



MAINE FOREST PRODUCTS COUNCIL

TIMBER TALK

RETURN OF THE
SPRUCE BUDWORM

Thank you to our event sponsors!



SPEAKERS



ALLISON KANOTI
Maine Forest Service



ANGELA MELCH
*UMaine
SBW Lab*



ANTHONY HOURIHAN
Maine Budworm Response Cooperative



ALEX INGRAHAM

MAINE FOREST PRODUCTS COUNCIL

TIMBER TALK

HOW SUSTAINABILITY CERTIFICATIONS BENEFIT MAINE

Please join the Maine Forest Products Council and industry professionals for a discussion about Maine's position as a national leader in sustainable forestry certification, and how these voluntary efforts shape forestry and benefit all of Maine.

WHEN/WHERE:

FEBRUARY 11, 2025

7:00 AM - 8:30 AM

MFPC - 535 Civic Center Dr.

SPEAKERS



REBECCA BARNARD

*Forest Certification Manager
Sappi North America*



DANIEL SIMONDS

*Consulting Forester
Mixedwood*

RSVP TODAY!

Thank you to our event sponsors: **SAPPI NORTH AMERICA & PCW MANAGEMENT**

An Introduction to Spruce Budworm

Allison Kanoti, State Entomologist
Forest Health and Monitoring
Maine Forest Service
Department of Agriculture, Conservation and Forestry

January 2025



**FOREST HEALTH AND
MONITORING**

DEPARTMENT OF AGRICULTURE,
CONSERVATION & FORESTRY

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207 827-1813

Maine Forest Service

87 Airport Road

Old Town, ME 04468



Spruce Budworm Basics

- A **native** moth that feeds on **spruce** and **fir**;
- Has **eruptive** populations;
- Reached **epidemic** levels in Maine, leading to tree **growth loss** and **mortality**, three times in the last century

Spruce Budworm Life Cycle in Maine

Adult moth
(July-August)

Egg mass on needle
(July-August)

Reddened foliage
(July)

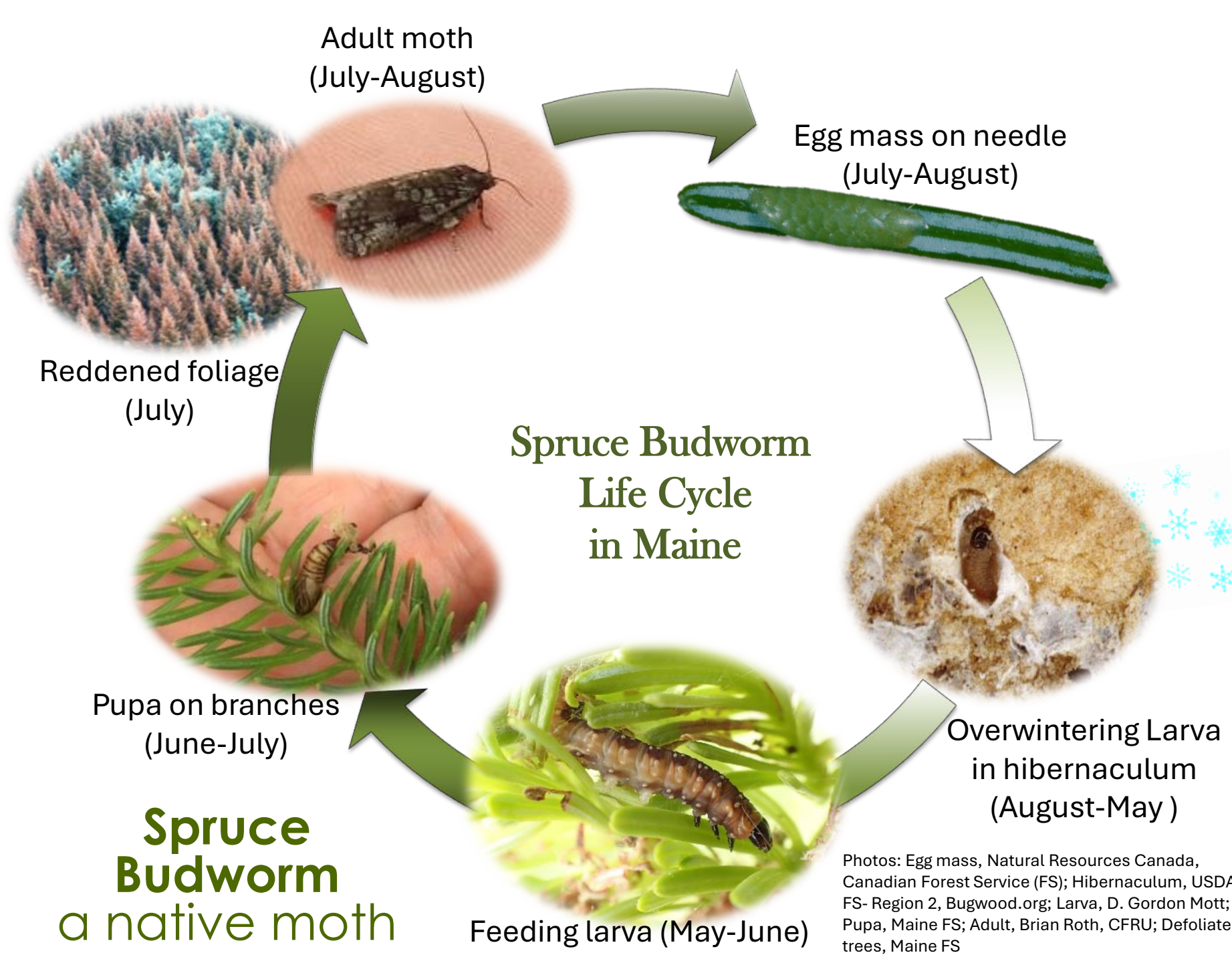
Feeding larva (May-June)

Overwintering Larva
in hibernaculum
(August-May)

Pupa on branches
(June-July)

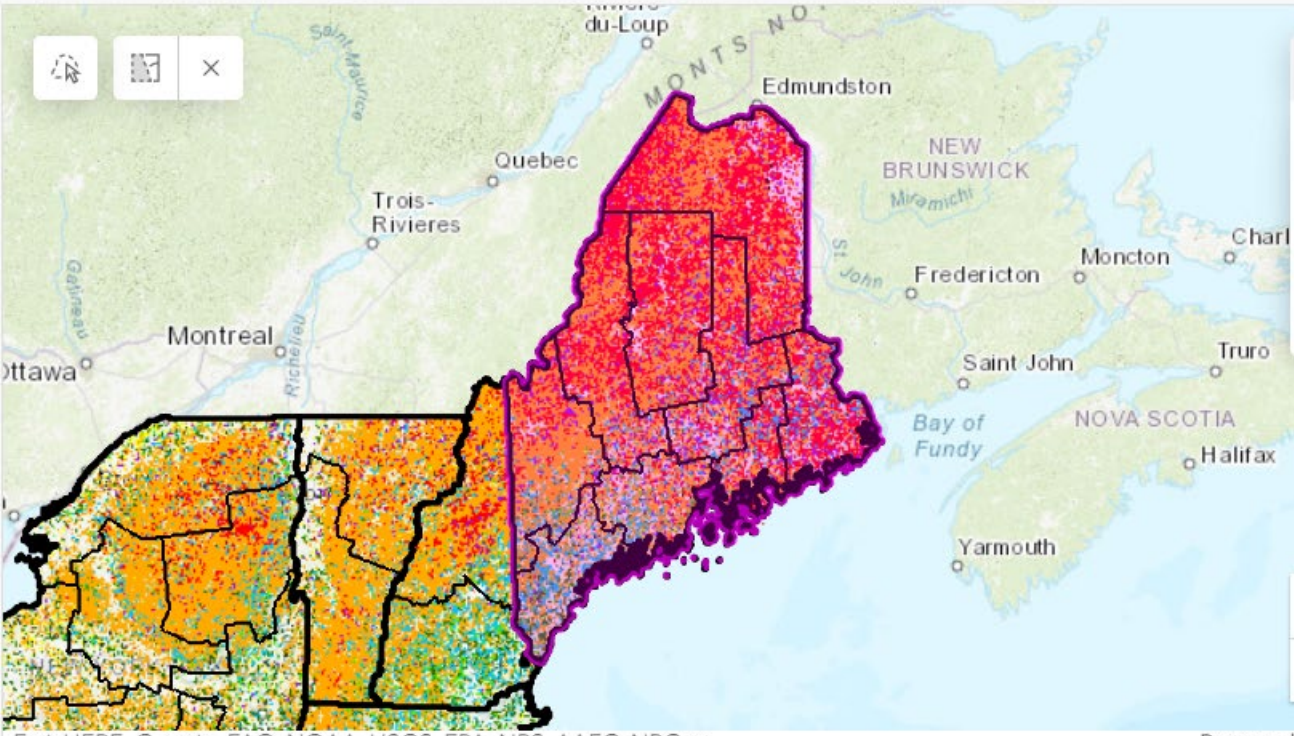
Spruce Budworm
a native moth

Photos: Egg mass, Natural Resources Canada, Canadian Forest Service (FS); Hibernaculum, USDA FS- Region 2, Bugwood.org; Larva, D. Gordon Mott; Pupa, Maine FS; Adult, Brian Roth, CFRU; Defoliated trees, Maine FS

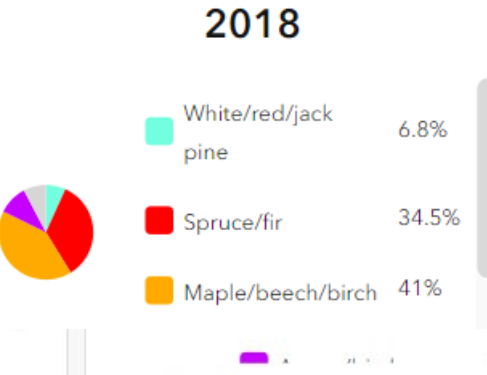
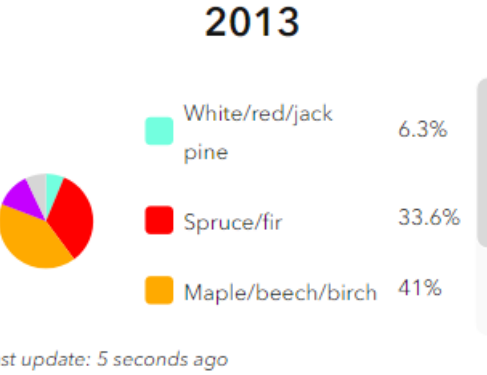
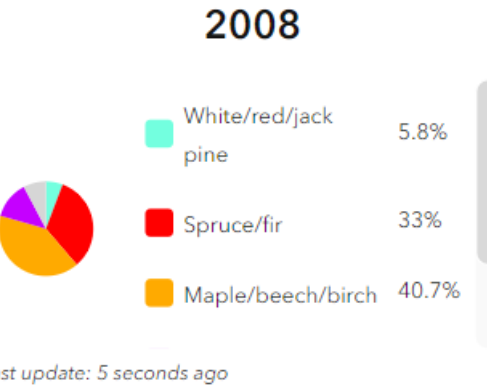


