

March 16, 2016

Executive Summary



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

The eastern spruce budworm (SBW), which returns every 30–60 years in a natural cycle, has been a part of Maine’s spruce-fir forest for thousands of years. Despite being a natural part of the forest, the SBW can be devastating to the health of spruce-fir stands as well as to the wildlife and people that depend on them. The last outbreak during the 1970s–80s killed millions of acres of spruce-fir stands, cost the state’s economy hundreds of millions of dollars, and helped “set the stage” for political conflict over Maine’s forestry practices during the decades that followed.

The current outbreak has caused severe defoliation to more than 15 million acres of spruce-fir forest in Quebec and is growing. Insect traps in northern Maine and New Brunswick have captured steadily increasing SBW moth counts over the past several years, and defoliation of spruce-fir stands is approaching Maine’s northern border.

To prepare for the coming outbreak, leaders from the University of Maine’s Cooperative

Forestry Research Unit, Maine Forest Service, and Maine Forest Products Council formed a joint SBW Task Force with leading experts on the SBW and various aspects of Maine’s forest resource to address key aspects of the coming outbreak:

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

The full report describes the complete findings of the SBW Task Force. The report includes an initial risk assessment for the coming SBW outbreak and makes key recommendations for how Maine’s forestry community can begin preparing for and responding to the coming outbreak.



Projected Wood Supply & Economic Impacts

As tree defoliation by the SBW crosses Maine's northern border, 5.8 million acres of spruce-fir stands containing 27.3 million cords of merchantable balsam fir are at risk of defoliation, leading to reduced growth and mortality of balsam fir and spruce trees over wide areas. Spruce-fir stands dominated by balsam fir and white spruce are at greatest risk, with stands dominated by red and black spruce also at some risk of damage.

Two studies on the potential impact of a SBW outbreak on spruce-fir wood supply in northern Maine recently were completed. Although each study used different methodologies, data sources, and measures of forest impact in their analyses, there was strong agreement between them on the general impact:

- A 15% to 30% maximum annual reduction in spruce-fir volume growth or standing biomass from moderate and severe SBW outbreaks, respectively, can be expected.
- A slow (40-year) recovery of the spruce-fir forest will follow the peak impact of the outbreak.
- The predicted effects of the next SBW outbreak on spruce-fir volume or biomass (both in severity and rate of recovery) were similar in both studies, regardless of when the outbreak begins over the next few decades.

The projected total volume loss over the next 40 years following an outbreak modeled to start in 2013 is 12.7 million cords from a severe outbreak to 6.4 million cords for a moderate outbreak half of that intensity. The maximum annual volume loss during the next outbreak is projected to be 494,000 cords per year for a severe outbreak (similar to the one in the 1970s–80s) and 247,000 cords per year for a moderate outbreak half of that intensity. This volume loss, without any forest management mitigation effort, is projected to have a **total economic impact of \$794 million per year during a severe outbreak and \$397 million per**



year for a moderate outbreak. Estimated annual job loss in the forest products sector would translate to 1,196 jobs and 598 jobs for severe and moderate outbreaks, respectively. Higher total job losses would be expected due to the multiplier effect of forest products jobs.

The wood supply model also indicated that it is possible to significantly reduce the spruce-fir wood volume and associated economic loss by:

1. **Adapting harvest** activities in the coming years before or as early as possible into the outbreak to reduce the area available in high-risk stands (i.e., those with high balsam fir and white spruce composition),
2. **Applying insecticide** to protect foliage in high-risk and high-value stands that are not ready for harvest, and
3. **Salvage logging** of dead and dying trees where they occur.

About 10% of the reduction in volume loss came from shifting future harvest plans toward high-risk stands. An additional 8% came from protecting foliage with insecticides such as BtK (*Bacillus thuringiensis* var. *kurstaki*; BtK was assumed in this model) on 20% of the affected area (little additional reductions in loss resulted from treating more than 20% of the susceptible area). Salvage logging using clearcut harvesting to capture dead and dying trees reduced the remaining 10% of the loss. Therefore, by aggressively implementing these three mitigation strategies, forest landowners can substantially reduce the negative impacts of the coming outbreak on spruce-fir volume losses.

