Forest & Shade Tree Insect & Disease Conditions for Maine

A Summary of the 2013 Situation

Maine Department of Agriculture, Conservation and Forestry

Maine Forest Service

Forest Health & Monitoring
Summary Report No. 25

March 2014

Maine Forest Service
MAINE DEPARTMENT OF AGRICULTURE CONSERVATION & FORESTRY
Augusta, Main

Forest Health & Monitoring Division
2013 Organizational Chart

S= positions funded by state general fund
F= positions funded by federal funds
S/F=positions split between state and federal funds
italics = project, non-status positions

MAINE
Governor — Paul R. LePage

Dept. of Agriculture, Conservation & Forestry
Commissioner — Walter E. Whitcomb

Maine Forest Service
Director — Douglas P. Denico

Forest Health & Monitoring Divison
Director & State Entomologist - (S) Dave Struble

- Office Associate II - (S) Gale Ross (RETIRED)
- Supervisor- Forest Health Mgt - (S) Michael Devine (ACTING)
- Office Associate II - (F) VACANT Seasonal, Part time

Insect & Disease Management Work Group
Based @ Augusta Insect and Disease Laboratory

Forest & Shade Tree Disease Survey and Management

Ent III Forest Pathologist - (S/F)	William Ostrofsky	
Project Ent Technician - (F)	*Wayne Searles*	*Project Seasonal field assigned Southern Maine*

Forest Pest Survey & Municipal Assistance

Ent II Forest Entomologist - (S/F)	Charlene Donahue	
Senior Ent Technician - (S/F)	F. Michael Skinner	field assigned Northern Maine
Senior Ent Technician - (S)	VACANT	field assigned Western Maine
Project Con Aide - (S)	*William Urquhart (DECEASED)*	*Project Seasonal*
Project Con Aide - (S)	*Kathleen Urquhart*	*Project Seasonal*

Quarantine/Regulatory

Ent II Forest Entomologist - (S)	Allison Kanoti	
Project Con Aide - (S)	*Julie Churchill*	*Project Seasonal*
Project Ent Technician - (F)	*Jon Tyler*	*Project Seasonal*

Lab Operations/ Cooperative Projects

Ent I Forest Entomologist - (S)	Colleen Teerling

Analytical Support
Based @ Augusta Office

Biometrician - (S	Ken Lausten

Forest Inventory & Monitoring Work Group
Based @ Old Town Office

Forest Inventory and Analysis/Forest Health Monitoring Plot Data Collection

Ent Field & Mapping Supervisor - (S)	VACANT
Senior Ent Technicain - (F)	Jeff Harriman

Field assigned inventory crews

Ent Technician - (S)	Joe Bither	Year-Round	field assigned Northern Maine
Ent Technician - (S)	Melanie Duffy	Year-Round	field assigned Southern Maine
Ent Technician - (F)	Kate Locke	Seasonal	field assigned Central Maine
Ent Technician - (F)	Greg Bjork	Seasonal	field assigned South Central Maine
Ent Technician - (F)	Jamie Dow	Seasonal	field assigned North Central Maine
Ent Technician - (F)	Aron Bishop	Seasonal	field assigned Western Maine
Conservation Aide - (F)	Dustin Bouchard	Seasonal	
Conservation Aide - (F)	Bill Phipps	Seasonal	
Conservation Aide - (F)	Elicia Dionne	Seasonal	
Conservation Aide - (F)	Chad Barton	Seasonal	
Project Ent Technician - (F)	*VACANT*	*Winter Season*	
Project Ent Technician - (F)	*VACANT*	*Winter Season*	
Project Ent Technician - (F)	*VACANT*	*Winter Season*	
Project Con Aide (S/F)	*Ronna Coleman*		
Project Con Aide (S/F)	*VACANT*	*Winter Season*	
Project Con Aide (F)	*VACANT*		

Forest Insect & Disease—Advice and Technical Assistance

Maine Department of Agriculture, Conservation and Forestry, Maine Forest Service
Insect and Disease Laboratory
168 State House Station, 50 Hospital Street, Augusta, Maine 04333-0168
Phone: (207) 287-2431 Fax: (207) 287-2432
http://maine.gov/dacf/mfs/forest_health/index htm

The Maine Forest Service/Forest Health and Monitoring (FH&M) program maintains a diagnostic laboratory staffed with forest entomologists and a forest pathologist. The staff can provide practical information on a wide variety of forest and shade tree problems for Maine residents. Our technical reference library and insect collection enables the staff to accurately identify most causal agents. Our website is a portal to not only our material and notices of current forest pest issues but also provides links to other resources. A stock of information sheets and brochures is available on many of the more common insect and disease problems. We can also provide you with a variety of useful publications on topics related to forest insects and diseases.