Northern Research Station Forest Inventory and Analysis Forest-Type Groups

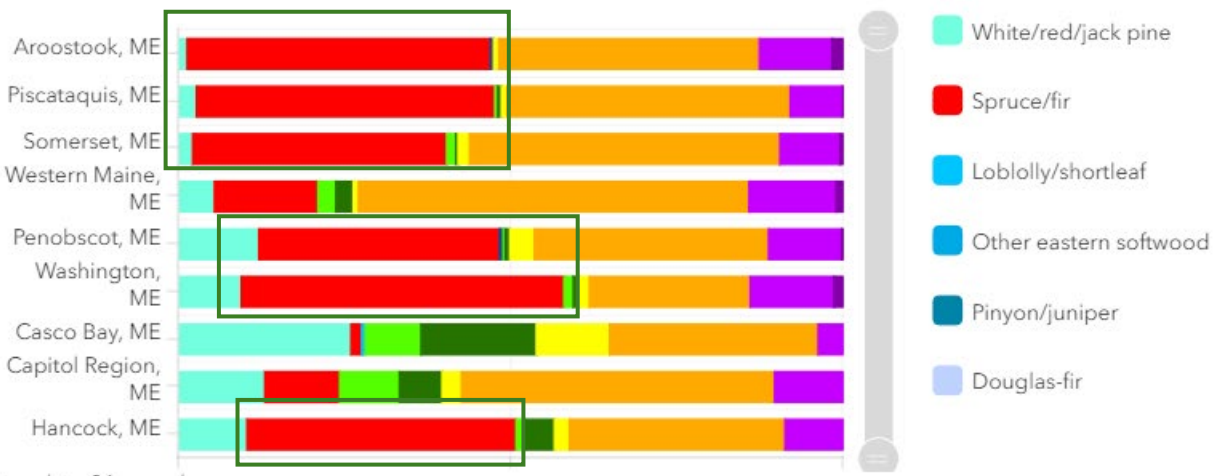
Maine's Current Spruce/Fir Forest



Major Forest-type Groups by Inventory Year (groups with at least 5% of total forest land)



Forest-type Group Distribution by NRS-FIA Inventory Unit, 2018 (acres)



6 million acres, or 34% of Maine's 17.5 million acres of forest land

84% of that in types dominated by budworm-preferred species (~5 million acres, 29%)

Most prevalent in Northern and Downeast regions

[Maine Forests 2018: Interactive Report](#)

Spruce and Fir Trees

Species

Roughly 1 of every 2 trees in Maine is a spruce or fir tree. Of that half:

- 72 % are balsam fir
- 2 % white spruce
- 21 % red spruce
- 5 % black spruce

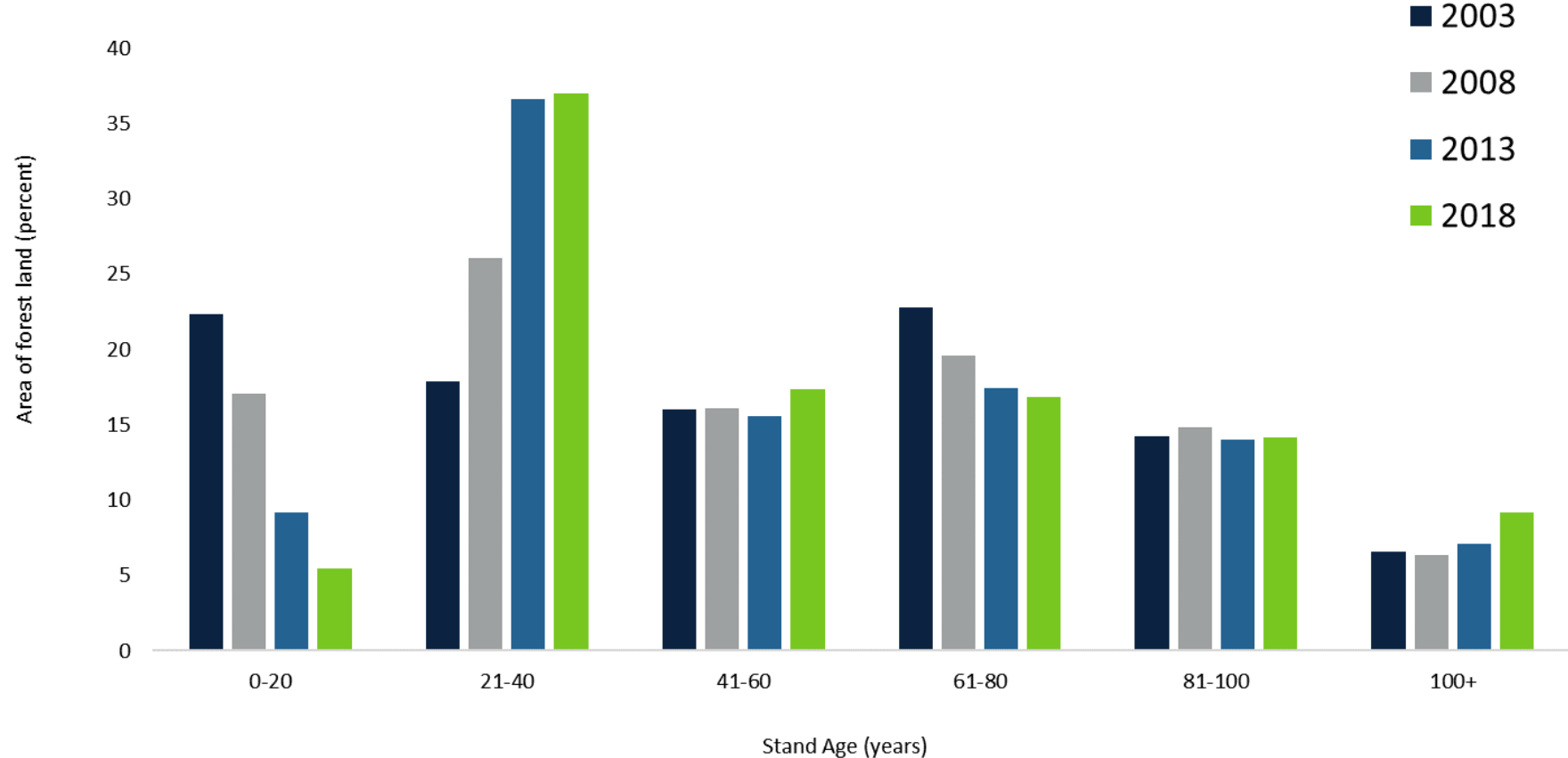


Age

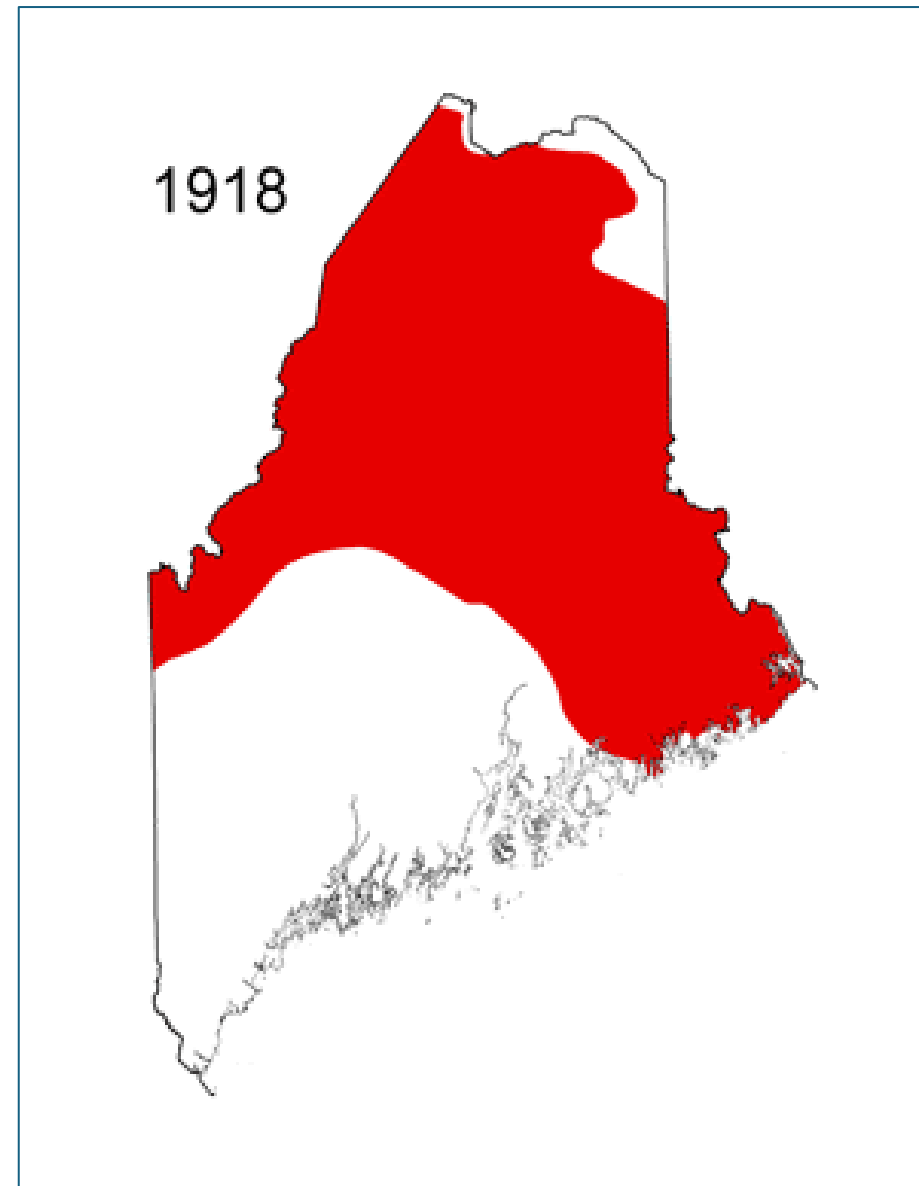
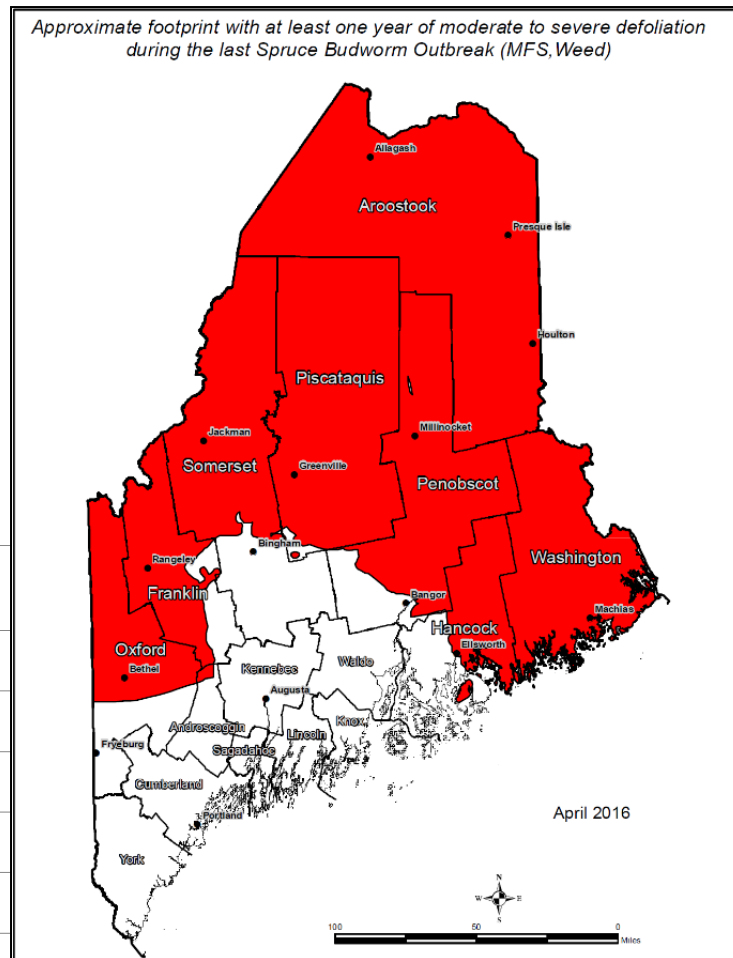


