

Maine Spruce Budworm Task Force Update

Robert G. Wagner

*Nercofe 2016 Workshop
March 14-15, 2016
Wells Conference Center, University of Maine*



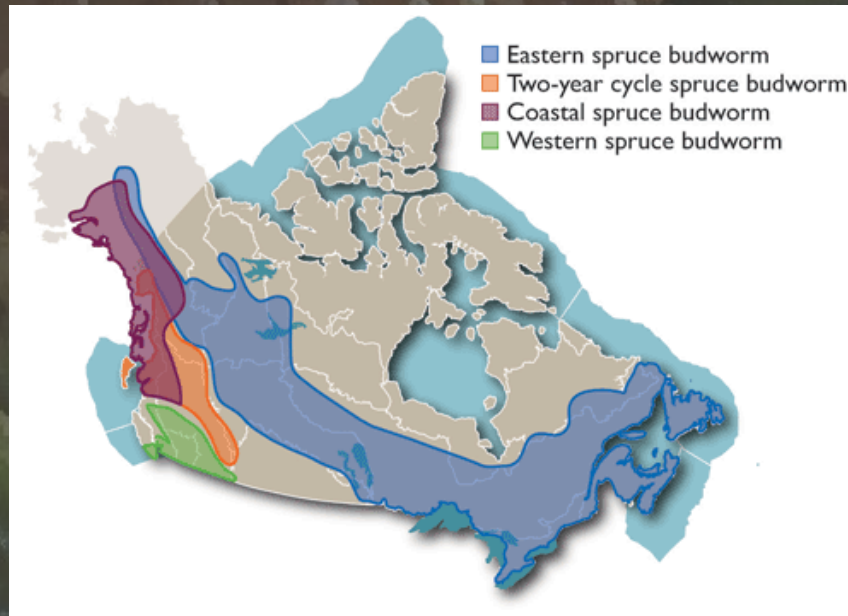
The Eastern Spruce Budworm



Choristoneura fumiferana

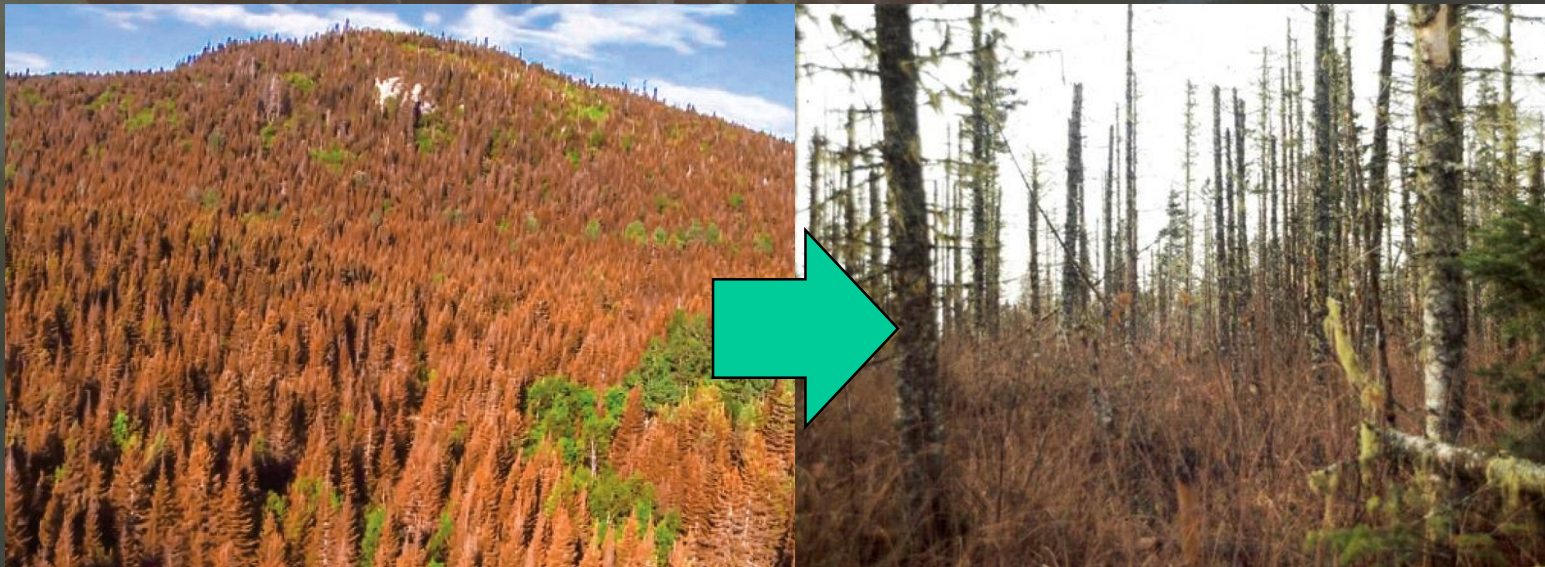
Eastern Spruce Budworm

- Natural part of spruce-fir forest for thousands of years
- Returns on 30-60 year cycle
- Affects spruce-fir forests from Alaska to Newfoundland



Eastern Spruce Budworm

- Last outbreak during 1970s-80s damaged over 130 million acres
- Considered most damaging forest insect in North America

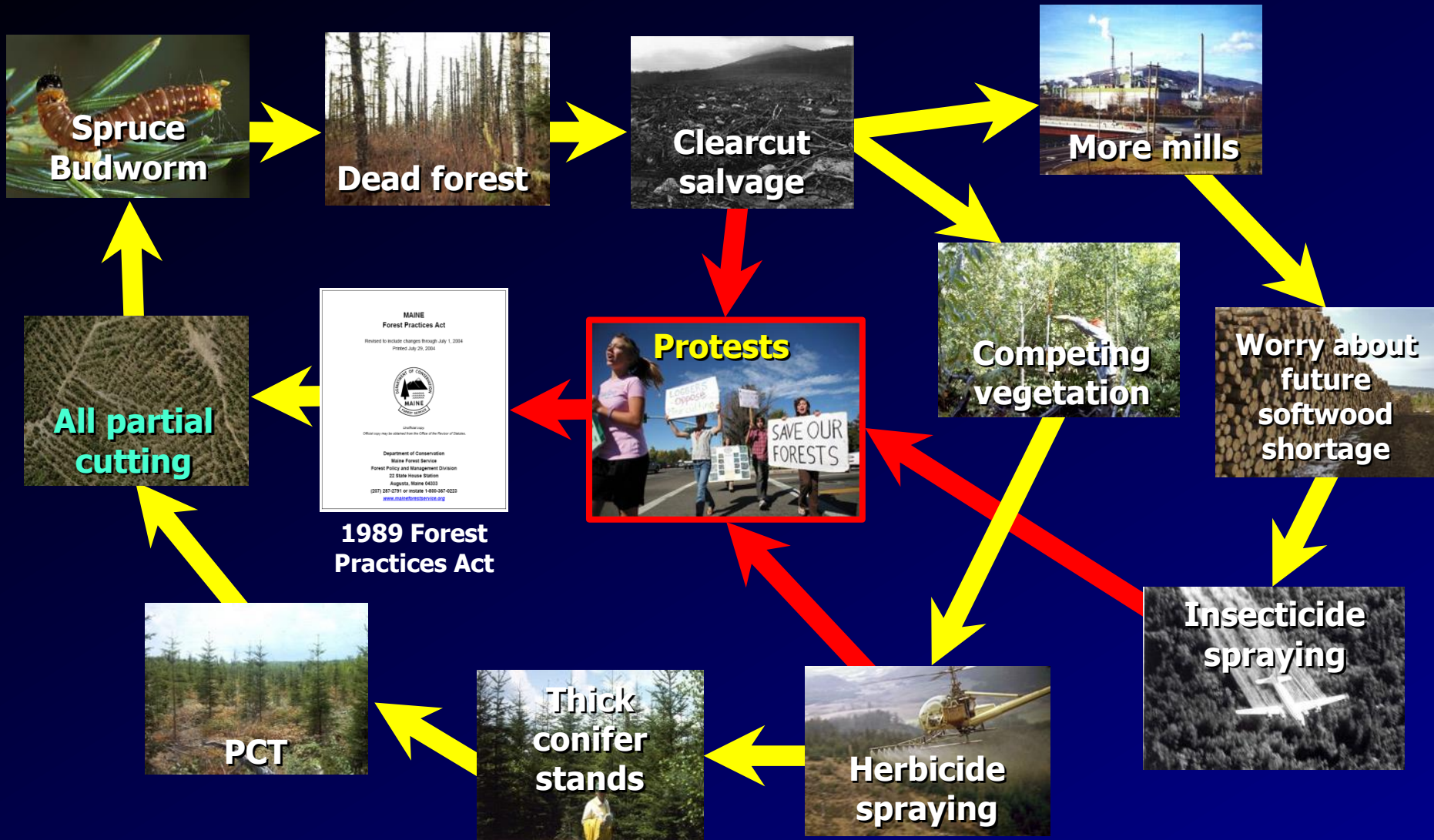




Spruce Budworm Kill From Top of Mt. Katahdin in 1980

Photo by: Dr. David Field

1970s-80s SBW Outbreak "Set the Stage" For Forest Management & Politics for Next 40 years



Maine SBW Task Force

A close-up photograph of a brown caterpillar with white spots, crawling on a green leaf. The caterpillar is positioned horizontally across the middle of the frame, facing left. The leaf is vibrant green and shows some signs of being eaten, with small holes visible. The background is dark and out of focus.