Submitting Samples - Samples brought or sent in for diagnosis should be accompanied by as much information as possible including: host plant, type of damage (i.e., canker, defoliation, wilting, wood borer, etc.), date, location, and site description along with your name, mailing address and day-time telephone number or e-mail address. Forms are available on our website and on the last page of the Annual Summary Report for this purpose. Samples mailed to the laboratory should be accompanied by all necessary information and insects should be in crush-proof containers (such as mailing boxes or tubes). Live insects should be provided with adequate host material for food. Disease samples should be enclosed in plastic bags. Mail containers for prompt shipment to ensure they will arrive at the Augusta laboratory on a weekday.

Insect & Disease Laboratory	State Entomologist	Field Staff*
168 State House Station Augusta, Maine 04333-0168 Location: 50 Hospital Street Phone: (207) 287-2431 Fax: (207) 287-2432 Hours: Mon.-Fri. 7:30 a.m. - 4:30 p m. (call ahead as we are often in the field) Charlene Donahue, Forest Entomologist (207) 287-3244 charlene.donahue@maine.gov Allison Kanoti, Forest Entomologist (207) 287-3147 allison m kanoti@maine.gov Colleen Teerling, Forest Entomologist (207) 287-3096 colleen.teerling@maine.gov William Ostrofsky, Forest Pathologist (207) 287-3008 bill.ostrofsky@maine.gov Wayne Searles, Entomology Technician Jocelyn Lahey, Conservation Aide jocelyn.lahey@maine.gov (207)-287-2431	David Struble 22 State House Station Augusta, Maine 04333-0022 Phone: (207) 287-2791 Fax: (207) 287-8422 dave.struble@maine.gov **State Supervisor of FH & M** Mike Devine P.O. Box 415 Old Town, Maine 04468 Location: 87 Airport Road Phone: 207-827-1812 Fax: 207-827-8441 mike.devine@maine.gov	Mike Skinner, Entomology Technician 185 Crystal Road Island Falls, Maine 04747 Phone: (207) 538-5571 Radio Call #F-181 * Can be contacted directly for assistance in his area of the state.

Forest & Shade Tree – Insect & Disease Conditions for Maine Reports
Sign-Up Form

For on-line form: http://www maine.gov/dacf/mfs/forest_health/condition_rpt_signup.html

The Maine Forest Service (MFS) Forest & Shade Tree Insect and Disease Conditions reports and Annual Summary Report provide information about what is impacting the health of Maine's forest and neighborhood trees. Updates are provided during the growing season and otherwise as conditions dictate. Additionally our website is especially useful for special alerts and quarantine information. The MFS Insect and Disease Lab maintains hardcopy information sheets on a variety of pest problems that are also available on our website. Diagnostic services are provided as time and manpower permit. We are always interested in what you are seeing affecting your trees – let us know!

E-Mail Address _____

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Area of Interest (*only check one*):

- ☐ Academic Institution
- ☐ Christmas Tree Grower
- ☐ Government Agency
- ☐ Land Trust
- ☐ Logger
- ☐ Woodland Owner
- ☐ Other
- ☐ Arborist
- ☐ Forester
- ☐ Landscaper
- ☐ Library
- ☐ Nursery/Greenhouse
- ☐ Interested Individual

Comments:_____

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Return your Completed Form To: **Insect & Disease Laboratory**
168 Statehouse Station
Augusta, Maine 04333-0168

Phone (207) 287-2431 Fax (207) 287-2432
http://www maine.gov/dacf/mfs/forest_health/index htm

Personnel

William S. Urquhart, MFS Entomology Technician, passed away on July 24, 2013. He was an integral part of the Maine Forest Service Entomology Lab and a good friend. Bill honed his skills at insect identification, making our lab the envy of many working on similar projects. He was pleased to share his knowledge with others and was always looking for ways to further his own understanding of insects. Bill was a wonderful ambassador for the MFS, always polite, helpful and going the extra mile for people. He was our 'man Friday', making so many activities here at the Lab run smoothly, willing to assist on any project and doing so with unsurpassed attention to detail. Bill's keen intellect and sense of humor will be missed around the Lab. We will also miss him sharing his fantastic smoked cheeses and meats of which he and Kathy were justly proud. Most of all we will miss him as our friend.

Acknowledgements

The information in this Annual Summary Report has been assembled and reviewed by Charlene Donahue, Allison Kanoti, William Ostrofsky, Dave Struble, and Colleen Teerling of the Maine Forest Service, Forest Health and Monitoring program. Many other individuals and organizations have contributed significantly to the information on forest health presented here, including Wayne Searles, Mike Skinner, William Urquhart and the rest of the Forest Health and Monitoring Division.

The Forest Inventory and Analysis Unit of our Division provided invaluable assistance in a number of areas including: setting and retrieving traps for gypsy moth, spruce budworm and winter moth, conducting sampling for hemlock woolly adelgid predators, and collecting data on hemlock impact plots.