Vulnerability

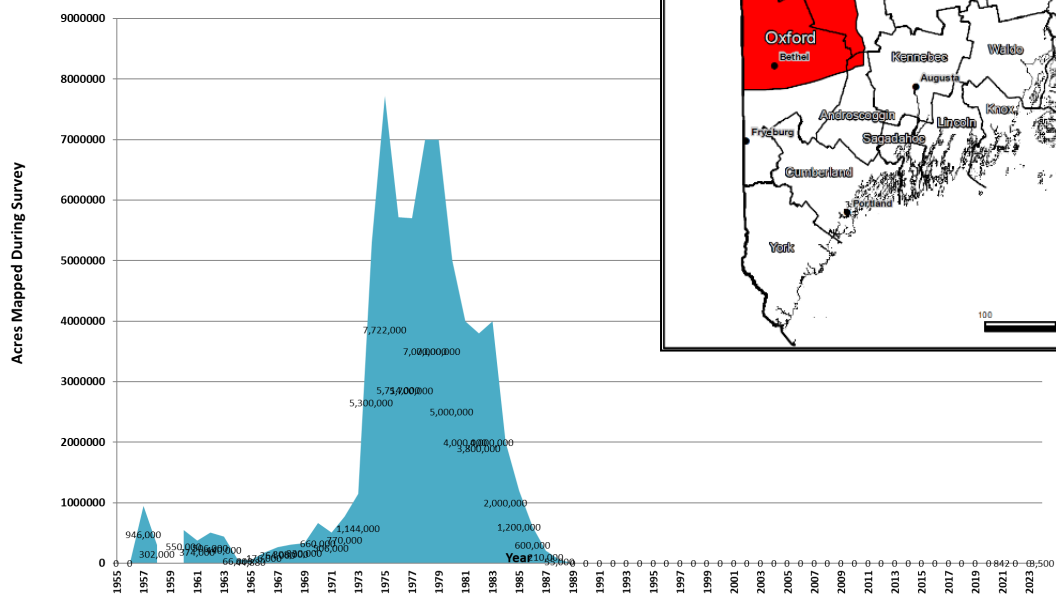
Preferred hosts



Spruce budworm damage through the 1900's

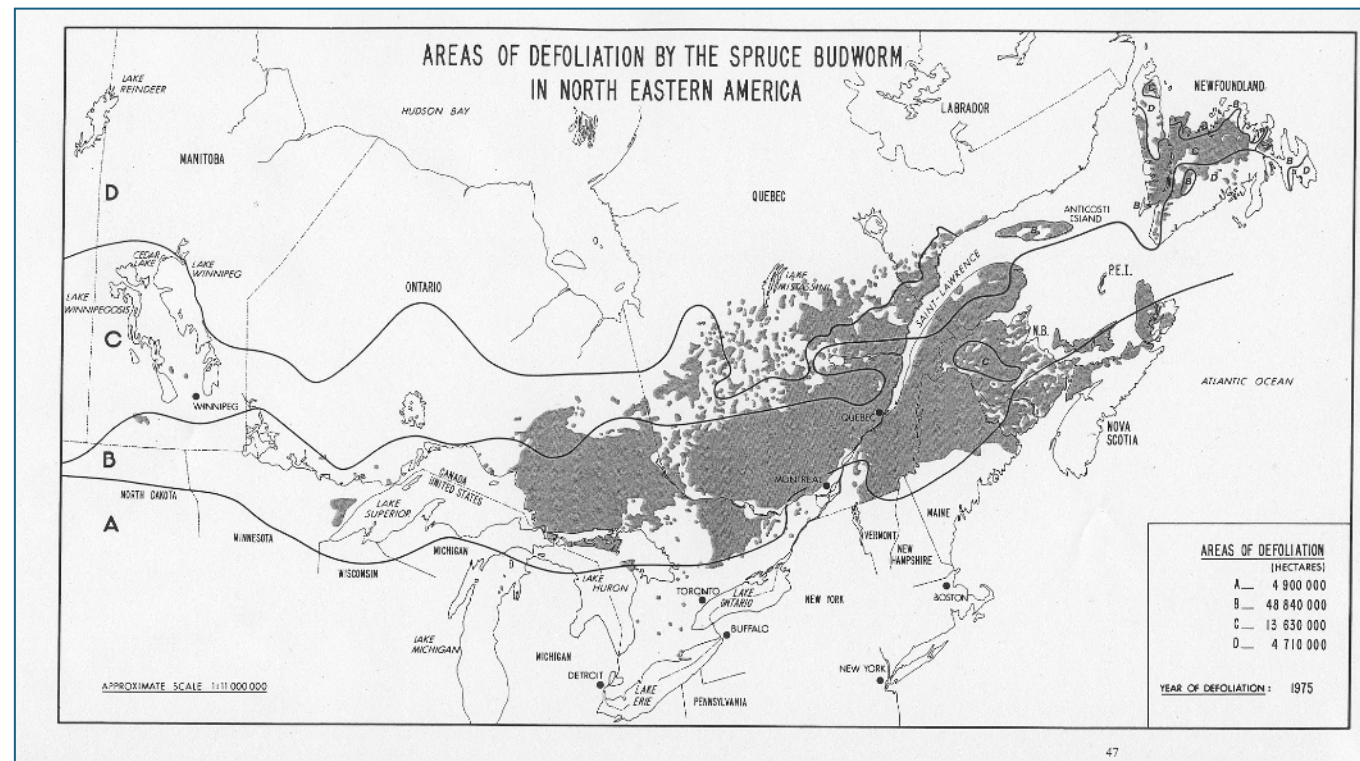


Maine Spruce Budworm Mapped Damage



Maine's Recent Past

- Last major SBW known as the 70s and 80s outbreak (~1967-1993).
- Regional outbreak covered ~136 million acres across eastern Canada and Maine
- Millions of acres of forest treated with insecticides
- In areas without budworm population control (Osawa et al., 1986):
 - Mortality rates for balsam fir reached 83-96%
 - Mortality rates for red spruce reached 25-45%
- Resulted in an estimated 20-25 million cords of spruce-fir mortality statewide
- Hundreds of millions of dollars lost revenue to forest industry
- Additional impacts to forest structure and composition, riparian areas, wildlife habitat, recreation, tourism, forest policies and practices



Added Stressors Since Last Outbreak

- **Balsam woolly adelgid: piercing sucking insect (aphid-like) throughout ME**, impact to forest increasing with higher minimum winter temperatures. Increased damage severity at higher latitudes since last outbreak
- **Brown spruce longhorned beetle: non-native woodborer not yet detected in ME**. Causing ecological damage in Nova Scotia, detections in traps in NB and QC. Attacks healthy and stressed spruce trees.
- Tree & forest health impacts from reduced snowpack, increased freeze- thaw events, drought and frequency of severe storms



Balsam woolly adelgid, Houlton, ME 2018

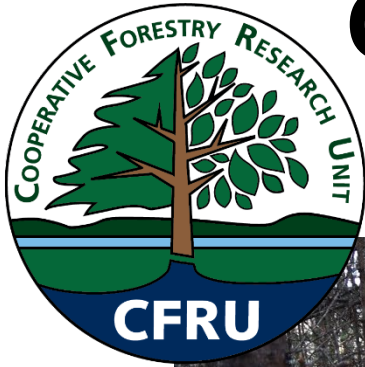
Spruce Budworm

Maine SBW Task Force



Spruce Budworm Task Force: www.sprucebudwormmaine.org

- Formed in response to spruce budworm population growth south of the St. Lawrence, University (CFRU/CRSF Director), Maine Forest Service (State Forester), and Maine Forest Products Council (Director) Leadership team
- Created a framework to prepare for the coming outbreak: Plan published in 2016, revisited in 2021 (CFRU-led)
- The overarching objective was to reduce the impacts of the next outbreak in comparison to the past and make sure that people would be aware of the issues associated with budworm
 - (budworm endemic phase is long, leading to loss of first-hand knowledge of impacts)



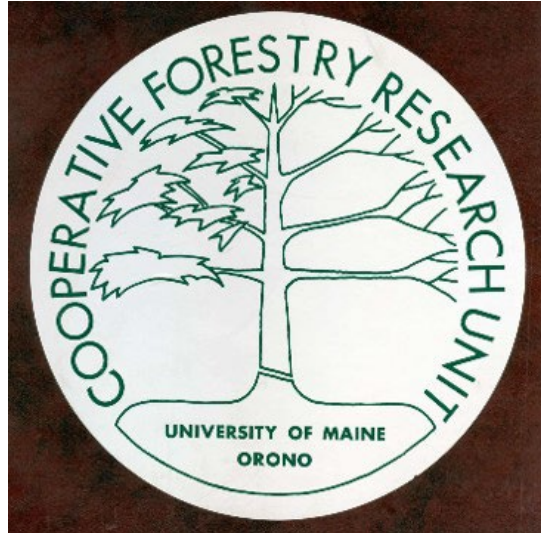
Cooperative Forestry Research Unit & Spruce Budworm Research



Regina Smith
Program Manager
Cooperative Forestry Research Unit

SBW Field Tour, Oct.
2024

EST. in 1976



Research CO-OP
Born out of the
last
Spruce budworm
outbreak

Connecting Maine's forest industry with applied research



2025



**Nearing our 50th
anniversary, still
funding spruce
budworm research!**

Holistically researching past SBW outbreaks, to help plan for the future



Spruce Budworm Management Benefit-Cost Analysis Calculator,

Dr. Adam Daigneault, University of Maine



Establishment of effective workflows for pest-induced damage detection and forest health monitoring in Maine by integrating remote sensing technology and field data,

