may result in economic and social impacts. Over a period of approximately 60 years the Canadian Forest Insect and Disease Survey (FIDS) established thousands of distribution records for both insects and pathogens occurring in Canada's forests. Using the FIDS data, which are housed in an electronic database, the PATHMAP project was initiated to develop baseline distribution maps of important forest pathogens. These maps will be of use to forest managers and modellers, who require baseline spatial distribution data to better predict forest disease impacts under a variety of future climate scenarios. The maps will also help biodiversity and trade specialists formulate timely and accurate descriptions and policy for both native and invasive pathogens.

PATHMAP : UTILISATION DES DONNÉES DU RIMA SUR LA RÉPARTITION DES PATHOGÈNES FORESTIERS POUR AMÉLIORER LA COMPRÉHENSION ET LA PRÉVISION DE L'ÉVOLUTION FUTURE DES FORÊTS

La répartition spatiale des pathogènes forestiers au Canada a d'importantes répercussions sur la productivité des forêts aménagées pour la production de bois et sur la biodiversité forestière dans les zones protégées. Sous l'influence du changement climatique, on s'attend à ce que la répartition spatiale des pathogènes forestiers soit modifiée, ce qui aura des conséquences sur la prestation des biens et des services écosystémiques, lesquelles pourraient entraîner des répercussions économiques et sociales. Sur une période d'environ 60 ans, le Relevé des insectes et des maladies des arbres (RIMA) du Canada a établi des milliers de dossiers de répartition des insectes et des agents pathogènes que l'on retrouve dans les forêts canadiennes. À l'aide des données du RIMA, qui sont hébergées dans une base de données, on a amorcé le projet PATHMAP dans le but d'élaborer des cartes de répartition de base des agents pathogènes forestiers importants. Ces cartes seront utiles aux gestionnaires forestiers et aux modélisateurs qui doivent avoir des données de répartition spatiale de base afin de mieux prévoir les répercussions des maladies des arbres forestiers pour divers scénarios climatiques du futur. Les cartes aideront également les spécialistes de la biodiversité et du commerce à formuler des descriptions et des politiques exactes et opportunes, à la fois pour les agents pathogènes, tant indigènes qu'envahissants.

SURVEY OF FIREWOOD TRANSPORTED TO KOUCHIBOUGUAC PARK BY CAMPERS IN 2013

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Parks Canada initiated a firewood exchange program in Kouchibouguac Park, New Brunswick, in 2012, in an effort to educate Park visitors on the dangers of moving firewood and associated pests such as the brown spruce longhorn beetle. During the process of campsite registration, visitors were asked whether they had brought firewood with them and if so, the wood was collected and destroyed (burned) and the camper was provided with a similar amount of locally produced firewood. The local firewood was provided free of charge in 2012 and again in 2013, so long as the camper had not already been informed of the risks of transporting firewood in 2012. Parks staff recorded the geographic origin of campers who brought firewood, the volume confiscated, and if possible, the tree species present. To obtain additional data on the risk of firewood as a potential pathway for movement of invasive bark and wood boring beetles, the Canadian Forest Service collaborated with Parks Canada in 2013 to gather additional data, i.e., number of samples containing signs of insects (e.g., larval galleries), number of samples with live insects, and species of insects present. Data are still being tabulated but so far it appears that most of the wood was from hardwood trees, most pieces had bark attached, about 60% of the samples contained pieces with signs of live insects, and about 40% of samples contained live insects. Species confirmations are not yet available but most were bark beetles in the subfamily Scolytinae; a list of species will be included on the poster.

ÉTUDE DU BOIS DE CHAUFFAGE TRANSPORTÉ AU PARC KOUCHIBOUGUAC PAR LES CAMPEURS EN 2013

Parcs Canada a lancé un programme d'échange de bois de chauffage dans le parc Kouchibouguac du Nouveau-Brunswick en 2012, dans le cadre d'un effort d'éducation des visiteurs du parc sur les dangers posés par le transport de bois de chauffage et des ravageurs qui y sont associés, comme le longicorne brun de l'épinette. Lors de l'inscription pour un site de camping, on demandait aux visiteurs s'ils avaient amené du bois de chauffage avec eux et, le cas échéant, le bois était recueilli et détruit (brûlé) et on fournissait au campeur une quantité équivalente de bois de chauffage produit localement. Le bois de chauffage local était fourni gratuitement en 2012 et encore une fois en 2013, à condition que le campeur n'ait pas été déjà informé des risques posés par le transport de bois de chauffage en 2012. Le personnel de Parcs Canada consignait l'origine géographique des campeurs qui avaient amené du bois de chauffage, la quantité de bois confisquée et, si possible, les essences d'arbres présentes. Pour obtenir des données supplémentaires sur les risques posés par le bois de chauffage en tant que voie potentielle de déplacement de scolytes et buprestidés envahisseurs, le Service canadien des forêts a collaboré avec Parcs Canada en 2013 pour recueillir des données supplémentaires, par exemple le nombre d'échantillons présentant des signes d'insectes (p. ex. galeries larvaires), le nombre d'échantillons présentant des insectes vivants et les espèces d'insectes présentes. Les données sont en cours de tabulation, mais il semble pour l'instant que la majorité du bois provenait de feuillus, la plupart des morceaux de bois portaient de l'écorce, environ 60 p. 100 des échantillons contenaient des morceaux présentant des signes d'insectes vivants et environ 40 p. 100 des échantillons portaient des insectes vivants. Les espèces ne sont pas encore confirmées, mais il s'agissait pour la plupart de scolytes de la sous-famille des Scolytinae; une liste des espèces sera incluse sur l'affiche.