Task Force Leaders:

- **University of Maine**
 - Bob Wagner, CFRU Director
- **Maine Forest Service**
 - Doug Denico, Director
- **Maine Forest Products Council**
 - Patrick Strauch, Executive Director

SBW Task Force Objectives

- Develop Risk Assessment
- Develop Preparation & Response Recommendations for:
 - Those directly affected by coming outbreak:
 - Forest landowners/managers, forest products industry, rural communities
 - Those with legislative responsibility for forest health:
 - Government (Legislature, MFS, IF&W, USFWS)
- Raise public awareness about coming outbreak

Report Complete!

- Will be presented by Governor Paul LaPage on Wednesday, March 16



March 16, 2016



Coming Spruce Budworm Outbreak:

Initial Risk Assessment and Preparation & Response Recommendations for Maine's Forestry Community

Jointly presented by:

Cooperative Forestry Research Unit (CFRU), University of Maine

Maine Forest Products Council

Maine Forest Service

Executive Summary & Brochure



March 16, 2016

Executive Summary



Coming Spruce Budworm Outbreak:

Initial Risk Assessment and Preparation & Response Recommendations for Maine's Forestry Community

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Maine Forest Products Council

Maine Forest Service

The Maine SBW Task Force Report

Leading authorities on the spruce budworm (SBW) and various aspects of Maine's forest resources address the following key aspects of the coming outbreak:

- Wood supply & economic impacts
- Monitoring & protection
- Forest management
- Policy, regulation, & funding
- Wildlife habitat
- Public communications & outreach
- Research priorities

Awareness about the coming SBW outbreak among forest landowners and managers, members of the forest products industry, state and federal government officials, wildlife biologists, forest researchers, the media, community leaders, and interested members of the public is vital as we prepare for and respond to the coming outbreak. This report helps Maine's forestry community learn from previous successes, avoid past mistakes, and take advantage of new opportunities.



Resources

The full Spruce Budworm Assessment and Preparation Plan report is available online: sprucebudwormmaine.org/task-force

Center for Research on Sustainable Forests (SBW outbreak status, background, ongoing research)
crf.umaine.edu/maine-spruce-budworm-outbreak

Maine Forest Service (Entomology)
maineforestservice.gov

Maine Forest Products Council (Issues and education)
maineforest.org

Northeast Forest Information Source (Archival information)
umaine.edu/bdfr



For more information:
Center for Research on Sustainable Forests
University of Maine
5755 Hurling Hall
Orono, ME 04469-5755
crf@umaine.edu • 207.581.3794
sprucebudwormmaine.org

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Spruce Budworm Assessment and Preparation Plan Overview

Jointly presented by:

Cooperative Forestry Research Unit (CFRU), University of Maine

Maine Forest Products Council

Maine Forest Service

sprucebudwormmaine.org



Spruce Budworm

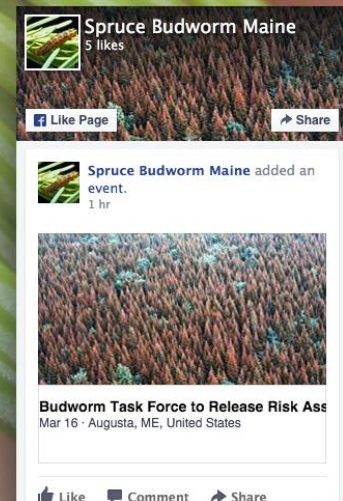
Maine Spruce Budworm Task Force

Coming Spruce Budworm Outbreak: Initial Risk Assessment and Preparation & Response
Recommendations for Maine's Forest Community

- [Full Report \(web version\) \(pdf\)](#) 10.4mb
- [Full Report \(print version\) \(pdf\)](#) 33mb
- [Executive Summary \(pdf\)](#) 4.9mb
- [Brochure \(pdf\)](#) 4mb
- News Release: [Gov. LePage, Budworm Task Force to release risk assessment and response plan \(pdf\)](#) 81kb
- Current Outbreak in Canada: [Healthy Forest Partnership](#)

crsf@maine.edu • (207) 581-3794

Full site coming May 2016



SBW Task Team Leaders

Leader

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Barry Burgason

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Maine Forest Service

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University of Maine

Task Team

Forest Management

Wildlife Habitat

Public Communications & Outreach

Research Needs

Policy, Regulation, & Funding

Monitoring & Protection

Wood Supply & Economic Impacts

SBW Task Team Members

Task Team Contributors

The following field-specific experts were major contributors to the technical content presented in this report:

Task Team	Technical Contributors¹
Wood Supply & Economic Impacts	Chris Hennigar (UNB), Erin Simons-Legaard (UMaine), Kasey Legaard (UMaine), Ken Laustsen (MFS), William McWilliams (FIA), Aaron Weiskittel (UMaine), Ernest Bowling (Sewall Co.), Peter Triandafillou (Huber Resources), Ian Prior (Seven Islands Land Co.), Todd Gabe (UMaine), Rob Lilicholm (UMaine), Lloyd Irland (The Irland Group)
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Policy, Regulation, & Funding	Joel Swanton (FRA), Mark Doty (Plum Creek), Jim Contino (Verso), Doug Denico (MFS), Don Mansius (MFS), Peter Triandafillou (Huber Resources), Don Tardie (Consultant), Marcia McKeague (Katahdin Forest Management), Bill Ferdinand (Plum Creek), John Cashwell (Consultant), Michele MacLean (MFPC), Tom Doak (SWOAM), Blake Brunson (JD Irving), Chuck Gadzik (LandVest)
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Research Needs	Bill Livingston (UMaine), Michel Huot (MFFP QC), Dave MacClean (UNB), Vince Nealis (CFS), Dave Struble (MFS), Andrew Willette (JD Irving), Lloyd Irland (Irland Group), Brian Sturtevant (USFS-NRS)

Public Review

- **Draft report released for public review in November 2014**
- **Report presented to municipalities, environmental groups, the legislature, logging contractors and economic development consortiums**
- ***Keeping Maine's Forest* group review was very helpful**

Report Addresses Key Topics

- **Monitoring strategies**
- **Forest management strategies**
- **Protection options**
- **Policy, regulatory & funding**
- **Wildlife habitat**
- **Public communications & outreach**
- **Research priorities**