Dr. Parinaz Rahimzadeh, University of Maine



Forest Ecosystem Status and Trends, ForEST

Dr. Erin Simons-Legaard, University of Maine



Spruce budworm L2 monitoring program in Maine

Dr. Angela Mech, University of Maine

Early Intervention Strategy & Spruce Budworm Monitoring

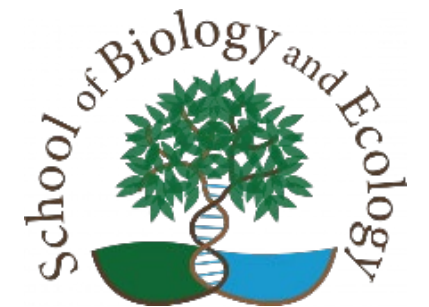
Angela Mech

Assistant Professor of Forest Entomology

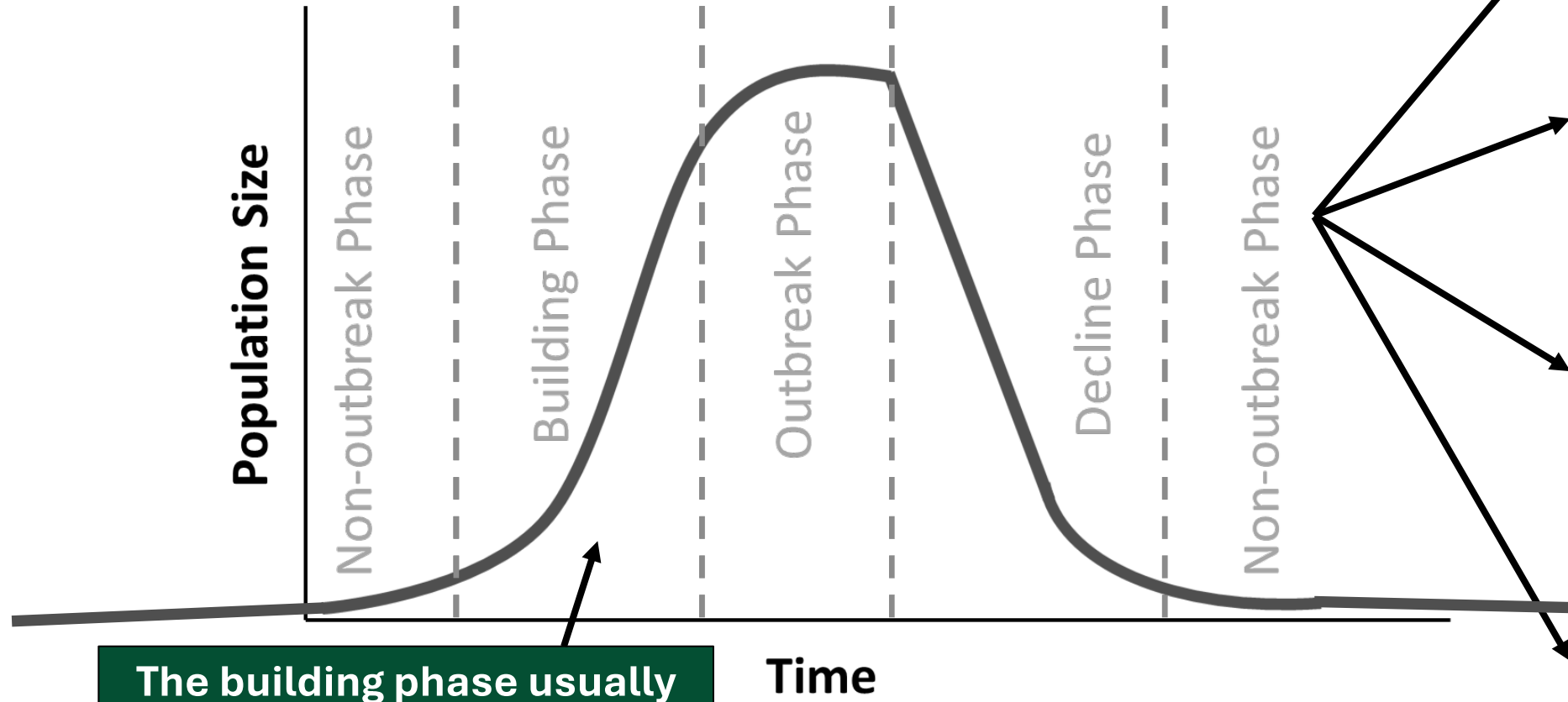
Director of the Spruce Budworm Processing Lab

University of Maine – School of Biology and

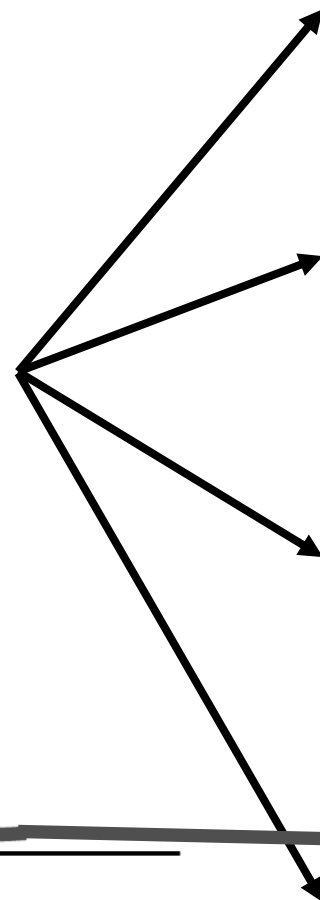
Ecology



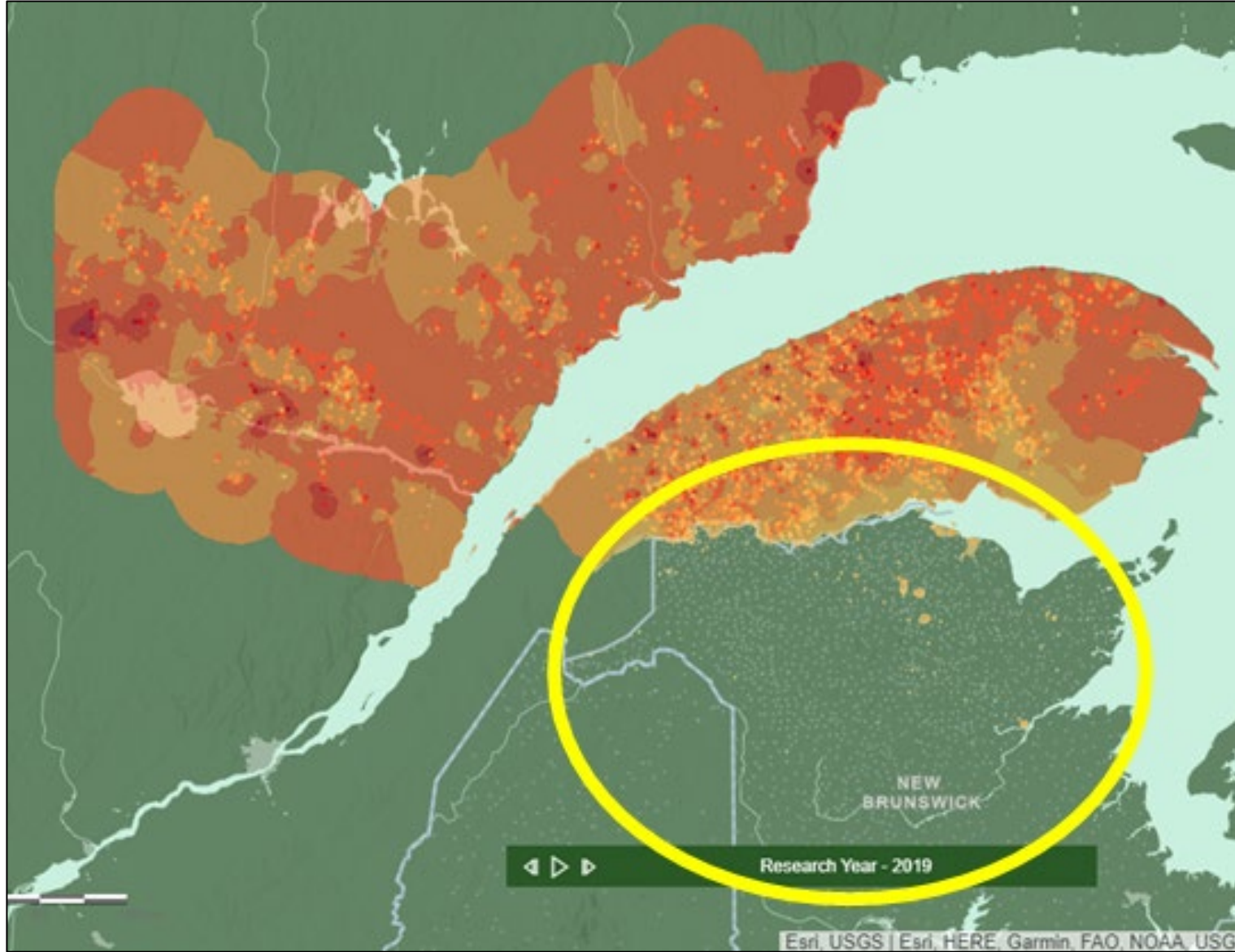
Stages of an insect/SBW outbreak



The building phase usually goes unnoticed because there are no significant

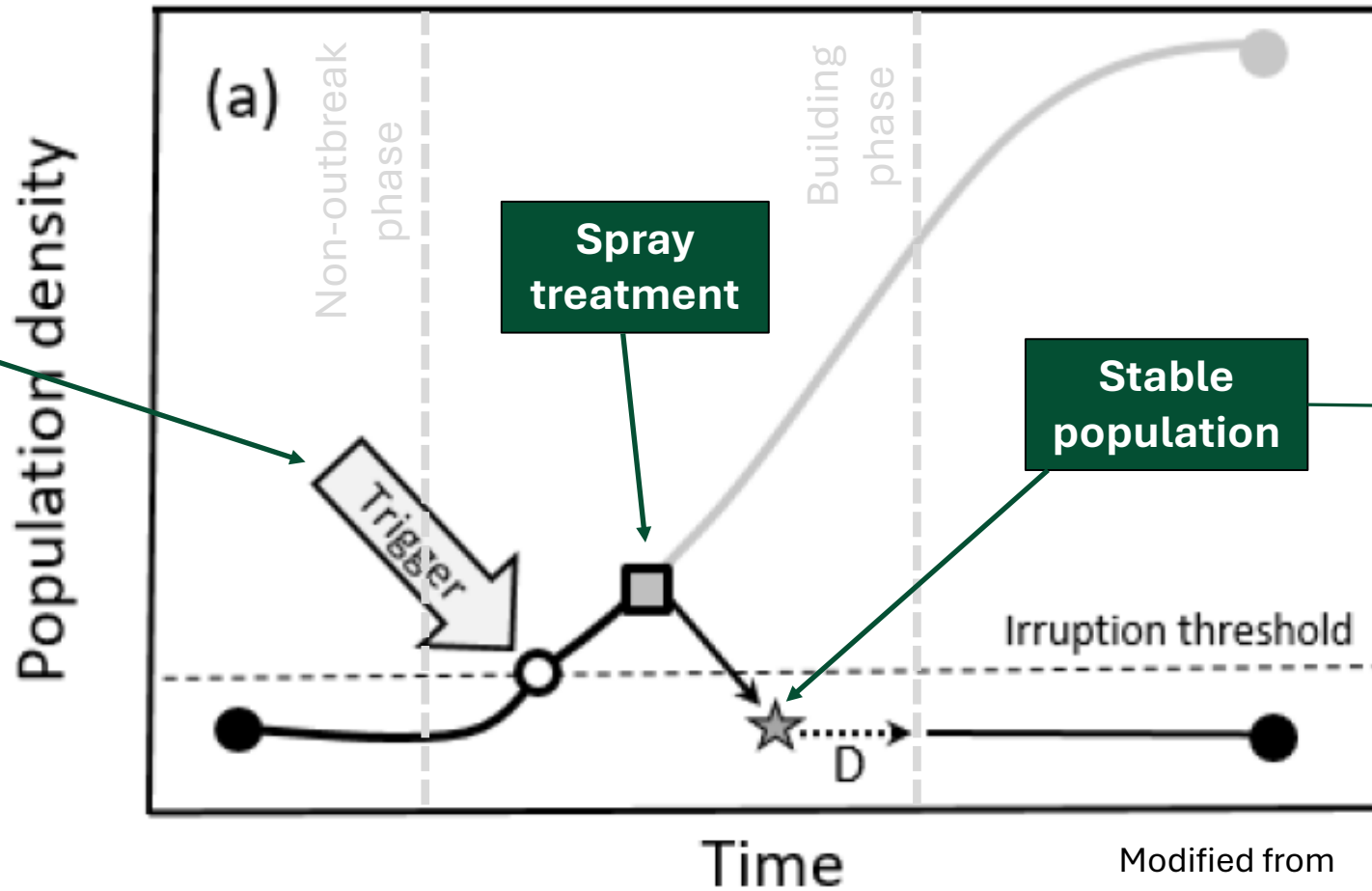


New Brunswick has escaped a large-scale SBW outbreak



Early Intervention Strategy (EIS)

Found through extensive monitoring



Modified from
Johns et al.
2019

Benefits of Early Intervention Strategy (EIS)

1. Cheaper & more environmentally friendly because only spraying small spots
2. Prevents largescale defoliation & mortality
3. Reduces potential secondary pests
4. 3:250 cost efficiency ratio over a 50-year period (EIS investment vs. timber loss with no management)



That was then, this is now...