Differences Between 1970s Outbreak & Coming Outbreak

For Maine's forest industry, government, and the university to effectively respond to the coming outbreak, it is important to understand how key factors and conditions have changed since the last outbreak in the 1970s–80s. These differences provide insight into the potential impact as well as the preparation and response strategies that will be needed relative to the last outbreak.

A quantitative and subjective assessment of changes in 43 factors (including spruce-fir forest condition, wood supply, forest management, forest products manufacturing, logging industry,

SBW monitoring capability, available protection measures, policies and regulations, political environment, available funding, and staffing levels) between today and when the last outbreak began in 1970 indicated more favorable circumstances in 55% of the factors, less favorable circumstances in 40% of the factors, and equal or unclear differences in 5% of the factors. Based on this analysis, the coming SBW outbreak will occur under very different circumstances than the last outbreak; as a result, the impact of and response to this outbreak will be different.

Summary of Recommendations

SBW Monitoring

Thorough monitoring of SBW populations will be required for a clear understanding of how the outbreak is progressing and for predicting how much and where damage to spruce-fir forests will occur. Effective monitoring also is the first requirement in deciding when and where to harvest high-risk stands or prescribe insecticide applications to protect valuable stands that are not ready for harvesting. As SBW population levels build over the next several years, it will be vital to intensify both short- and long-term monitoring efforts. Strong collaboration between forest landowners and the Maine Forest Service will be crucial in this effort.

Key specific recommendations for intensifying monitoring efforts include:

- *Engaging the public in SBW monitoring by educating them and encouraging their direct participation in monitoring efforts.*
 - *Increasing the number of pheromone traps in host forest types across northern Maine.*
 - *Investigating the use of new remote-sensing technologies for improved monitoring.*
 - *Sharing and comparing monitoring data and predictions with neighboring jurisdictions (U.S. and Canadian) to improve internal and partner analyses.*
- *Conducting egg mass or L-2 larval surveys in areas where pheromone trapping and/or defoliation surveys indicate a high probability of significant population intensification or in areas where land managers request such information to better determine the need for insecticide applications.*
 - *Assessing strengths and weaknesses of ongoing trapping efforts and making adjustments as needed, especially with regard to partnership agreements, trapping density and locations, and overall data quality.*
 - *Reviewing landowner progress in adapting harvesting efforts to reduce the availability of high-risk stands and identifying high-risk stands that landowners may want to protect using insecticide applications.*



Forest Management Strategies

Although experience from previous outbreaks shows that forest management strategies are not a panacea to protecting the forest from a SBW outbreak, it is important to begin developing proactive forest management strategies to reduce the area of high-risk stands before the outbreak begins. Identifying high-risk and high-value stands that may need foliage protection also is vital to mitigating damage by the SBW. To do this effectively requires that landowners categorize stands based on SBW risk on their property. A six-level system for categorizing stands based on SBW risk is provided in the full report.

Key forest management recommendations for forest landowners to prepare for the coming SBW outbreak include:

- *Mapping the location, condition, and concentration of high-risk stands on their forestlands.*
- *Shifting harvesting now and in the coming years toward merchantable higher-risk stands.*
- *Stopping precommercial and commercial thinning within three years of the outbreak in stands where balsam fir and white spruce make up more than 50% of the composition, or where red spruce will be greater than 50% of the post-thinned stand.*
- *Preparing action plans to salvage (or pre-salvage) trees that will likely be lost through SBW mortality.*
- *Seeking and encouraging markets for low-value trees from pre-salvage and salvage operations.*
- *Regularly communicating with government agencies and other landowners to understand how the infestation is moving and to develop plans to minimize the impact.*

It is imperative that these recommendations be implemented as soon as possible before the outbreak begins because mitigating stand damage by adapting short-term harvest plans will be more difficult once the outbreak is in full force. Delays in implementing these forest management measures also may force greater reliance on more expensive aerial insecticide treatments later when response options are greatly reduced.