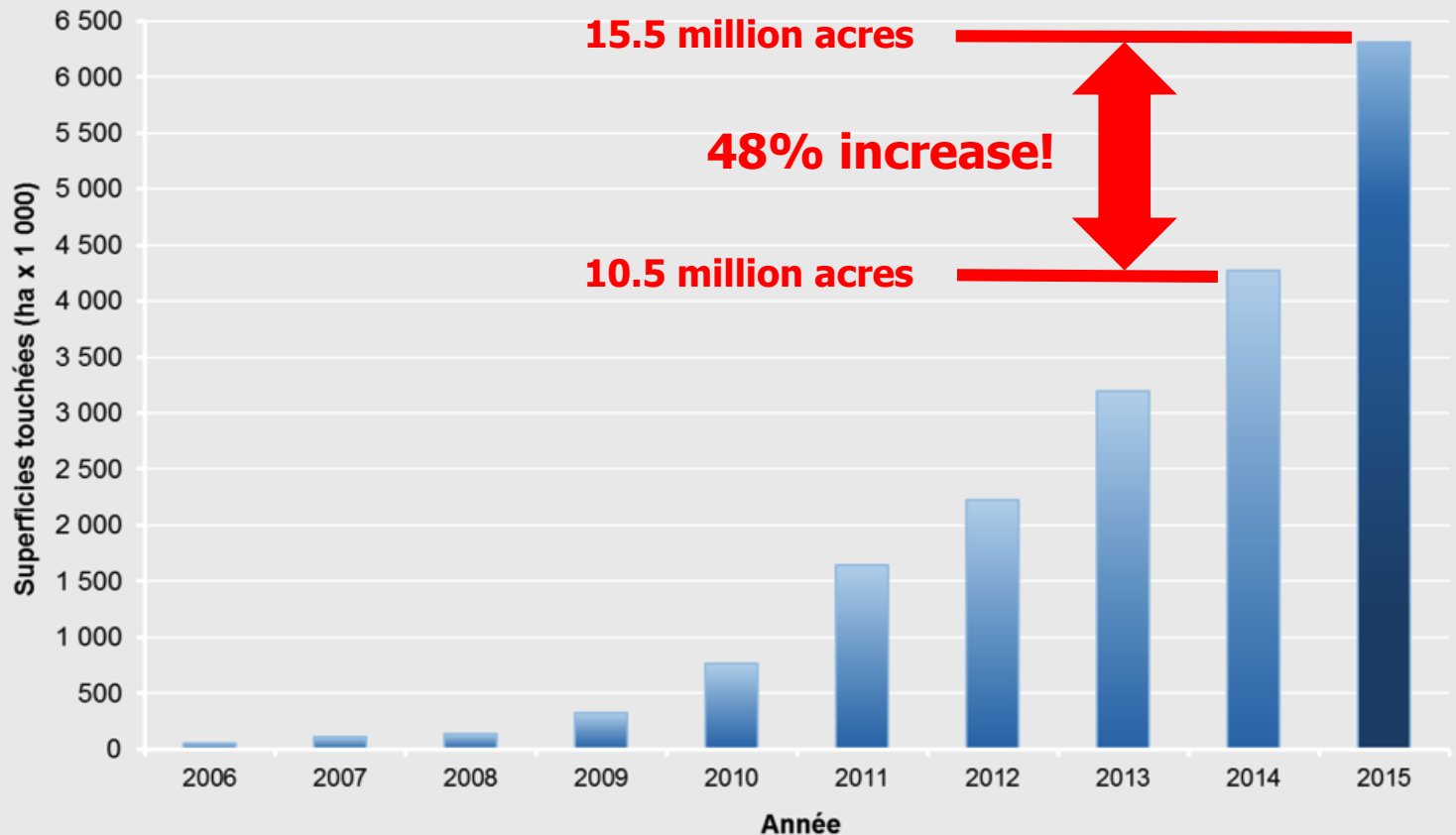
More than 70 recommendations

A close-up photograph of a brown caterpillar with white spots and a black head, crawling on a green leaf. The caterpillar is positioned on the left side of the frame, moving towards the right. The leaf is vibrant green and shows some signs of being eaten. The background is dark and out of focus. Overlaid on the center of the image is the text 'Outbreak Update' in a bold, yellow, italicized font with a black outline.

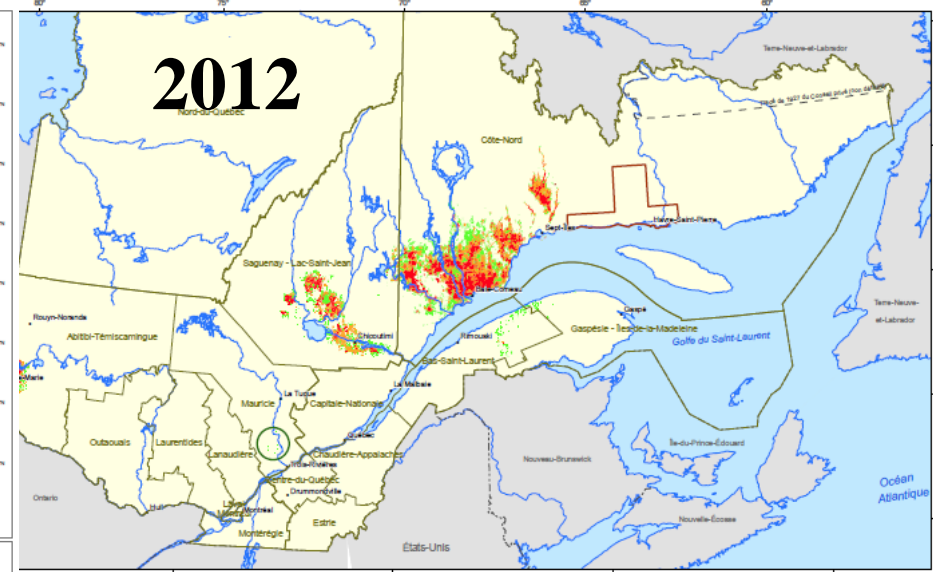
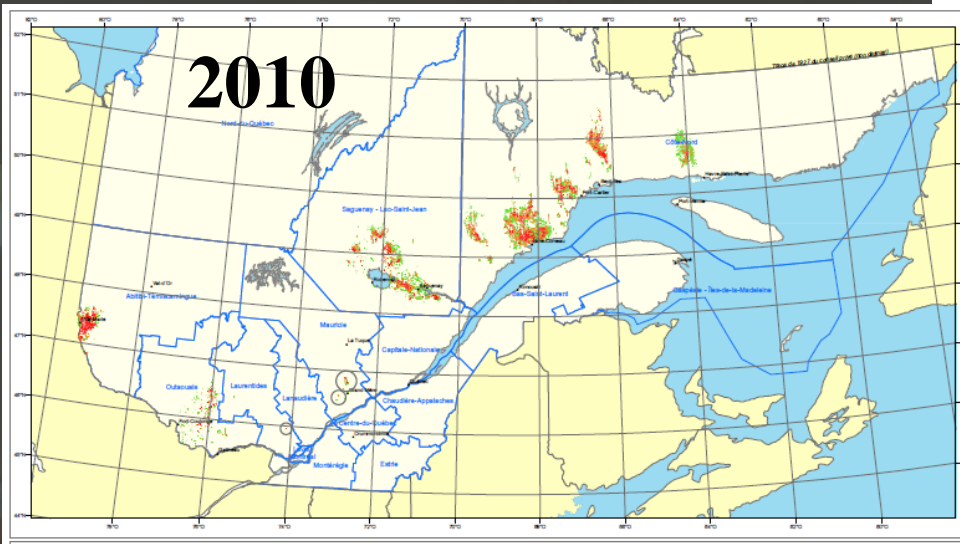
***Outbreak
Update***

Quebec SBW Outbreak Update

Superficies annuelles totales touchées par la tordeuse des bourgeons de l'épinette de 2006 à 2015