1970s/80s Outbreak

Foliar Protection Strategy

- Spray large areas to suppress high-density populations (keep defoliation < 50%)
- Focused on high-value stands
- Surrounding outbreak left to run its course (significant tree mortality)
- Not designed to alter outbreak dynamics
- Objective: Keep trees from dying before harvest
- SBW often reinvaded from untreated areas, so retreated ~every year
- Used broad spectrum pesticides
(e.g., Carbaryl, Acephate)

Current Outbreak

Early Intervention Strategy

- Smaller fragmented treatment areas (many areas untreated)
- Spraying emerging populations *before* any significant defoliation
- Prevents population from outbreaking/spreading to other areas
- Designed to alter outbreak dynamics
- Objective: Keep forests healthy
- Rarely 2 consecutive years of treatment
- Uses targeted pesticides

Targeted Insecticides:

Bacillus thuringiensis kurstaki (Btk) and Tebufenozide

“Targeted” means that they only affect certain insect groups: Lepidopteran larvae (butterfly and moth)



Has to be of the right insect group to be impacted

- Beneficial insects (bees, parasitic wasps) & non-Lepidopteran pests (aphids, bark beetles) are largely unaffected

Has to be the right life stage at the time of spray to be impacted

- Any butterfly/moth species that are pupae or adults at the time of spray will not be impacted

Must be ingested by caterpillars

- No contact toxicity

Both degrade relatively quickly in the environment under normal conditions

- Btk = biopesticide (derived from natural biological sources)
- Tebufenozide = biorational insecticide (mimics natural hormone)

Stands being sprayed are fir-spruce

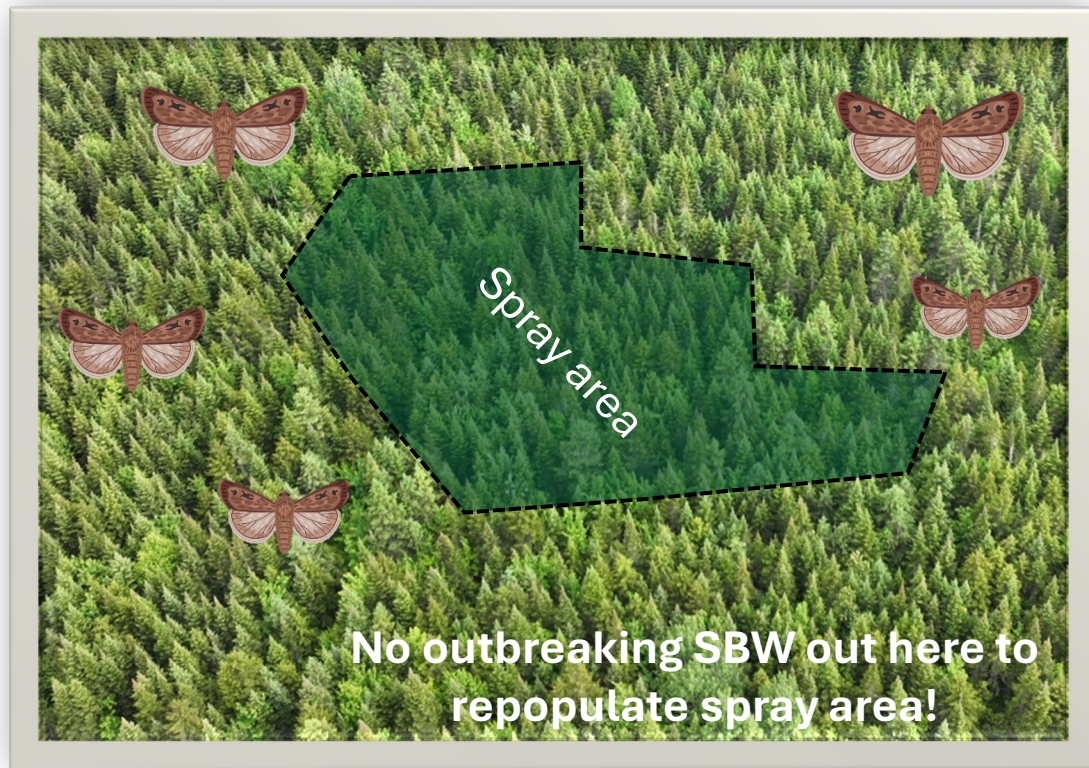
- Has lower diversity of butterflies/moths than areas with lots of hardwoods

Also keep in mind...

Rarely 2 consecutive years of treatments
& typically only small hotspots treated

- Native species will be able to quickly repopulate the healthy forest

If there is no spray program, spruce mortality (up to 60%) and fir mortality (up to 97%) would severely impact native insects that utilize them

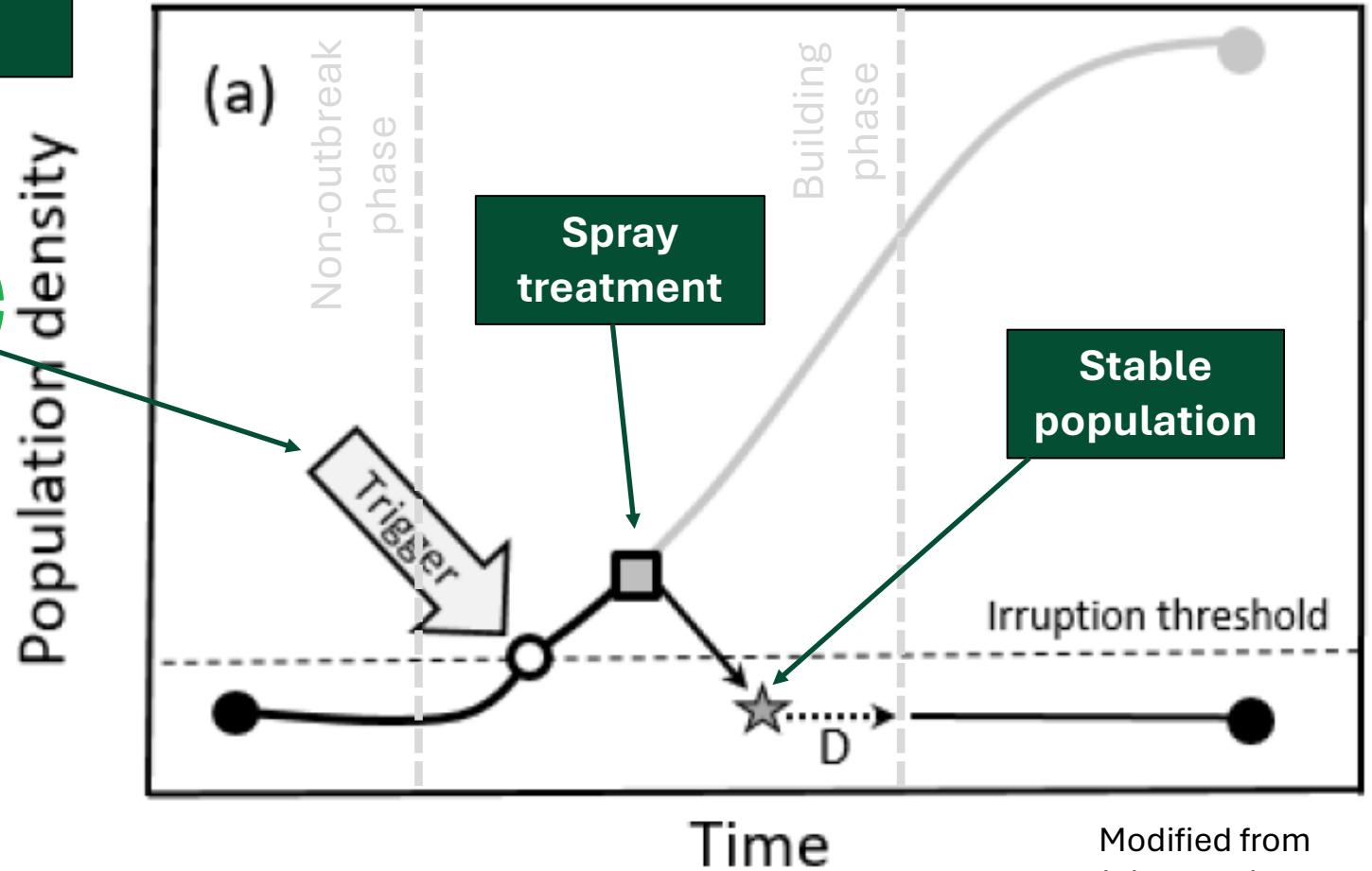


Early Intervention Strategy (EIS)

****EIS is not possible without timely L2**

Found through extensive monitoring

L2 = the 2nd instar larvae (what SBW overwinters as)

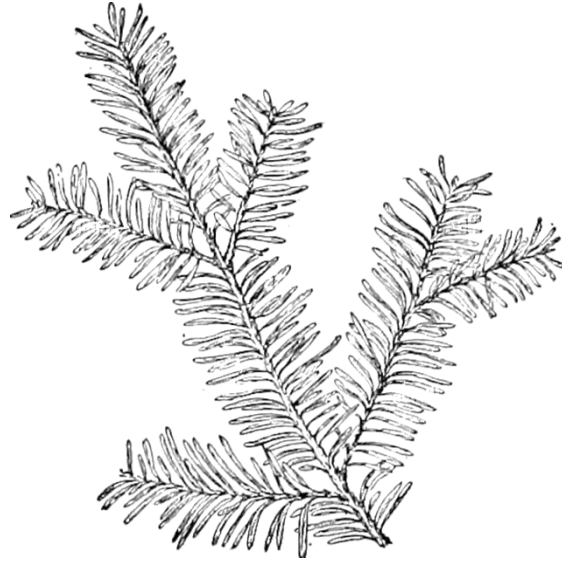


Modified from Johns et al. 2019

SBW L2 Processing



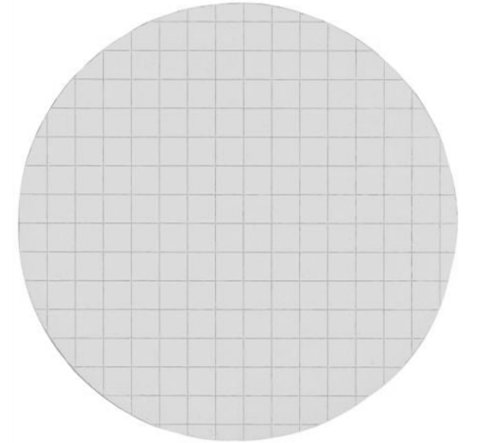
A branch is clipped from 3 trees
at a monitoring site



The branches are cut
up & soaked in hot
sodium hydroxide to
dissolve silk



Larvae are separated
from majority of plant
material
(chemistry magic!)