We extend our thanks to Greg Miller, Greg Lord, and Ken Laustsen, Maine Forest Service, for their assistance with mapping, computer, and statistical tasks. Our summer work was greatly enhanced by the efforts of Kathleen Urquhart, Julie Churchill and Jon Tyler. Jocelyn Lahey, who has only recently joined the FH&M Division staff, has made a significant and much appreciated effort in assembling, formatting, and proof-reading this report.

We work closely with the DACF Division of Animal and Plant Health and appreciate the cooperation of Ann Gibbs, State Horticulturalist; Karen Coluzzi, Pest Survey Coordinator and Lorraine Taft, Outreach Coordinator in particular. Their work in quarantines, survey and outreach nicely dovetails with our work.

A significant amount of work is completed through the assistance of volunteers. Our deepest thanks go to those who volunteer in survey and monitoring as well as other tasks. In particular we thank David Bourque and Dana Michaud for their taxonomic contributions and additions to the insect collection.

Sincere thanks are also extended to many other administrative and field staff of the Maine Department of Agriculture, Conservation, and Forestry, and to our many contacts in the USDA Forest Service Northeastern Area – Forest Health and Protection, the USDA-APHIS, and to our other cooperators in the Northeastern States of the U.S. and Maritime Provinces of Canada.

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Printed under appropriation number: 010-01A-5221-52 and 013-01A-2FHM-52

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Introduction

This annual summary report describes the efforts towards understanding and managing the health issues of importance to Maine's forest resources. Emphasis is placed primarily on insect and disease relationships of forest, shade, and ornamental trees. The myriad of biotic and abiotic agents capable of damaging trees can result in losses to wood production and quality, water quality values, recreational opportunities and enjoyment and, in some cases, to human health. Conversely, the great majority of these agents are not simply beneficial, but critical to the productive functioning of forest ecosystems. Therefore, our understanding of the role insect and disease agents play in maintaining a healthy forest is as important as mitigating the damaging effects of the few native and invasive pest species capable of significant disruptions to forest sustainability.

The Forest Health and Monitoring Division has four primary mission responsibilities related to insect and disease conditions of our forest resources: 1) **monitoring and evaluating** the resource for overall health using both aerial and ground survey methods; monitoring is done for both specific agents of concern, and in cooperation with the statewide continuous forest inventory efforts of the Forest Inventory and Analysis group of the Division; 2) **providing advice and assistance** on forest health issues to private and public landowners, foresters, industrial and commercial entities, and to the general public; 3) **conducting applied research and demonstration projects** to further the understanding and improve management of specific pests of concern and other forest health issues, and 4) **supervising and managing the forest pest-related quarantines** established by state regulations.

As this report will show, 2013 was a year marked with a high level of Division activities conducted on several existing pest problems, along with significant efforts towards anticipating forest pests not yet present in the state. And, considering the pest management challenges of the coming seasons, the efforts outlined in this report will serve to strengthen our response towards more effectively managing our forest resources.

Insect Conditions

Insects: Softwood Pests

Arborvitae Leaf Miners
A complex of four species
Host(s): Northern White-Cedar (*Thuja occidentalis*)

Arborvitae leaf miners are a perennial concern and cedar stands across northern and eastern Maine continue to be thin and off-color due to a variety of factors with arborvitae leaf miner being just one of them. The leafminer populations are moderating in the northern and eastern parts of the state. Damage continues to be high in the eastern part of Aroostook County, moderate to low in Penobscot, Piscataquis, and Washington Counties. This problem was not aerially mapped as it so pervasive across the northern part of the state. Tree condition appears to be improving over 2012.

Balsam Gall Midge
Paradiplosis tumifex
Host(s): Balsam Fir (*Abies balsamea*)

Few reports of damage from gall midge in 2013.

Balsam Woolly Adelgid
Adelges piceae
Host(s): Balsam Fir (*Abies balsamea*), Fraser Fir (*A. fraseri)*

Balsam woolly adelgid populations continued at low levels in 2013. This is a pest that will be back causing deformed growth and mortality.

Elongate Hemlock Scale
Fiorinia externa
Host(s): Hemlock (*Tsuga* spp.), Fir *(Abies* spp.*)* and other conifers