Spruce Budworm Defoliation 2010 to 2015

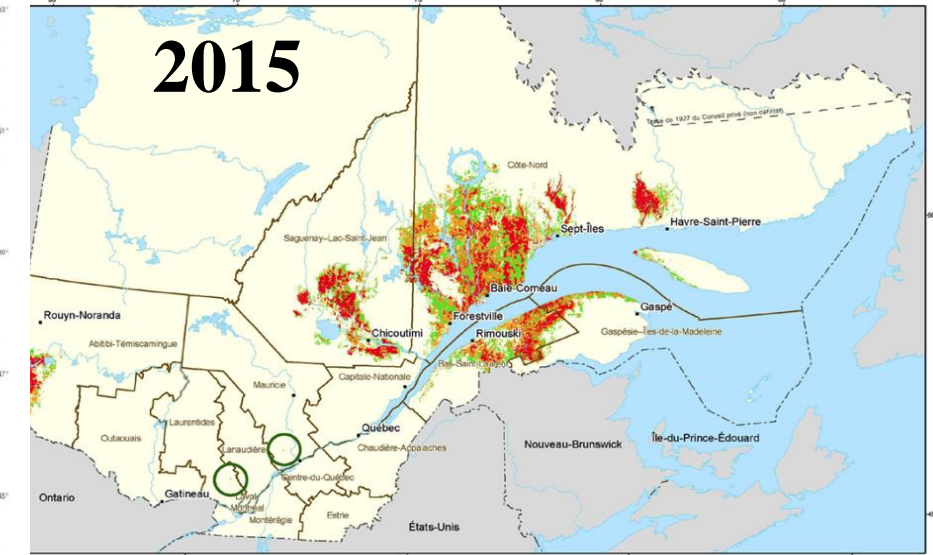
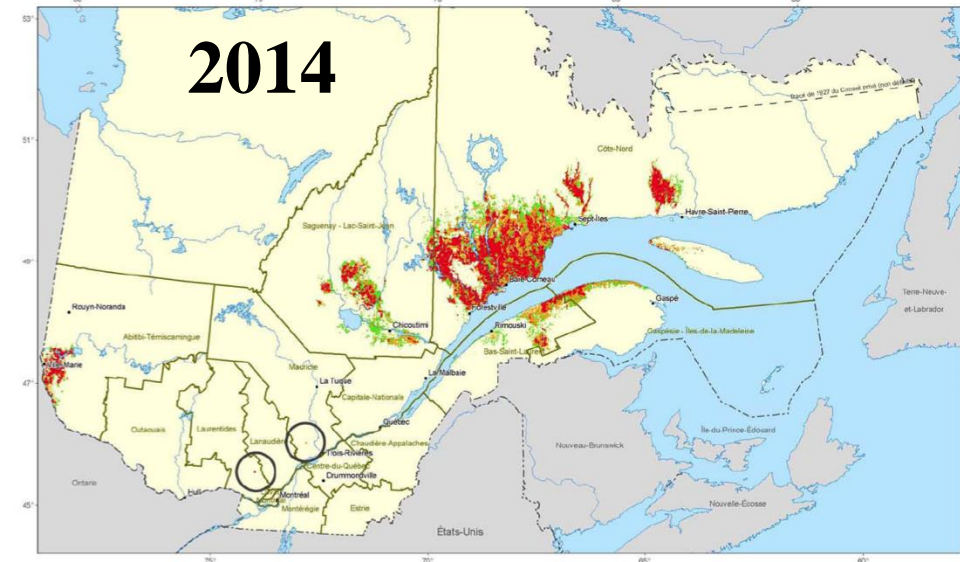


Tordeuse des bourgeons de l'épinette
 Défoliation annuelle 2010
 Province de Québec

Source: Direction de l'arborescence et de la protection des forêts
 Projection cartographique: Conique conforme de Lambert

■ Légère
 ■ Modérée
 ■ Grave
 Région Administrative

Défoliation causée par la tordeuse des bourgeons de l'épinette
 Québec méridional



Québec méridional
 Tordeuse des bourgeons de l'épinette
 Défoliation annuelle 2014

Source: Direction de l'arborescence et de la protection des forêts
 Projection cartographique: Conique conforme de Lambert avec deux parallèles d'échelle conservés (46° et 60°)

■ Légère
 ■ Modérée
 ■ Grave

Défoliation annuelle 2015

■ Légère
 ■ Modérée
 ■ Grave

Organisation territoriale
 — Limite de région administrative
 --- Frontière interprovinciale
 - - - Frontière internationale
 - - - Frontière Québec - Terre-Neuve-et-Labrador (non définitive)

Métadonnées
 Projection cartographique: Conique conforme de Lambert avec deux parallèles d'échelle conservés (46° et 60°)
 Réalisation: Ministère des Forêts, de la Faune et des Parcs
 Direction de la protection des forêts
 © Gouvernement du Québec, 2015

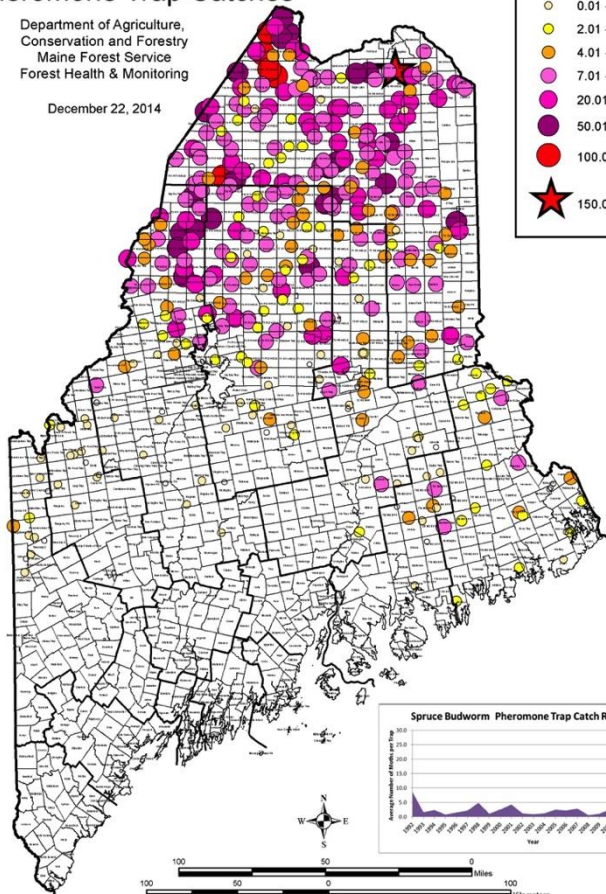
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Pheromone Trap Catches of Spruce Budworm Moths in 2014 and 2015

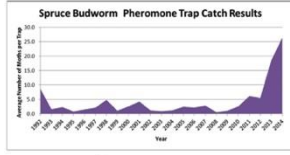
2014 Spruce Budworm Pheromone Trap Catches

Department of Agriculture,
Conservation and Forestry
Maine Forest Service
Forest Health & Monitoring

December 22, 2014



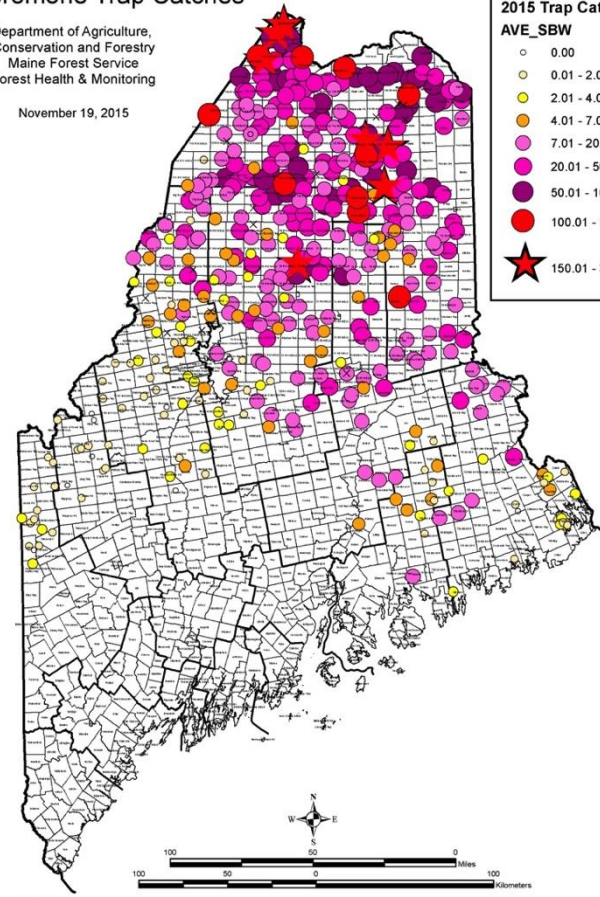
2014 Trap Catches



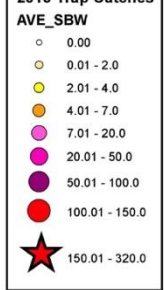
2015 Spruce Budworm Pheromone Trap Catches

Department of Agriculture,
Conservation and Forestry
Maine Forest Service
Forest Health & Monitoring