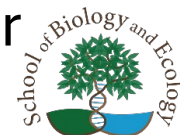


Larvae are identified
to species and all
SBW counted;
landowners
contacted



UMaine Spruce Budworm Lab

- Only SBW processing facility in United States
- Opened in 2021 – funded by CFRU & USDA Forest Service
 - Processes branches from 350 monitoring sites in ME (and VT, NH, & NY)
- Offers fee-for-service option to landowners (\$35/site)
- **Currently:**
 - 2 full-time staff & **10 student workers**
 - More than 700 sites (so far)
- **Expected:**
 - 1,500+ sites per year



THE UNIVERSITY OF
MAINE
Spruce Budworm Lab

Current Results

Spruce budworm overwintering (L2) population based on 2024 samples. See <https://www.sprucebudwormmaine.org/map/> for last year's data in Maine and Canada.

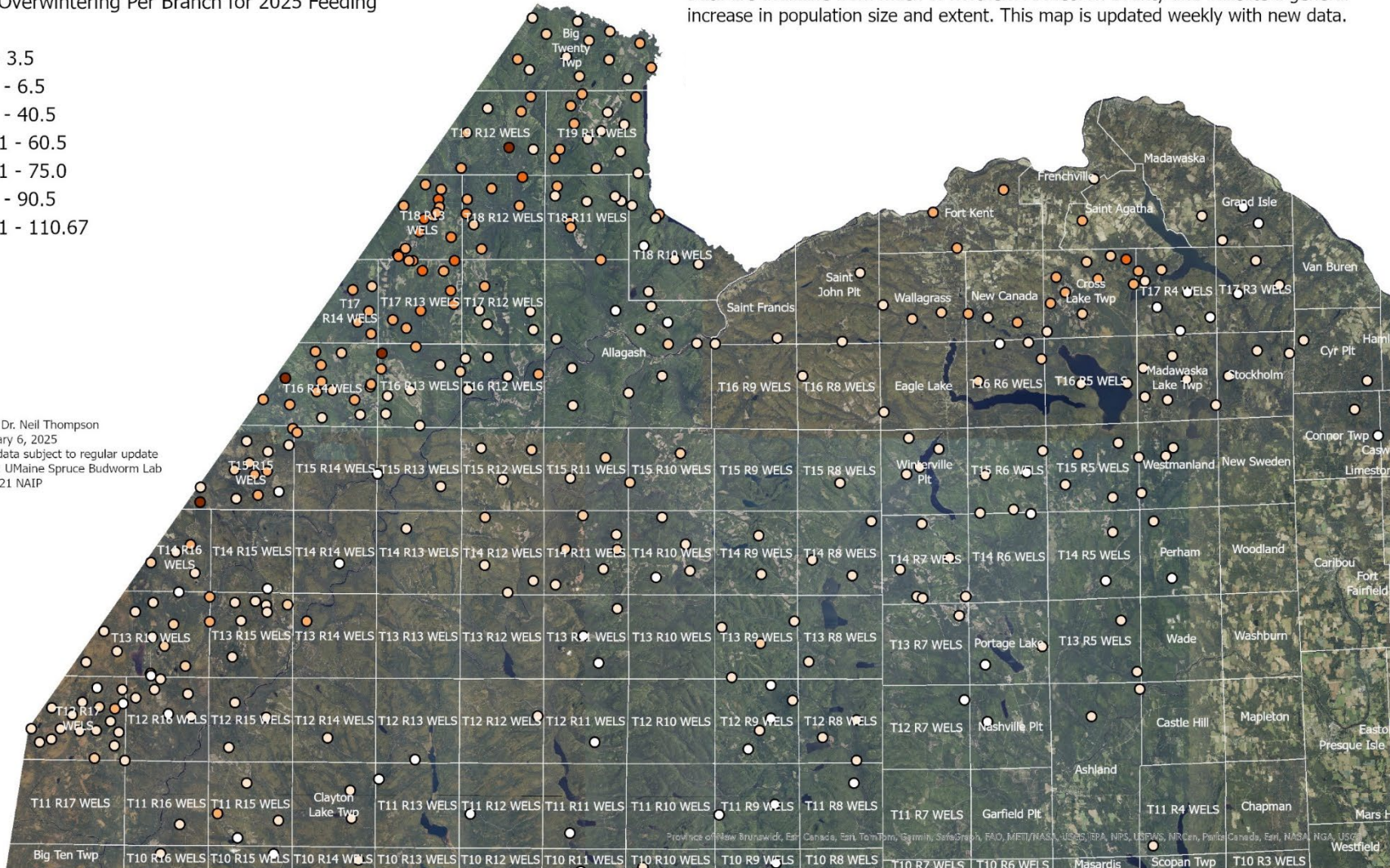
Data are available from much of northern Aroostook County and indicate a general increase in population size and extent. This map is updated weekly with new data.

January 9, 2025

Larvae Overwintering Per Branch for 2025 Feeding

- 0
- 0.1 - 3.5
- 3.51 - 6.5
- 6.51 - 40.5
- 40.51 - 60.5
- 60.51 - 75.0
- 75.1 - 90.5
- 90.51 - 110.67

Prepared by Dr. Neil Thompson
UMFK, January 6, 2025
Preliminary data subject to regular update
Data source: UMaine Spruce Budworm Lab
Imagery: 2021 NAIP



Neil Thompson:
Associate
Professor of
Applied Forest
Management
(UM Fort Kent)



UNIVERSITY OF MAINE
FORT KENT
UNIVERSITÉ DU MAINE

Spruce Budworm in Canada

Anthony Hourihan

Director Land Development

J.D. Irving



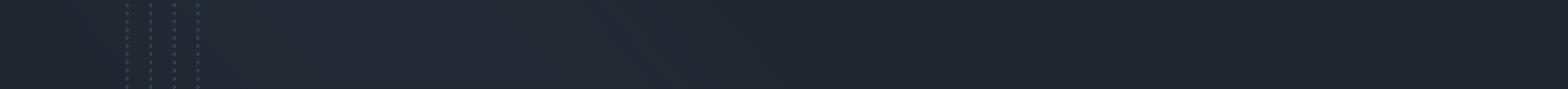
<https://healthyforestpartnership.ca/get-informed/resources/>

NB treatments for EIS
2014-present



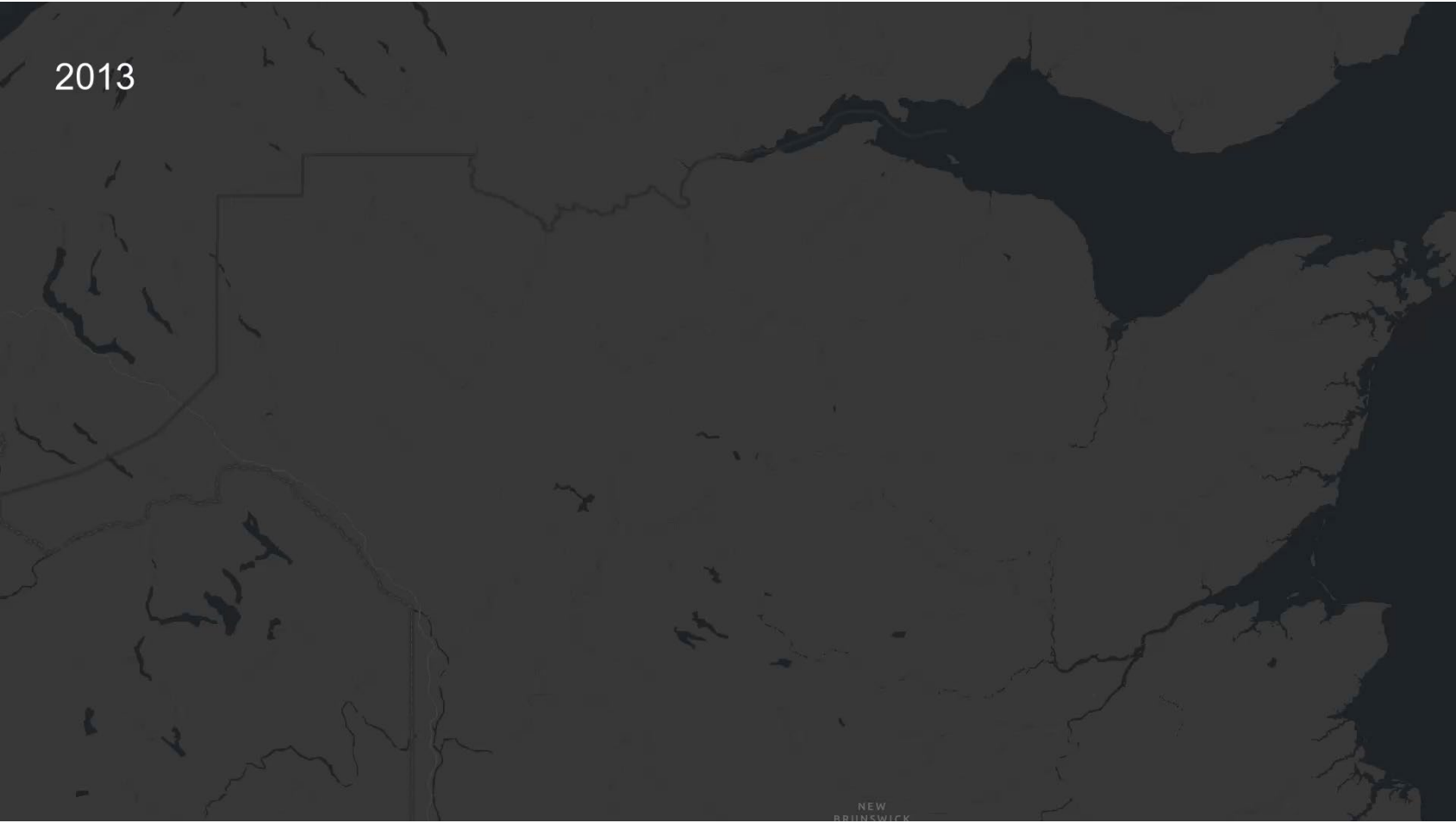
-  Treatment Area
- Setback**
-  Water
-  Habitation
-  Recent Harvests