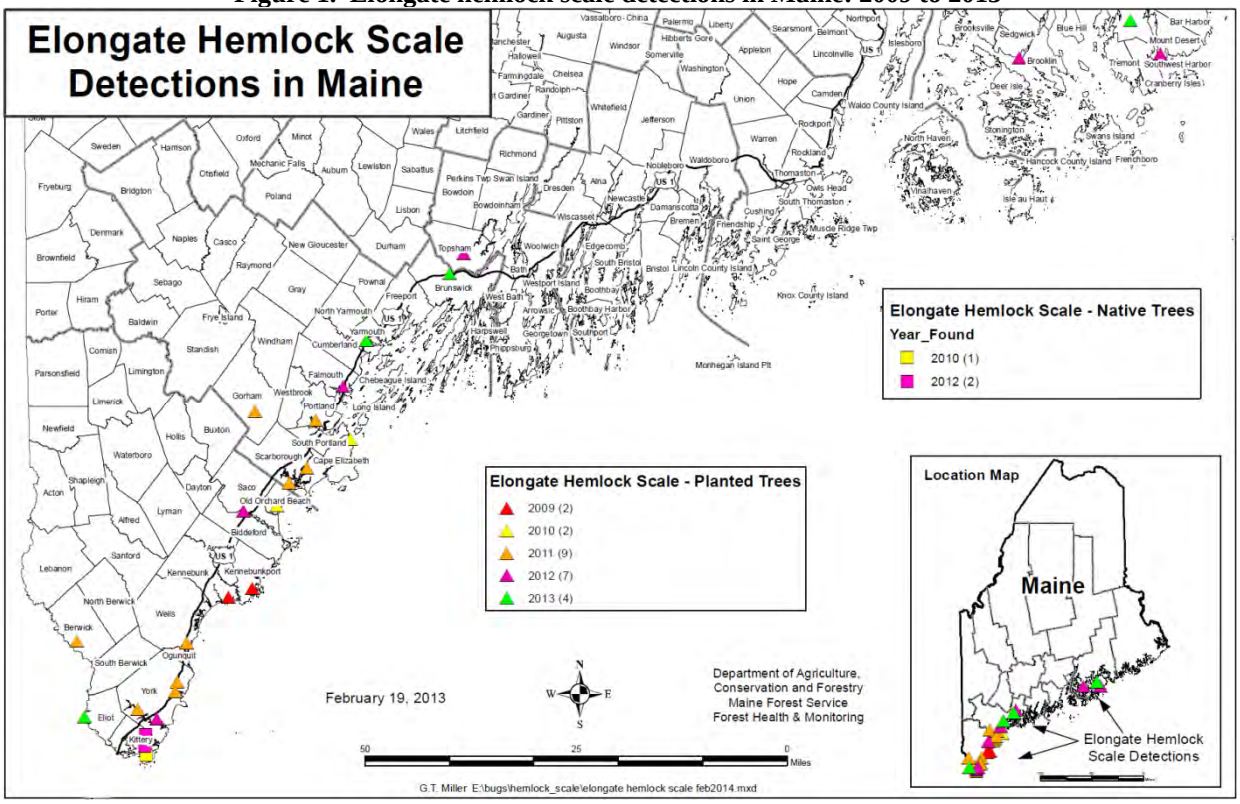
Elongate hemlock scale was first detected in Maine in 2009 when it was found in Kennebunk and Kennebunkport (York County) on planted hemlocks. Since then we have seen a steady increase in reports and detections of the pest, especially on planted trees (Table 1, Figure 1). Elongate hemlock scale was found on planted trees in two new towns in 2013. It is now known to be established in the forest in Kittery (York County) and has been found on planted trees in Cumberland County (Brunswick (2013), Cape Elizabeth, Falmouth, Gorham, Portland, Scarborough, Yarmouth), Hancock County (Mount Desert, Sedgwick), Sagadahoc County (Topsham), and York County (Berwick, Elliot (2013), Kennebunk, Kennebunkport, Kittery, Old Orchard Beach, Saco, Wells, York).

Table 1. Elongate hemlock scale detections through December 2013.

Type[1]	County	Town	Date Reported	Host	Detector	Applicator	Month Treated
F	*York*	*Kittery*	*11/2/2010*	*hemlock*	*MFS*	*n/a*	
F	*York*	*Kittery*	*2/7/2012*	*hemlock*	*MFS*	*n/a*	
F	*York*	*Kittery*	*11/21/2012*	*hemlock*	*MFS*	*n/a*	
L	Cumberland	Brunswick	9/19/2013	fir	Arborist	Pending	
L	Cumberland	Cape Elizabeth	8/25/2010	hemlock	Arborist	MFS Contractor	6/2011
L	Cumberland	Falmouth	7/18/2012	fir	Homeowner	MFS Contractor	8/2012, 9/2013, 11/2013
L	Cumberland	Gorham	5/31/2011	fir	Lawncare Pro.	MFS Contractor	6/2011
L	Cumberland	Portland	10/24/2011	hemlock	Arborist	MFS Contractor	6/2012
L	Cumberland	Scarborough	5/20/2011	fir	Lawncare Pro.	MFS Contractor	6/2011
L	Cumberland	Scarborough	11/4/2011	fir	Lawncare Pro.	MFS Contractor	6/2012
L	Cumberland	Yarmouth	9/8/2012	hemlock	Arborist	Other LPA[2]	2012
L	Cumberland	Yarmouth	4/3/2013	hemlock	Arborist	Other LPA[2]	2013
L	Hancock	Mount Desert	9/11/2012	hemlock /fir	MFS (HWA report by caretaker)	MFS Contractor	6/2013
L	Hancock	Mount Desert	6/20/2013	hemlock /fir	MFS (HWA report by caretaker)	MFS Contractor	6/2013
L	Hancock	Sedgwick	8/30/2012	hemlock	MFS (HWA report by homeowner)	tree removal	11/2012
L	Sagadahoc	Topsham	7/17/2012	fir	Arborist	MFS Contractor	8/2012
L	York	Berwick	12/7/2011	fir	Lawncare Pro.	MFS Contractor	6/2012
L	York	Eliot	7/10/2013	fir	Homeowner	Homeowner	Summer 2013
L	York	Kennebunk	9/21/2009	hemlock	Homeowner	MFS Contractor	6/2011
L	York	Kennebunkport	8/28/2009	hemlock	Homeowner	MFS Contractor	6/2011
L	York	Old Orchard Beach	11/22/2010	hemlock	Homeowner	MFS Contractor	6/2011
L	York	Saco	10/6/2012	fir	Homeowner	MFS Contractor	9/2013
L	York	Wells	8/31/2011	hemlock	MFS	MFS Contractor	6/2012
L	York	York	6/8/2011	hemlock	Lawncare Pro.	MFS Contractor	6/2011
L	York	York	9/23/2011	fir	Lawncare Pro.	MFS Contractor	6/2012
L	York	York	11/16/2011	fir	Lawncare Pro.	MFS Contractor	6/2012
L	York	York	4/12/2012	fir	Lawncare Pro.	MFS Contractor	6/2012