November 19, 2015



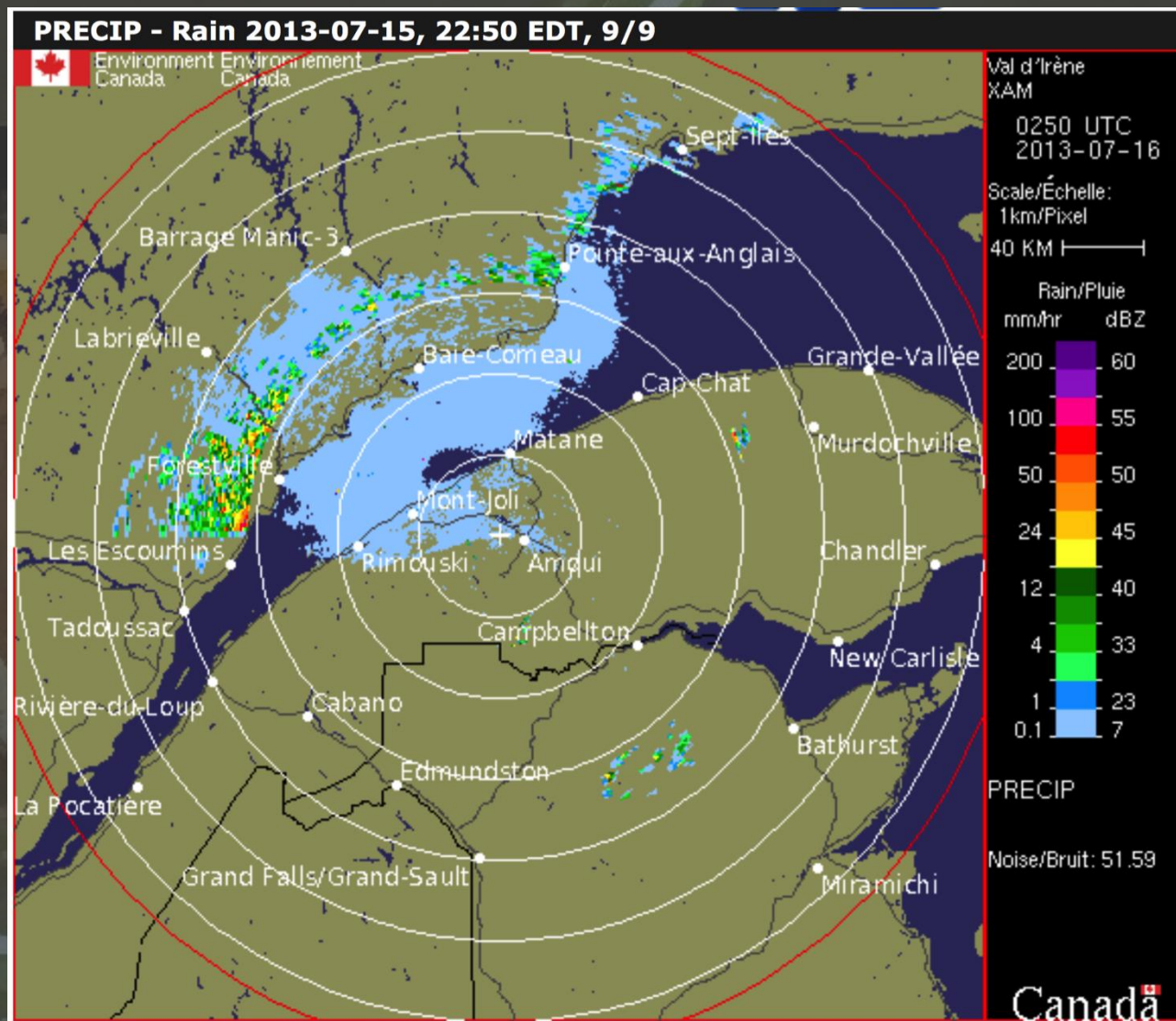
2015 Trap Catches



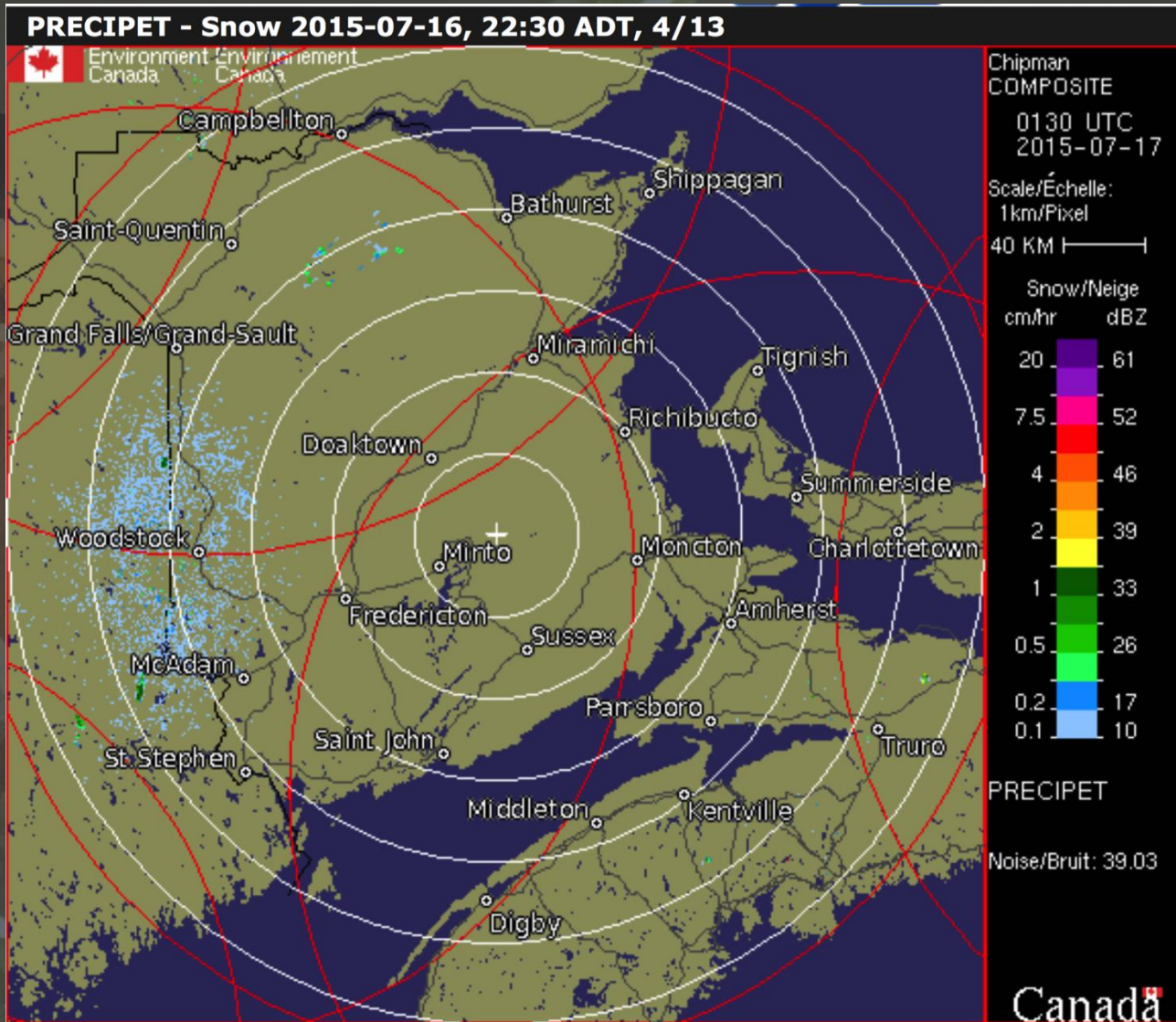
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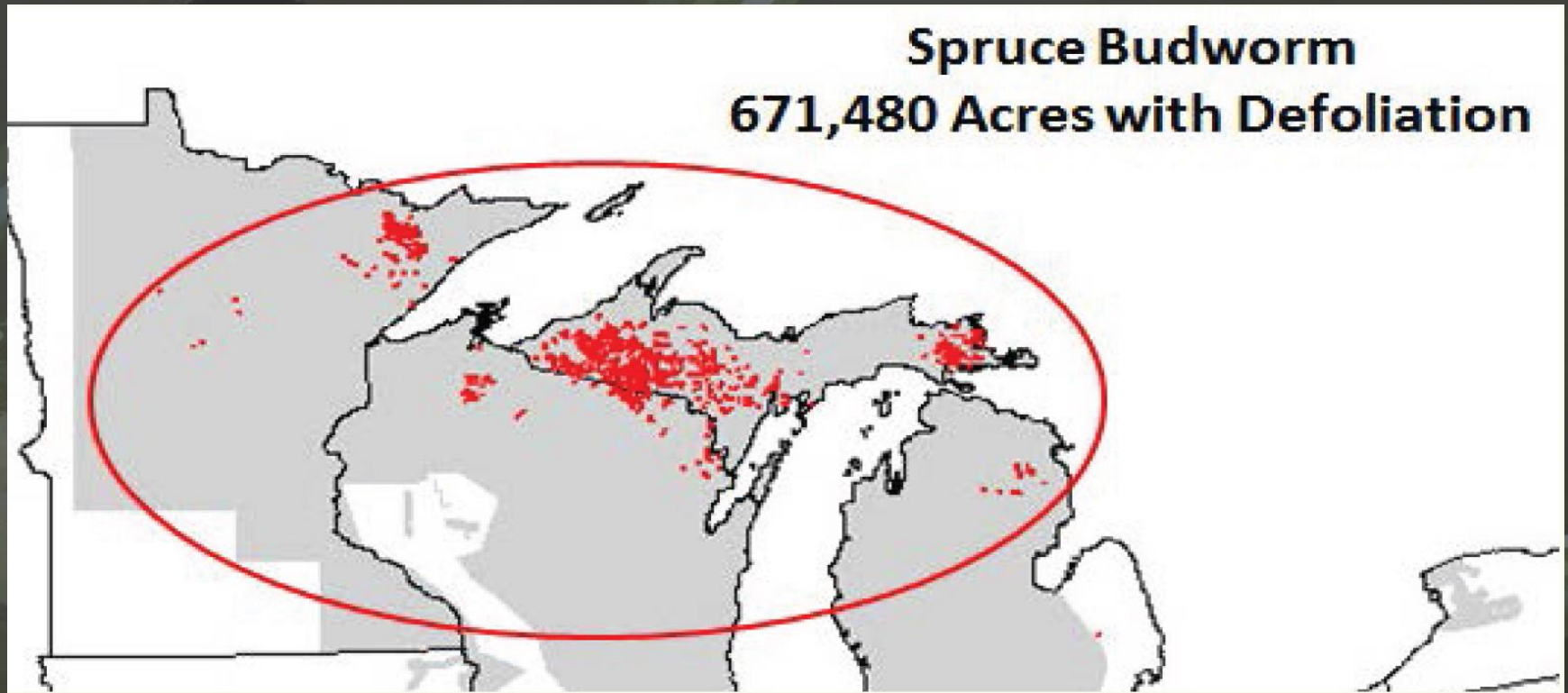
Spruce Budworm Mass Flight