Protection Options

As the outbreak develops, forest landowners with high-risk and high-value stands, especially those that have received thinning and contain high proportions of balsam fir and white spruce, may choose to protect them. Foliage protection using aerially applied insecticides has been shown to be effective in reducing tree damage from SBW. Twelve insecticide products with three active ingredients (BtK, tebufenozide, and carbaryl) whose labels specifically address aerial application to control SBW over naturally regenerated forests are registered with the Maine Board of Pesticides Control. Additional insecticides also are registered for controlling SBW under special circumstances, including forest plantations, Christmas trees, tree nurseries, and seed orchards.

Based on successful use in Maine during the 1970s–80s outbreak and the continued research, development, widespread use, efficacy, and general public acceptance over the past 30 years, it is anticipated that the biological insecticide BtK (applied as Biobit, Dipel or Foray insecticide products) will likely be the first choice for foliage protection for many forest landowners. Tebufenozide (an insect growth regulator specific to Lepidoptera) is another option likely to be favored. BtK and tebufenozide also are currently being used by Canadian researchers in a new research program to develop an early intervention strategy for SBW in the Atlantic Provinces.

Financing and coordination of the state's SBW insecticide program will likely be substantially different than it was during the 1970s–80s when state and federal government agencies played a large role in financing and coordinating insecticide applications. The insecticide program developed during the coming outbreak is expected to be delivered in the same way that aerial herbicide treatments have been financed and coordinated on private lands over the past few decades. There are a number of other assumptions under which the SBW insecticide program will be developed that are presented in the full report.

Key recommendations for SBW protection preparation include:

- *Forest landowners should assess and map high-risk and high-value stands on their lands that*
-

they may consider protecting with insecticide application during the SBW outbreak.

- *The Maine Forest Service should develop plans for providing technical assistance on SBW management to landowners.*
- *The Maine Forest Service, Maine Forest Products Council, Maine Board of Pesticides Control, and UMaine should work collaboratively to develop a communications strategy about SBW, its effects, and the need for insecticide applications for forest protection in some situations.*
- *The Maine Forest Service and UMaine's Cooperative Forestry Research Unit should be actively engaged with U.S. Forest Service and Canadian counterparts to ensure that Maine landowners and policymakers have access to the latest information and experience for controlling SBW damage.*

Policy, Regulation, & Funding

Successfully preparing for and responding to a SBW outbreak involves a number of governmental policy and regulatory issues that must be addressed. Determining how responsibilities for monitoring and protection programs will be divided among state government, federal agencies, and private landowners presents a special challenge. It is vital that all relevant policy, regulatory, and funding issues be identified and addressed as soon as possible.

Key recommendations for the policy, regulatory, and funding issues related to the next SBW outbreak, include:

- *Reviewing the Spruce Budworm Management Act to determine whether any changes are needed given likely changes in roles and responsibilities between the state government and private landowners in managing the next SBW outbreak.*
- *Maintaining an open dialogue among private landowners, state government, and the ENGO community.*
- *Determining the personnel, funds, and timing needed to implement the required SBW monitoring within the Maine Forest Service,*

and how supplemental labor and financial assistance from forest landowners will be provided.

- *Exploring options for developing a cooperative organization for coordinating and delivering aerial insecticide applications among large landowners anticipating the need for insecticide applications.*
- *Working with the Maine Board of Pesticides Control to identify and address any obsolete or other policy issues associated with delivering aerial insecticides to large areas of forestland.*
- *Preparing legislation defining the regulatory process for determining an expedited response for areas categorized as high SBW risk where there is a strong likelihood of increased SBW activity.*

Wildlife Habitat

Because the SBW generally has a substantial impact on forest composition and structure over large areas, provides a food source for birds and other species, and changes harvest patterns of forest landowners, major outbreaks have a significant influence on wildlife habitat over a long period of time. Four specific aspects of the coming SBW outbreak that could affect wildlife and wildlife habitat include: mortality of mature spruce-fir, changes in harvest patterns, non-target impacts of insecticides, and increased forest fire risk.