[1]L= planted tree in landscape, F= trees in forest stand
[2]Other LPA = other licensed pesticide applicator/landscape arborist

Figure 1. Elongate hemlock scale detections in Maine: 2009 to 2013



There is a possibility that *some* of the scale found on planted trees is from insects that have found their way to plantings from as yet undetected forest infestations. However, it seems likely that for the majority of those sites, the trees were already infested when planted. Because it is cryptic and is widespread in other states, it appears establishment of this pest in our forests will be accelerated by importation and out-planting of infested trees. Forest infestations of elongate hemlock scale have only been found in Kittery, with three locations detected.

In 2013 chemical treatments for containment of scale populations were employed at four sites (Mount Desert, Hancock County (2); Falmouth, Cumberland County; Saco, York County). Additional chemical treatments are planned for 2014 (Table 2).

Follow up visits to assess scale populations at 2011 and 2012 treatment sites indicated excellent control with a basal bark application of Safari 20SG at a concentration of 24 oz./gallon water (Table 2). A lower rate of dinotefuran would be effective in managing damage on ornamental trees, but may not be effective in containing populations. At one site where homeowner applied oil late in the growing season effective control for containment was not achieved. At that site, timing of application was not ideal, but level of control was consistent with what has been seen in Christmas tree trials in other states.

Table 2. Assessments of treatment success at elongate hemlock scale infested landscape plantings.

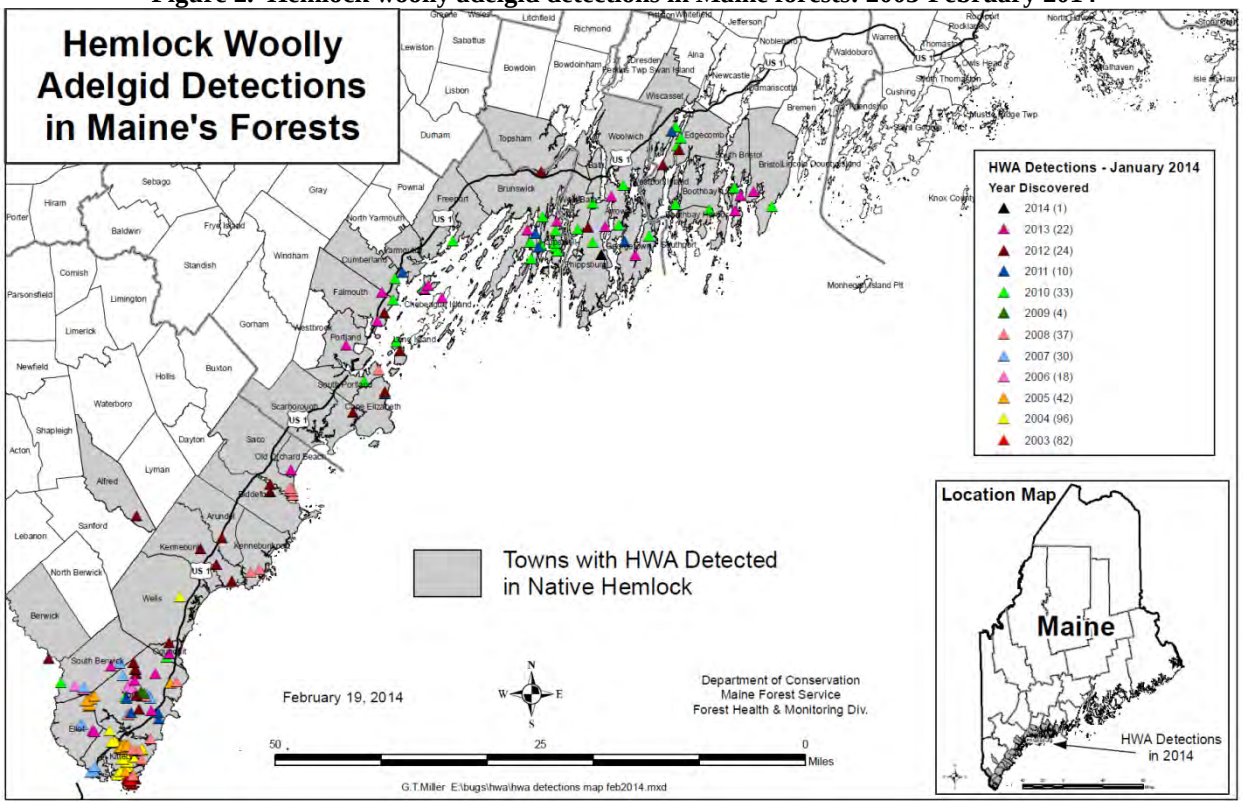
County	Town	Active Ingredient	Applicator	Month Treated	Month Checked	Result
Cumberland	Falmouth	Dinotefuran	MFS Contractor	8/2012	7/2013	No live scale detected
Cumberland	Gorham	Dinotefuran	MFS Contractor	6/2011	9/2013	No live scale detected
Cumberland	Scarborough	Dinotefuran	MFS Contractor	6/2011	6/2013	No live scale detected
Cumberland	Scarborough	Dinotefuran	MFS Contractor	6/2012	7/2013	No live scale detected
York	Eliot	Horticultural Oil	Homeowner	Summer 2013	12/2013	35% live scale detected