Spruce Budworm Mass Flight



Lake States SBW Outbreak

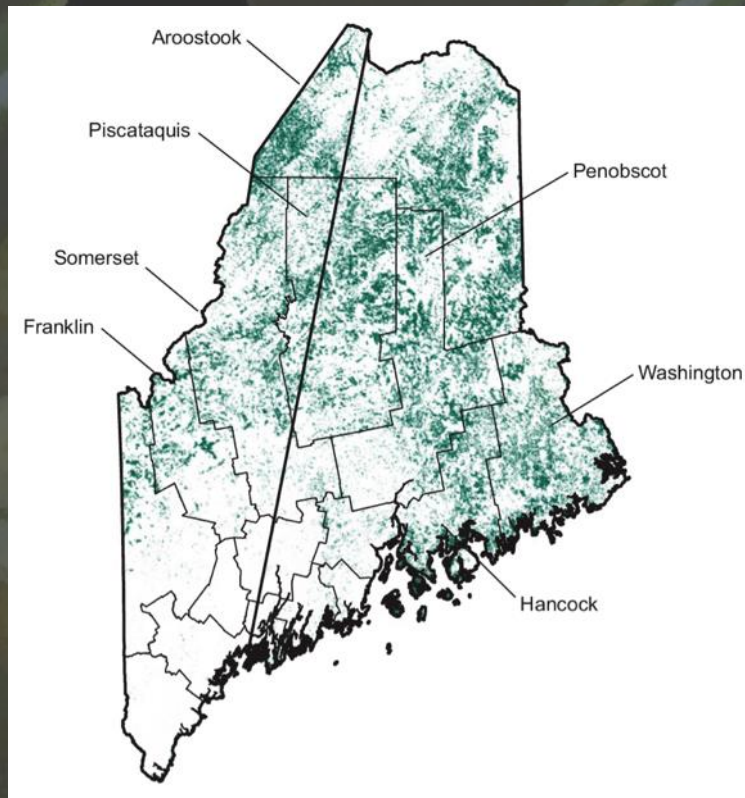


A close-up photograph of a brown and white spotted caterpillar on a green leaf. The caterpillar is positioned horizontally across the middle of the frame. The text 'Risk Assessment' is overlaid in a large, bold, yellow font with a black outline, centered over the caterpillar. The background is dark and out of focus.

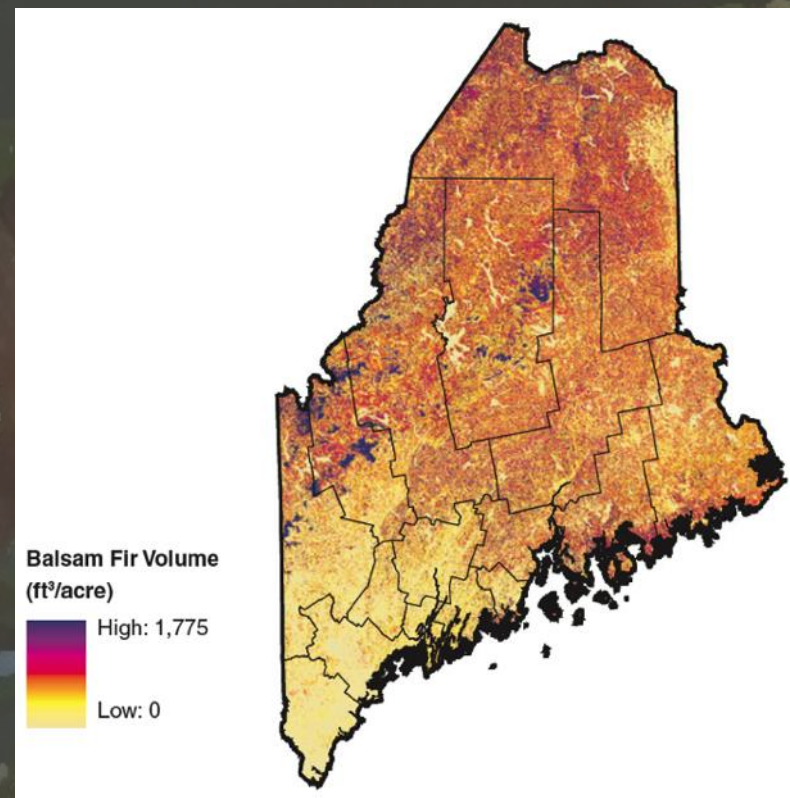
Risk Assessment

Risk Assessment

5.8 million acres of spruce-fir stands at risk of some level of defoliation, leading to reduced tree growth and mortality over wide areas.