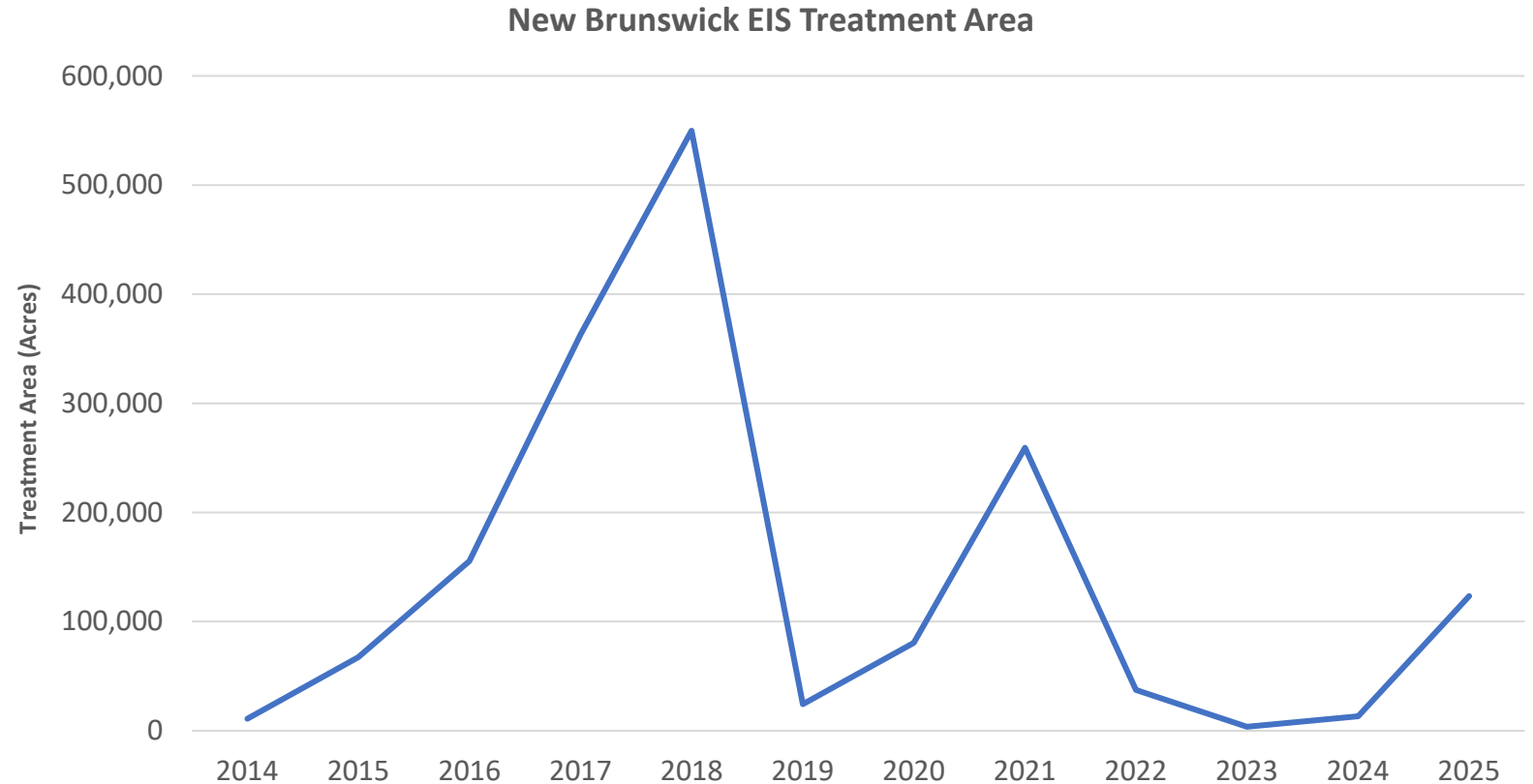
The Treatment Program 2014-today



New Brunswick EIS Treatment History

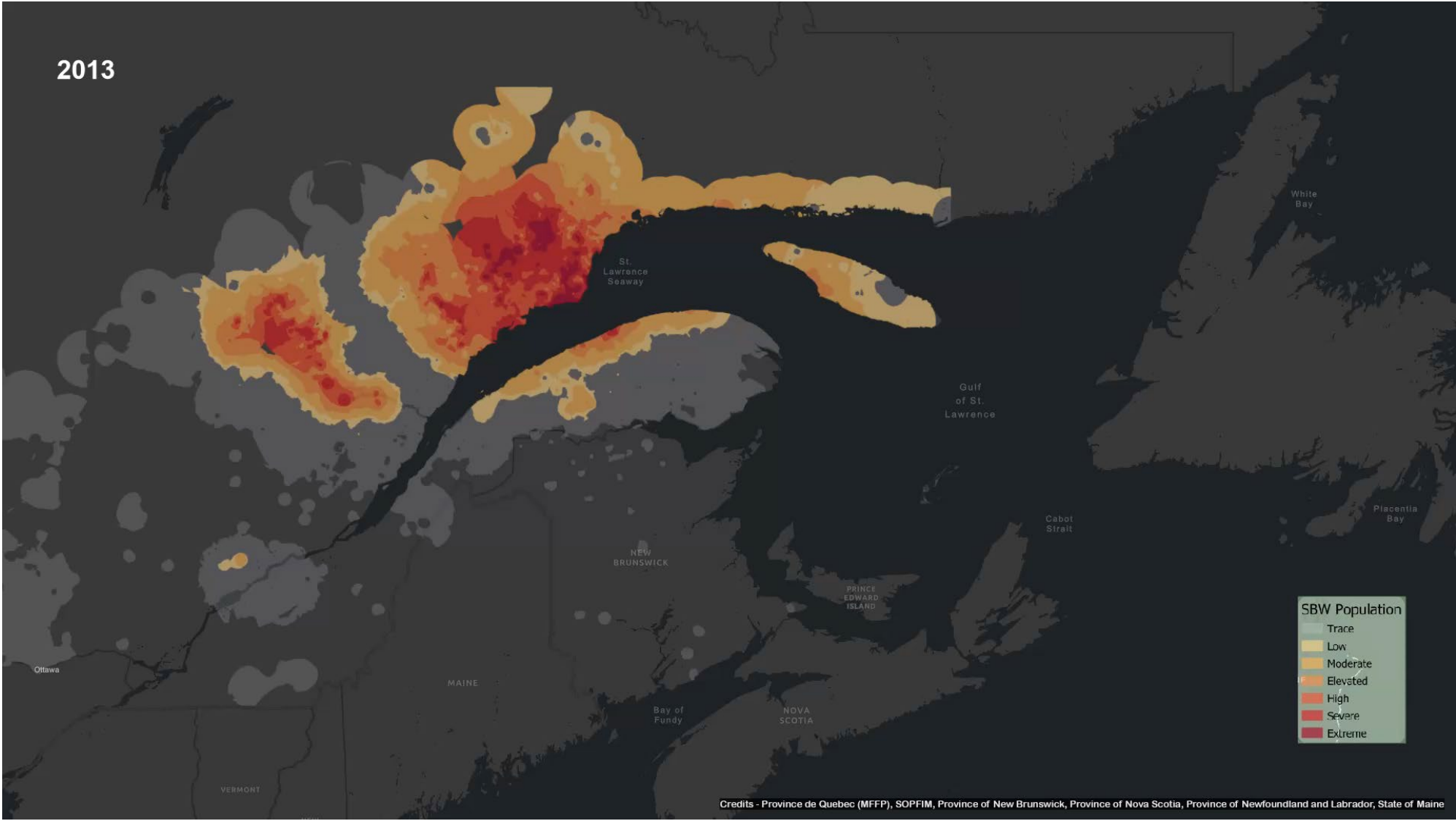
Since the start of the outbreak in 2014, NB has treated 1.6 M acres (160,000 acres per year on average) using the early intervention strategy.

During past outbreaks in the 1980's, **1-3 M acres were treated annually** using a foliage protection strategy.





Is it working?



Spruce Budworm Landowner Cooperative

Alex Ingraham
President
Pingree Associates





January 6, 2025

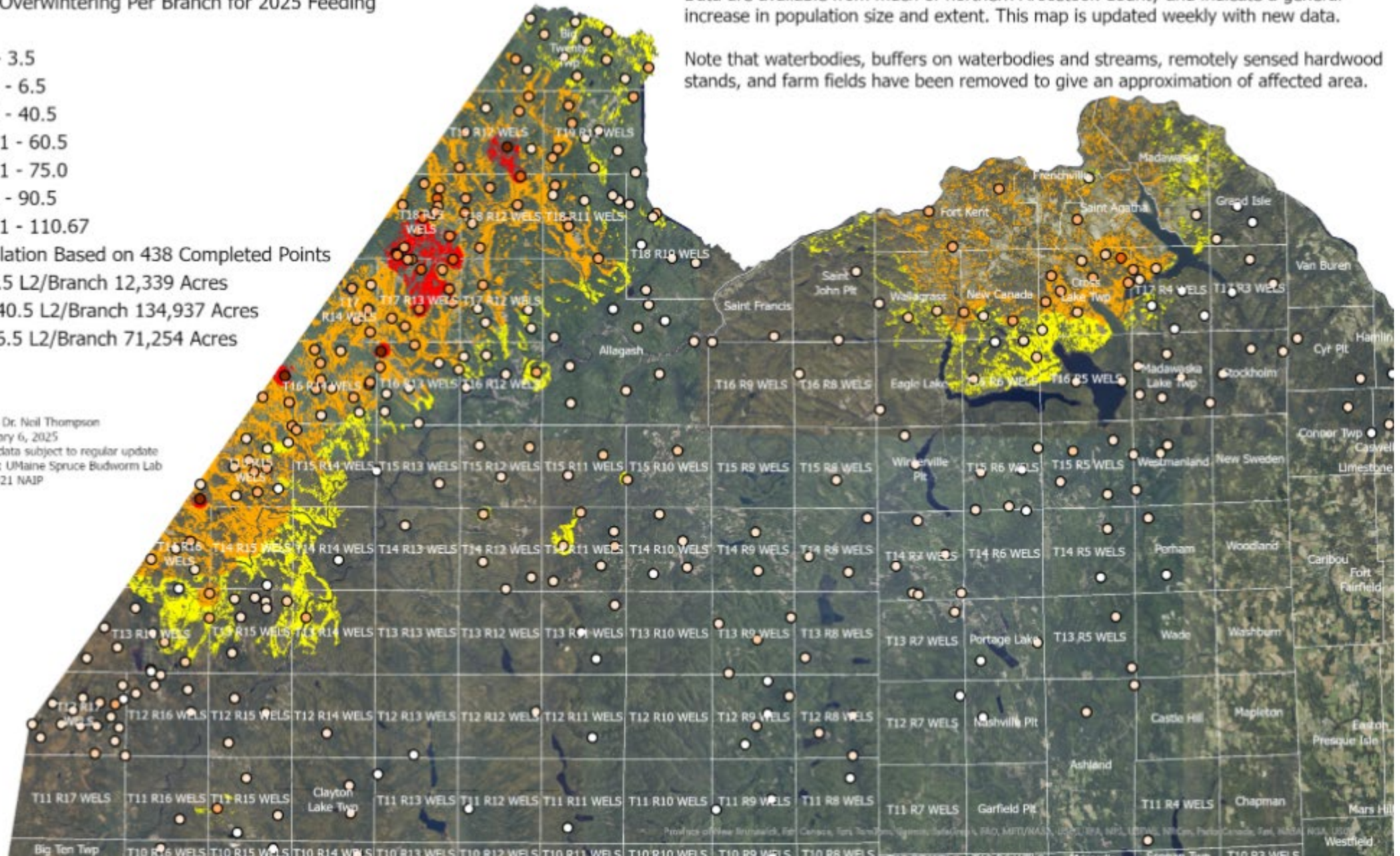
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- 75.1 - 90.5
- 90.51 - 110.67

Interpolation Based on 438 Completed Points

- >40.5 L2/Branch 12,339 Acres
- 6.5-40.5 L2/Branch 134,937 Acres
- 3.5-6.5 L2/Branch 71,254 Acres

Prepared by Dr. Neil Thompson
 UMFK, January 6, 2025
 Preliminary data subject to regular update
 Data source: UMaine Spruce Budworm Lab
 Imagery: 2021 NAIP



Spruce budworm overwintering (L2) population based on 2024 samples. See <https://www.sprucebudwormmaine.org/map/> for last year's data in Maine and Canada.

Data are available from much of northern Aroostook County and indicate a general increase in population size and extent. This map is updated weekly with new data.