Hemlock Woolly Adelgid
Adelges tsugae
Host(s): Hemlock (*Tsuga* spp.)

Forest infestations of hemlock woolly adelgid (HWA) were detected in Old Orchard Beach (York County) in 2013. This brings the number of towns in Maine known to have forest infestations of HWA to 38. In addition, the first mainland established population in Portland was found in Baxter Woods in November 2013 by science students from a nearby high school.

Most known infestations of HWA are close to the coast or other significant water (Figure 2). To date, no established forest infestations of HWA have been found east of Lincoln County. Hemlock decline, due at least in part to HWA damage, is apparent in several coastal communities, although not yet detectable by aerial survey at most sites.

Figure 2. Hemlock woolly adelgid detections in Maine forests: 2003-February 2014



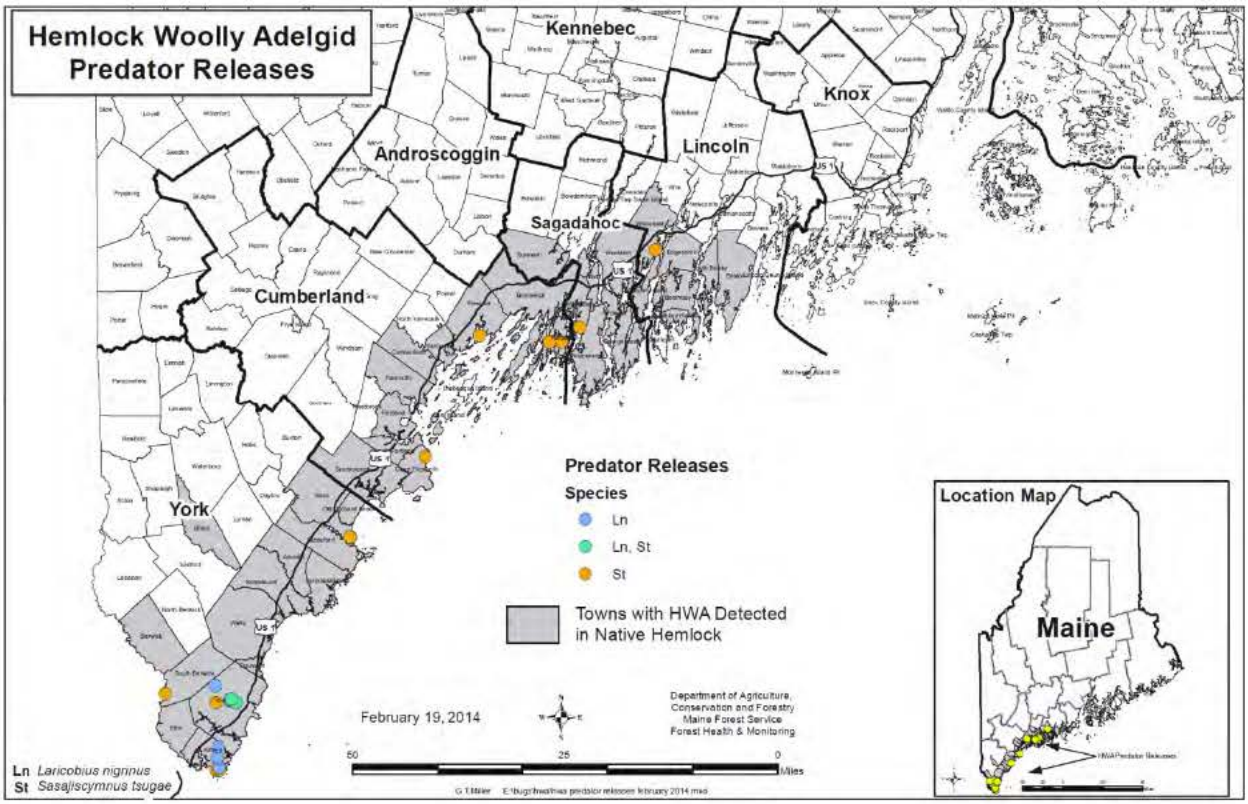
Containment measures in the form of chemical controls were performed in Bar Harbor, Blue Hill, Ellsworth, and Mount Desert (Hancock County) on planted and adjacent native trees at infestation sites outside the known forest HWA distribution. These sites were deemed likely to lead to significant artificial spread of the insect in the absence of control measures.