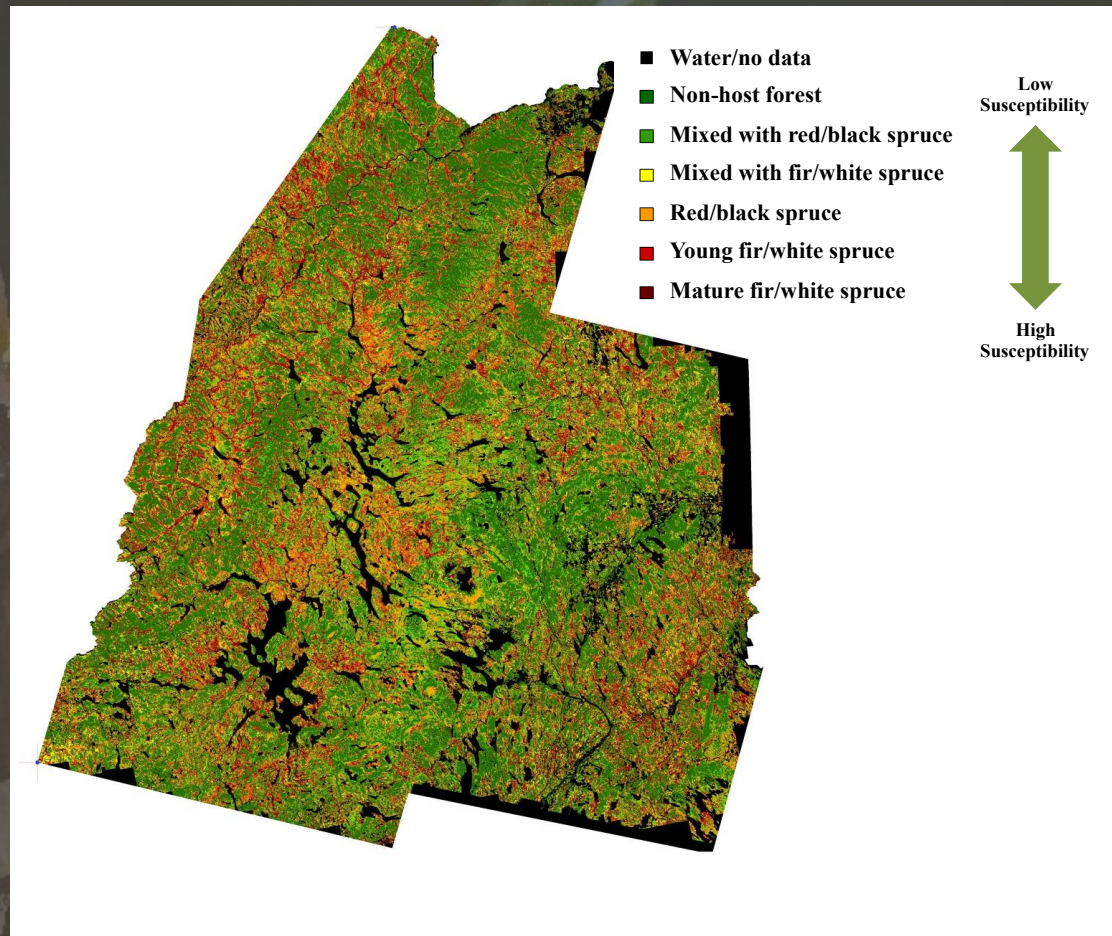


Distribution of Spruce-Fir Forest Type in Maine counties, 2008 (Source: McCaskill et al. 2011).



Balsam fir concentrations (as depicted on map) by average volume (ft^3/acre) by county in Maine, 2008. (Source: McCaskill et al. 2011)

Risk Assessment



Map of approximately 10 million acres of northern Maine showing areas of forestland classified based on susceptibility to defoliation by SBW. (Source: Legaard et al. 2013)

Potential Spruce-fir Yield Reductions

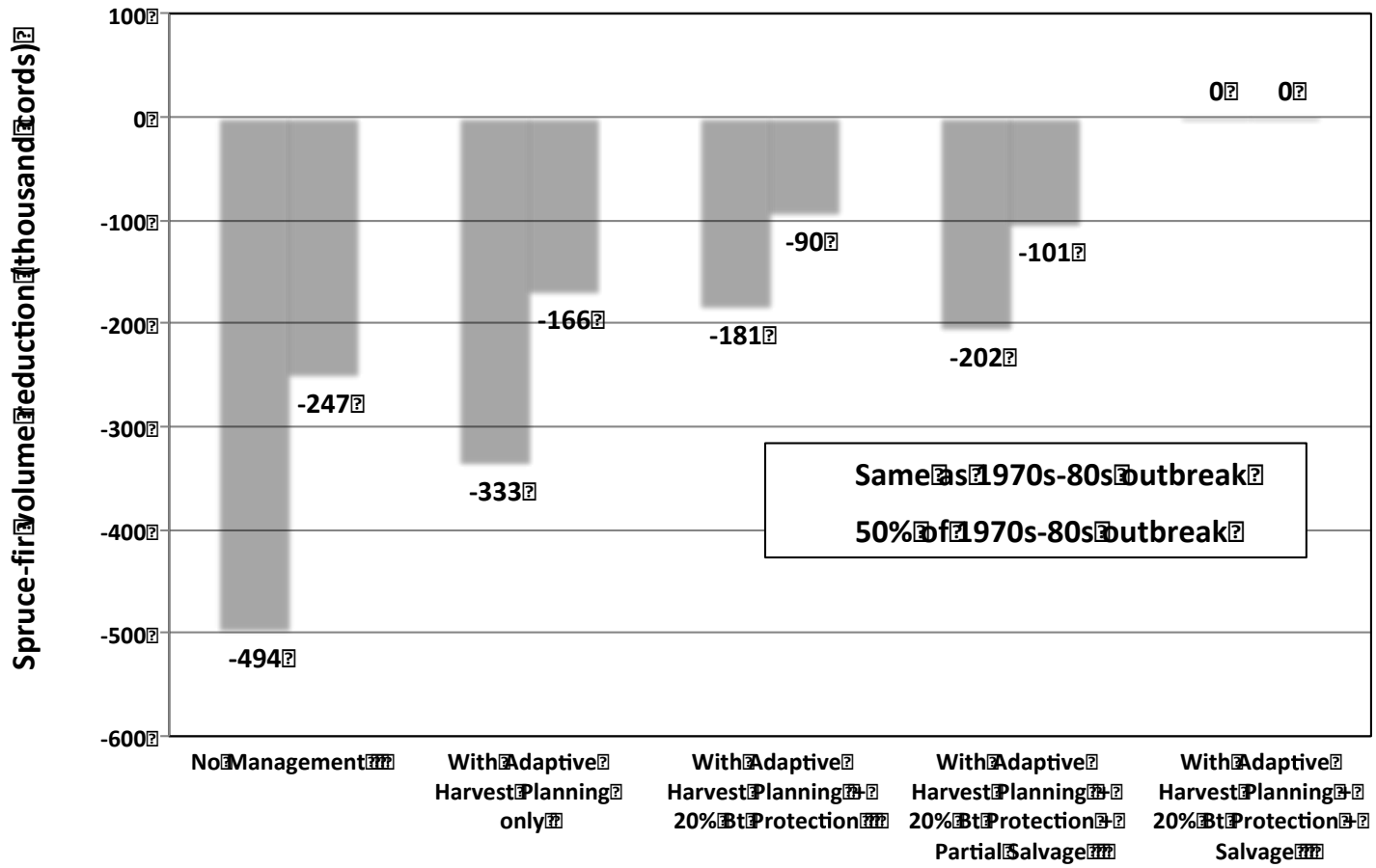
- **Two studies completed:**
 - Hennigar et al. 2013 – CFRU
 - Legaard et al. 2013 – NSRC
- **Both studies concluded:**
 - 15% to 30% maximum annual reduction in spruce-fir harvestable volume or standing biomass for moderate to severe SBW outbreak
 - Slow (40-year) recovery of spruce-fir following peak impact of outbreak
 - Impact similar (both severity and rate of recovery) regardless of when outbreak occurs over next few decades

Mitigation Strategies

Hennigar et al. (2013) concluded that nearly all spruce-fir volume losses can be prevented by:

- **Adaptive harvesting**
 - Reducing area of high-risk stands (i.e., those with high balsam fir and white spruce composition) ahead of outbreak
- **Foliage protection**
 - Insecticide application to high risk and valuable stands
 - Only 20% of area of affected area needs to be treated
- **Salvage logging**
 - Dead and dying trees

Projected Maximum Annual Spruce-fir Volume Reduction Under Various Mitigation Scenarios



Economic Impact - Projected Maximum Annual Spruce-fir Loss

SBW Outbreak Scenario on Current Forest	Forest Management Response Scenario	Estimated Total Direct Economic Impact to Forest Products Industry	Estimated Total Indirect Economic Impact to Maine	Estimated TOTAL Economic Impact to Maine
Same as 1970s-80s	No Management	-\$505 million	-\$290 million	-\$795 million
50% of 1970s-80s	No Management	-\$252 million	-\$145 million	-\$397 million

ASSUMPTIONS:

- **No substitutions made for lost spruce-fir volume during outbreak**
- **No change in market price of spruce-fir wood with increased supply during outbreak**
- **No real price change in spruce-fir stumpage over time**

Many Factors Different Today Than During 1970s Outbreak

- Less spruce-fir forest
- Younger spruce-fir forest
- TIMO & REIT ownership
- Better road system
- Better forest management technology
- More diverse forest products
- Higher mill capacity
- More diverse markets
- Less dependence on spruce-fir
- Better logging technology
- Better protection technology
- More policy & regulations
- Lower funding levels in government & industry
- More sensitive political environment
- Less entomology expertise

Challenges during coming outbreak will be very different than in 1970s-80s

A close-up photograph of a brown and white spotted caterpillar on a green leaf. The caterpillar is positioned in the center-left of the frame, facing right. The leaf is vibrant green with prominent veins. The background is dark and out of focus. Overlaid on the image is the text 'Preparation & Response' in a bold, yellow, italicized font with a black drop shadow.

***Preparation &
Response***

What Can Forest Managers Do Now?

- **Participate in pheromone trap monitoring efforts**
- **Map location, condition and concentration of high-risk stands**
- **Adapt harvest activities before or as early as possible into the outbreak to reduce area available in stands**
- **Track annual progress of infestation by monitoring SBW population levels and distribution**

What Can Forest Managers Do Now?