Understanding the overall impact of the coming SBW outbreak on wildlife will depend largely on how species most closely associated with spruce-fir forest habitat will be influenced. Of special interest are those species and habitats of special conservation value (e.g., species listed as rare/endangered/special concern) as well as game species of economic and recreational importance.

Seven wildlife issues were identified as being of greatest concern during the coming SBW outbreak:

- *Mature softwood songbirds and mammals,*
 - *Deer wintering areas,*
 - *Riparian habitats and aquatic systems (including coldwater fish habitat),*
-

-
- *Early/mid-successional species of concern (lynx/snowshoe hare/moose),*
 - *Rare species (including northern butterflies),*
 - *High elevation habitats and bird species, and*
 - *Old-growth softwood and mixedwood forest.*

The assumptions, potential positive effects, and potential negative effects related to the coming outbreak are presented for each of these issues, and specific recommendations for forest and wildlife managers are provided.

Public Communications & Outreach

A vital part of responding successfully to the coming SBW outbreak will include effective public communications, especially regarding progress of the outbreak, damage caused to the forest and wildlife, economic impacts, what actions are being taken to mitigate and respond to the damage, and how the forest is recovering. The goals and objectives for public communications for the next outbreak should include: identifying key communications issues associated with SBW, building a communications infrastructure for the entire SBW effort, and building stakeholder understanding of SBW.

To meet these communications goals and objectives, it is recommended that:

- *Maine Forest Service, Maine Forest Products Council, and University of Maine work together to develop and implement a comprehensive SBW communications strategy for the Maine public that will be implemented before, during, and after the outbreak.*
- *Specific communications programs should be designed for:*
 - *Public media,*
 - *Family forest owners,*
 - *Schools,*
 - *Environmental NGOs,*
 - *Government,*
 - *Forest industry, and*
 - *Recreation and tourism groups.*

Details about the background, framing, messages, outreach methods, and timing and timelines that should be used when developing communication strategies for each of the groups are presented in the full report.

Research Needs

The approaching SBW outbreak means there is an urgent need and opportunity for new research by U.S. and Canadian researchers in the region. Short- and mid-term research early in the outbreak will help forest managers more effectively and efficiently respond during the outbreak. Furthermore, the coming outbreak will provide ample opportunity for longer-term research that will help inform those managing future SBW outbreaks.

The report includes a list of the highest priority research questions solicited from the task teams that prepared this report and from researchers who have been working on SBW in the U.S. and Canada. Short-, mid-, and long-term priorities for improving SBW monitoring, protection, forest management responses, and wildlife management are presented as a guide for university and government researchers in the region.

About the Report

The Maine Spruce Budworm Task Force was formed in summer 2013 by the University of Maine's Cooperative Forestry Research Unit (CFRU), Maine Forest Service (MFS), and Maine Forest Products Council (MFPC) to begin preparing for the next outbreak of the eastern spruce budworm.

This document is an executive summary of the full Maine Spruce Budworm Task Force report:

Wagner, R.G., J. Bryant, B. Burgason, M. Doty, B.E. Roth, P. Strauch, D. Struble, and D. Denico. 2015. Coming Spruce Budworm Outbreak: Initial Risk Assessment and Preparation & Response Recommendations For Maine's Forestry Community. Cooperative Forestry Research Unit, University of Maine, Orono. 77p.

The full report can be found online: sprucebudwormmaine.org/task-force



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

The University of Maine does not discriminate on the grounds of race, color, religion, sex, sexual orientation, including transgender status and gender expression, national origin, citizenship status, age, disability, genetic information, or veteran status in employment, education, and all other programs and activities. The following person has been designated to handle inquiries regarding nondiscrimination policies: Director, Office of Equal Opportunity, 101 North Stevens Hall, 581.1226, [mailto:eoinfo@umit.maine.edu] | eoinfo@umit.maine.edu.