Biological control establishment efforts continue in Maine (Table 3, Figure 3). In 2013, through a cooperative agreement with USDA-APHIS, 10,000 *Sasajiscymnus tsugae* beetles were received from the North Carolina Department of Agriculture rearing lab. These beetles were split between two sites, one in Cape Elizabeth (Cumberland County) and the other in Wiscasset (Lincoln County) for inoculative releases. In addition, private, state and federal funds allowed for purchase of 5750 *S. tsugae* from Tree-Savers LLC for augmentative releases at three state parks: Ferry Beach (Saco, York County), Vaughan Woods (South Berwick, York County) and Wolfe Neck Woods (Freeport, Cumberland County).

Table 3. Hemlock woolly adelgid biological control releases 2004-2013.

County/Town	*Laricobius nigrinus* Released	*Sasajiscymnus tsugae* Released
Cumberland		**23,000**
Cape Elizabeth		5,000
Freeport		10,500
Harpswell		7,500
Lincoln		**5000**
Wiscasset		5,000
Sagadahoc		**4,000**
West Bath		4,000
York	**5,272**	**43,568**
Kittery	900	17,734
Saco	500	4,500
South Berwick		10,037
York	3,872	11,297
Grand Total	**5,272**	**75,568**

Figure 4. Hemlock woolly adelgid biological control release sites in Maine: 2004-2013.



Spring 2013 sampling at a subset of USDA APHIS, PPQ supported *S. tsugae* release sites yielded no predator captures. Fall sampling at all release sites yielded no recoveries of HWA predators.

Significant changes were made to the state hemlock woolly adelgid quarantine rules in 2013. The quarantine area was expanded to include infested areas detected since the 2007 revision as well as buffer towns not known to be infested in Maine. The list of regulated articles was revised to exclude roundwood and lumber with the result that the only regulated forestry products are those with top (branch) material. Live plants from infested areas are still regulated. See "Forestry Related Quarantines in Maine – 2013" for more information.

Pine Shoot Beetle
Tomicus piniperda
Host(s): Pines (*Pinus* spp.)

There is a State and Federal quarantine on pine shoot beetle and its host trees (pines) in all Maine counties except Aroostook and Washington (See "Forestry Related Quarantines in Maine – 2013" for more information). The Maine Forest Service and USDA-APHIS-PPQ trap to monitor for the spread of pine shoot beetle in unregulated counties. No pine shoot beetles were trapped in either Aroostook or Washington counties in 2013.

Table 4. 2013 Maine Forest Service pine shoot beetle trap sites.

Town	County	Site Type
Ashland – Re-energy	Aroostook	Biomass Plant
Ashland - Fraser	Aroostook	Lumber Mill
Crystal	Aroostook	Red Pine Plantation
Dyer Brook	Aroostook	Scots Pine Plantation
Easton	Aroostook	Red Pine Plantation
Fort Fairfield	Aroostook	Biomass Plant
Monticello	Aroostook	Red Pine Plantation
Moro Plantation	Aroostook	Red Pine Plantation
New Limerick	Aroostook	Mill
Washburn	Aroostook	Red Pine Plantation

Spruce Beetle
Dendroctonus rufipennis
Host(s): White Spruce (*Picea glauca*), Red Spruce (*P. rubens*)

Decadent spruce trees along the coast continue to succumb to spruce beetle. Infestations are widely scattered and a reflection of tree age and poor sites. This is a continuation of an ongoing problem.