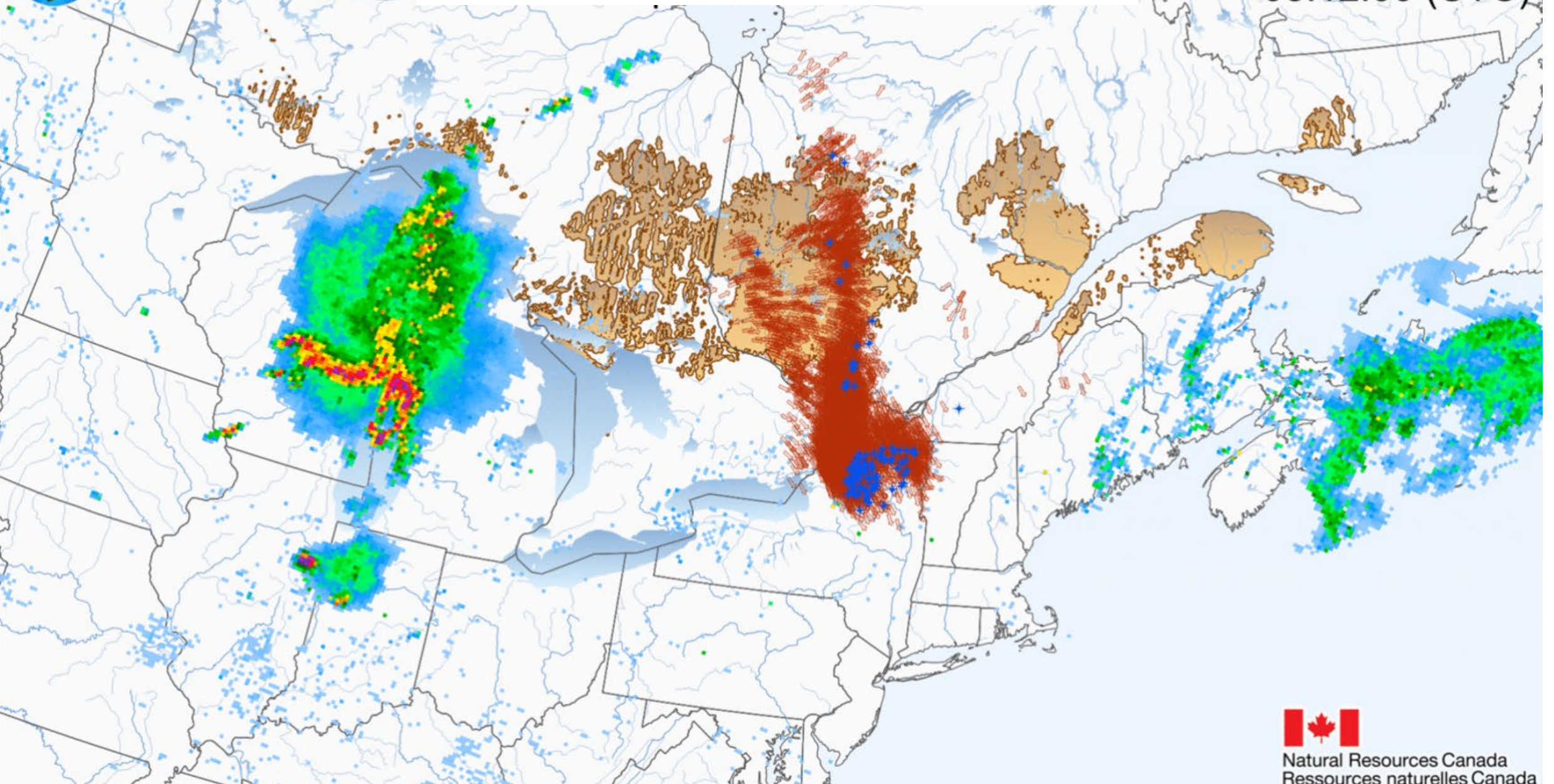
Note that waterbodies, buffers on waterbodies and streams, remotely sensed hardwood stands, and farm fields have been removed to give an approximation of affected area.



BioSIM

Spruce Budworm Moth Flight
June 2024

2024-06-25
08:12:00 (UTC)



The Time to Act is Now

PROJECTED IMPACTS OF A SEVERE SPRUCE BUDWORM OUTBREAK IN MAINE



**494,000
cords**

of annual wood supply
reduction



\$794 M

of annual economic
impact



3,865 jobs

direct and indirect job
losses

The Solution:

Early Intervention Strategy (EIS)

A simple but effective strategy to combat a large-scale spruce budworm outbreak in Maine.

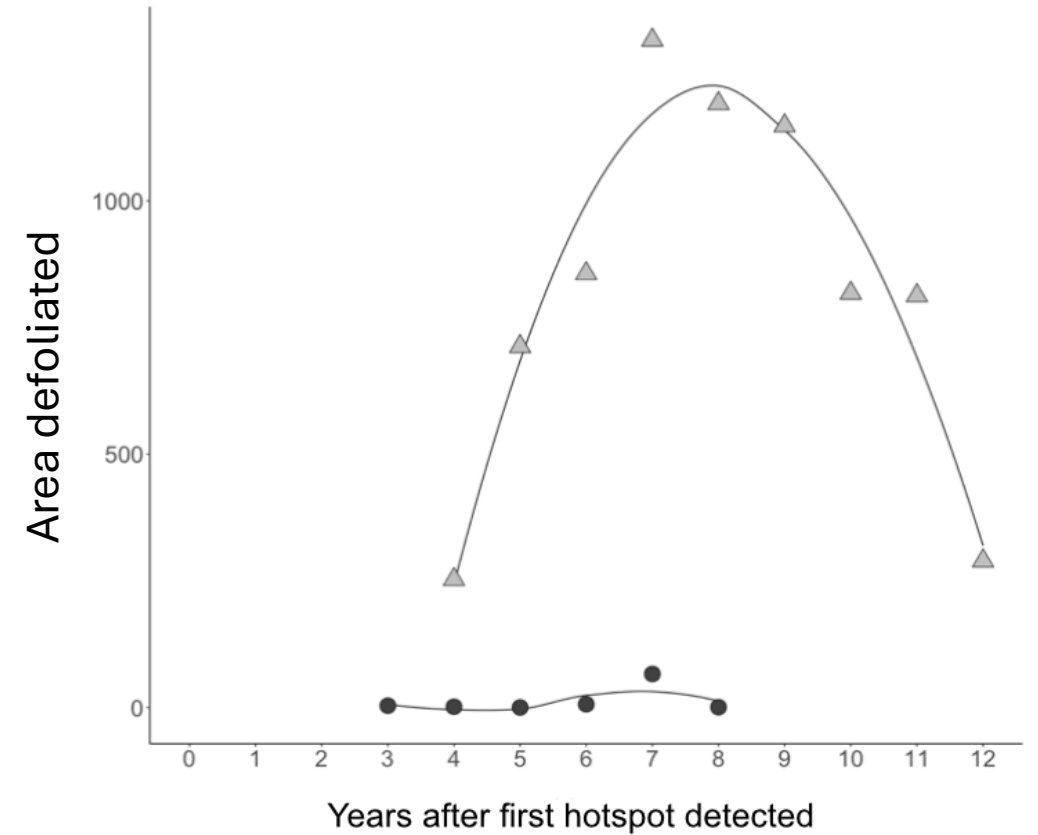
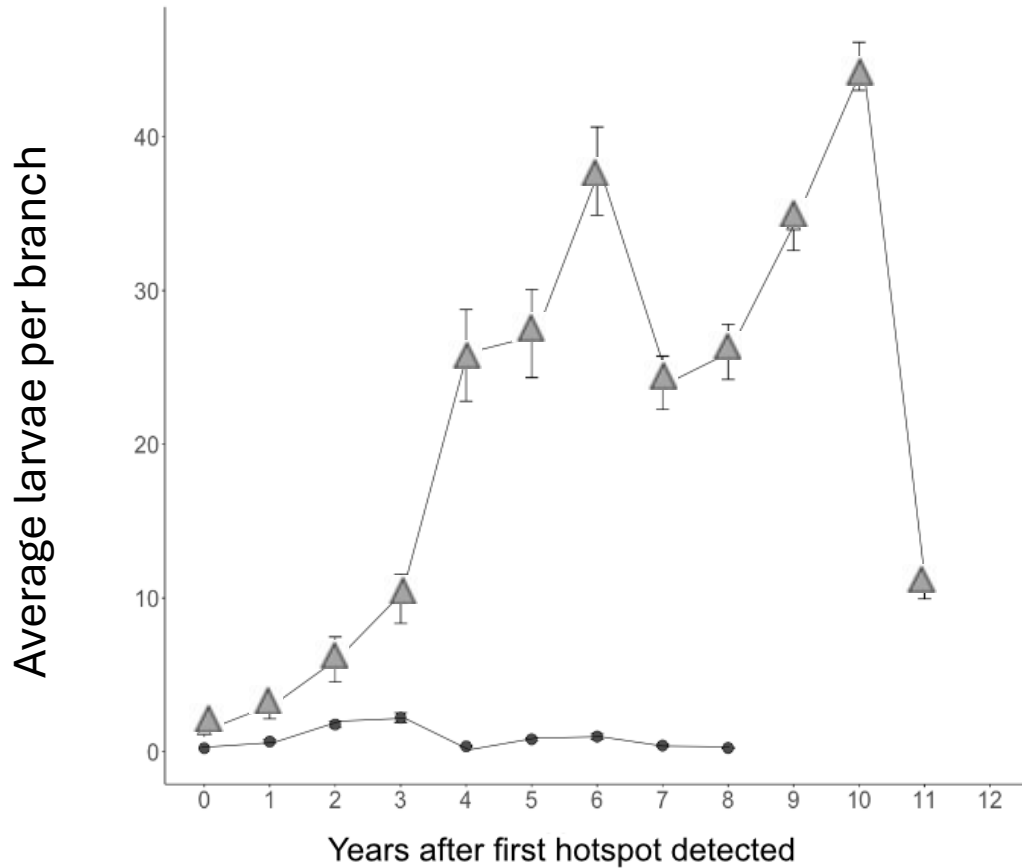
Includes:

1. **Early Detection** - Monitoring populations to detect hot spots.
2. **Early Intervention** - Targeted insecticide treatment to prevent spread.
3. **Communication** - Proactive communications and engagement with stakeholders on project activities and results.

THE STATS

EIS is Working

RESULTS TO DATE INDICATE SUCCESS IN REDUCING BUDWORM POPULATIONS IN TREATED HOTSPOTS THROUGH EARLY INTERVENTION, COMPARED TO CONTROL AREAS:



SPRUCE BUDWORM POPULATIONS IN TREATED AREAS HAVE DECREASED BY 60-80%.

The Solution:

Early Intervention Strategy (EIS)

MAINE'S FORESTS ARE AT RISK.

With balsam fir and spruce as important tree species in Maine, a budworm outbreak would cause mass devastation, heavily impacting the forest industry and the tourism sector.

EARLY INTERVENTION IS WORKING.

Treating hotspots as they occur has been successful at stopping budworm at Maine's borders. Making full use of all available tools, including 2 approved insecticides (Tebufenozide and Btk) will ensure we continue to stop the spread.

THE TIME TO ACT IS NOW.

Funding and commitment from all partners for the 2025 early intervention plan will ensure we avoid massive outbreaks as seen in the past.

**Thank you for
joining us
today!**

Questions?