- **Stop thinning within 3 years of outbreak in stands where balsam fir and white spruce are >50% of composition**
- **Seek and encourage markets for low-value trees from pre-salvage and salvage operations**
- **Apply insecticide to protect foliage in high-risk and high-value stands not ready for harvest**
- **Prepare action plans to salvage trees that would likely be lost through spruce budworm mortality**

Insecticides Likely to Be Used



Btk (*Bacillus thuringiensis* var. *kurstaki*) (Foray, Dipel, or Biobit) –

- Naturally occurring bacterium found in soil, foliage, wildlife, water, and air across most of the world.
- Used as an insecticide on organic farms for over 50 years.
- Contains naturally occurring protein crystals and dormant spores of bacterium that are insecticidal when eaten by susceptible species of insects, Lepidoptera (SBW, other moths, and butterflies).
- Potential adverse effects to non-target Lepidoptera (Karner blue butterfly, some swallowtail butterflies, and promethea moths).
- Minimal risk of adverse effects to aquatic invertebrates in studies.
- Low risk of adverse effects to non-Lepidoptera invertebrates.
- Non-toxic to vertebrates (mammals, birds, fish, etc.).

Insecticides Likely to Be Used



Tebufenozide (Mimic) –

- **Widely used insect growth regulator to control Lepidoptera pests in fruit, vegetable and other agricultural crops around the world.**
- **Mimics action of the molting hormone (ecdysone) , resulting in unsuccessful molting of Lepidoptera larvae within few hours of exposure.**
- **Active against wide range of arthropods (not just Lepidoptera).**
- **Similar toxicological profile to Btk.**
- **Very low risk to vertebrates, non-Lepidopteran insects, and other wildlife species under normal use, even at highest application rates.**

EIS-SBW:
Early Intervention Strategies to Suppress
a Spruce Budworm Outbreak



Strategic Windows Project Proposal submitted
to the Atlantic Innovation Fund

Submitted by
FOREST PROTECTION LIMITED®
2502 Route 102
Lincoln, New Brunswick, Canada
E3B 7E6

December 31, 2013



Experimental Canadian Early Intervention Strategy (EIS)

- **Cost-shared by federal & provincial governments & industry**
- **\$18 million CDN, 4 years**
- **~30 scientists & collaborators**
- **Projects in NB and Quebec**

- 1. Intensive monitoring & study of SBW population responses**
- 2. Use Bt, Mimic, &/or pheromone to treat rising populations **before** defoliation in attempt to prevent outbreaks**
- 3. Scenario and economic analyses using SBW DSS with remote sensing of current & cumulative defoliation**

Canadian Healthy Forest Partnership

NEFIS – Beta Version | LinkedIn | Google Maps | Google | Bing | Dropbox



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The Healthy Forest Partnership is a four-year research initiative that started in 2014. We are dedicated to keeping our forest green and healthy by protecting it from spruce budworm.



Protecting Our Forests

The North Shore and Gaspé regions of Quebec are currently experiencing a significant infestation from the spruce budworm, which is moving towards the Quebec/New Brunswick border.

What is Spruce Budworm?



A spruce budworm is a small, brown caterpillar with the latin name *Choristoneura fumiferana*, found throughout the range of spruce and fir in Canada and the United States. Spruce budworm is native to North America and has evolved together with the spruce and fir trees it feeds on over thousands of years.

[Learn More](#)

On the Blog

- » [Monitoring non-target impacts of the Early Intervention Strategy](#)
- » [Another spruce budworm field season comes to an end ~...](#)
- » [The Economic Reality of Spruce Budworm](#)
- » [Using Weather Radar to Track an Enemy of our Forests...](#)
- » [Pheromone Application Concludes in Quebec for 2015 - July 20, 2015](#)
- » [NB Spruce Budworm Treatment Concludes for 2015 - June 23, 2015](#)

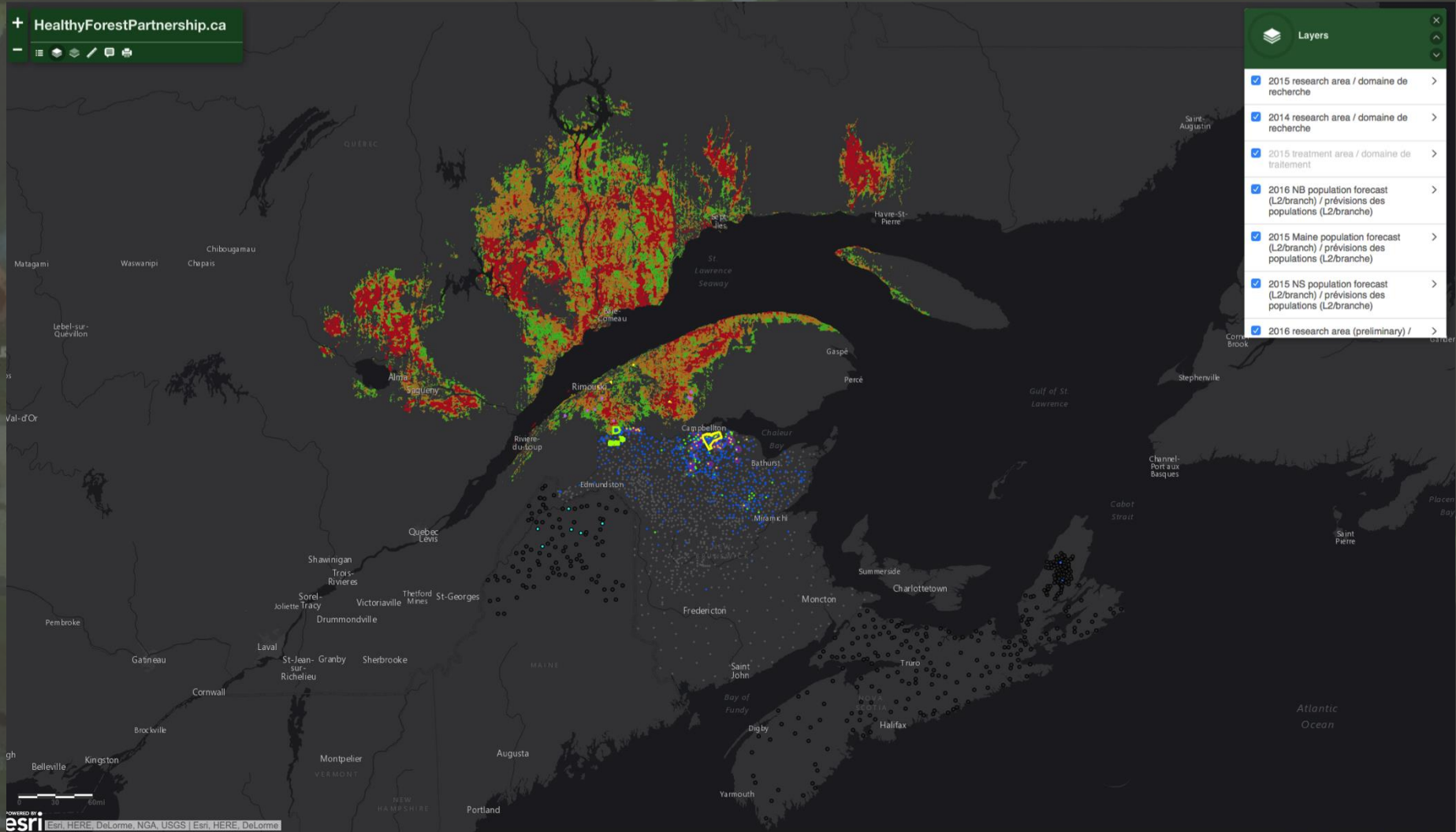
[OLDER POSTS »](#)

Ask the Experts

- » [How safe for the environment are the Btk, Mimic and...](#)
- » [If the partnership is successful, what can we expect for...](#)
- » [What happens to Mimic after it is sprayed?](#)
- » [Do all of the spruce trees die during an outbreak?](#)
- » [When will we know if the research treatments are working?...](#)
- » [If a full spruce budworm infestation occurs how long would...](#)

[ASK YOUR QUESTION »](#)

Canadian Healthy Forest Partnership





CFRU Research on SBW

- **Identifying high-risk stands using latest remote sensing technology**
- **Using remote sensing for early damage detection**
- **Forest growth & wood supply impacts**
- **Economic impacts**
- **Wildlife impacts**

A close-up photograph of a brown caterpillar with white spots, resting on a green leaf. The caterpillar has a dark head and is positioned horizontally across the frame. The background is dark, making the caterpillar and leaf stand out.

Questions?