Spruce Budworm
Choristoneura fumiferana
Host(s): Balsam Fir (*Abies balsamea)*, White Spruce (*Picea glauca*), Red Spruce (*P. rubens*), Black Spruce (*P. marian*), and Hemlock (*Tsuga canadensis*)

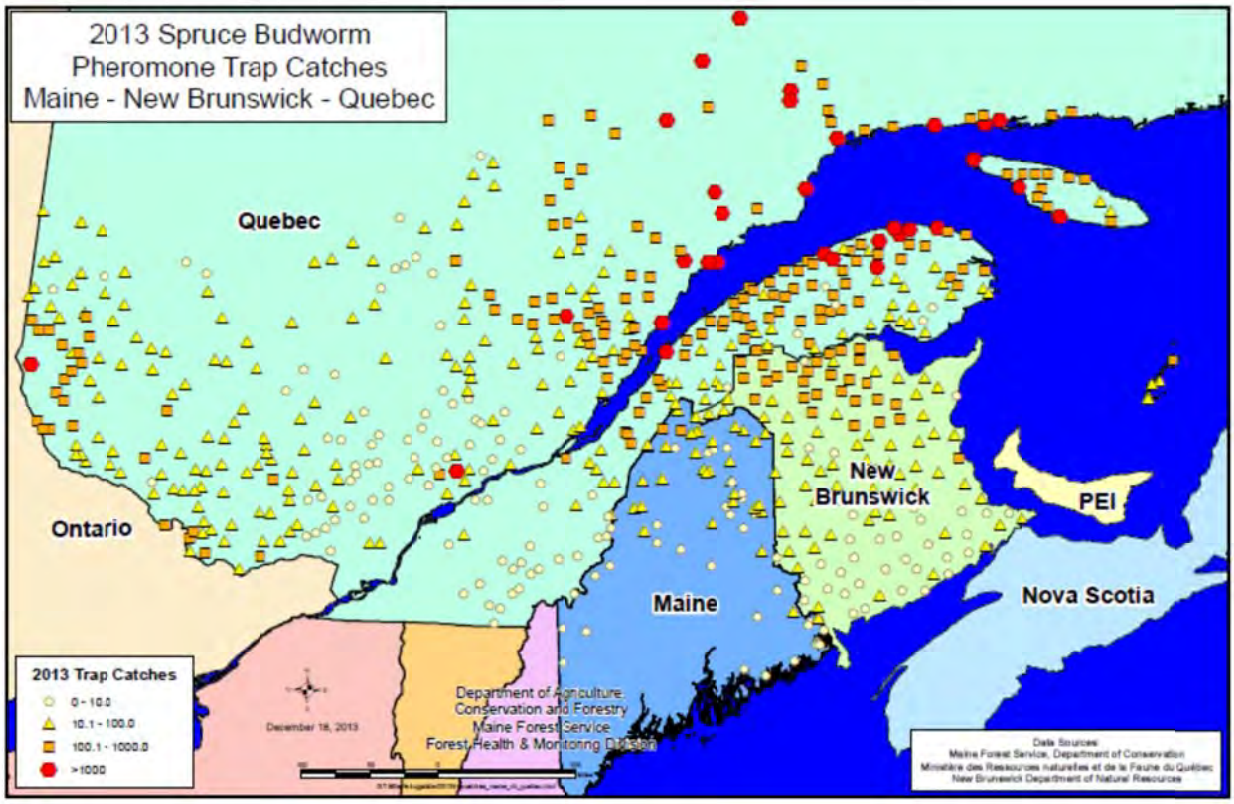
Spruce budworm catches in pheromone traps are up significantly in 2013. Many locations are showing a four-fold increase in trap catches. Last year the average trap catch across all sites was 5.5; this year the average is 20.7 moths/ trap. The highest counts are in T17 R12 WELS and T17 R14 WELS (Aroostook County), both sites with just over 100 moths/trap (Figure 5). These numbers are high enough to trigger survey for larval feeding in 2014. Seven more sites have catches of over 50 moths/trap and an additional 10 sites came in at over 20 moths/ trap out of a total of 60 sites. This compares with three years ago when the highest trap catch was 13 moths/ trap. Thank you to cooperators who are running spruce budworm traps on their lands.

Light trap catches are not as sensitive to spruce budworm as are pheromone traps and there have been have been very few if any budworm caught in them for years. This year, of the nine trap catches processed to date, two traps

had budworm in them. These were: Allagash (Aroostook County) with 11 moths, Shirley (Piscataquis county) 2 moths and T15 R15 WELS (Ste. Pamphile, Aroostook County)) with 56 moths.
The Ste. Pamphile catch probably would have been even higher but it is run on an intermittent basis dependent on operator availability. Interestingly there is a pheromone trap site near the light trap and only 35.3 moths/trap (total = 106 in 3 traps) were caught. There are still no reports of larval feeding.

New Brunswick budworm pheromone trap catches are rising (Figure 5) and Quebec is experiencing a large budworm outbreak north of the Saint Lawrence Seaway with defoliation now south of the seaway as well. Spruce budworm outbreaks can start from moth flights coming in from defoliated areas - such as those currently in Quebec – or outbreaks from a buildup of the endemic budworm population or from a combination of the two.

Figure 5. Region-wide 2013 spruce budworm pheromone trap catches

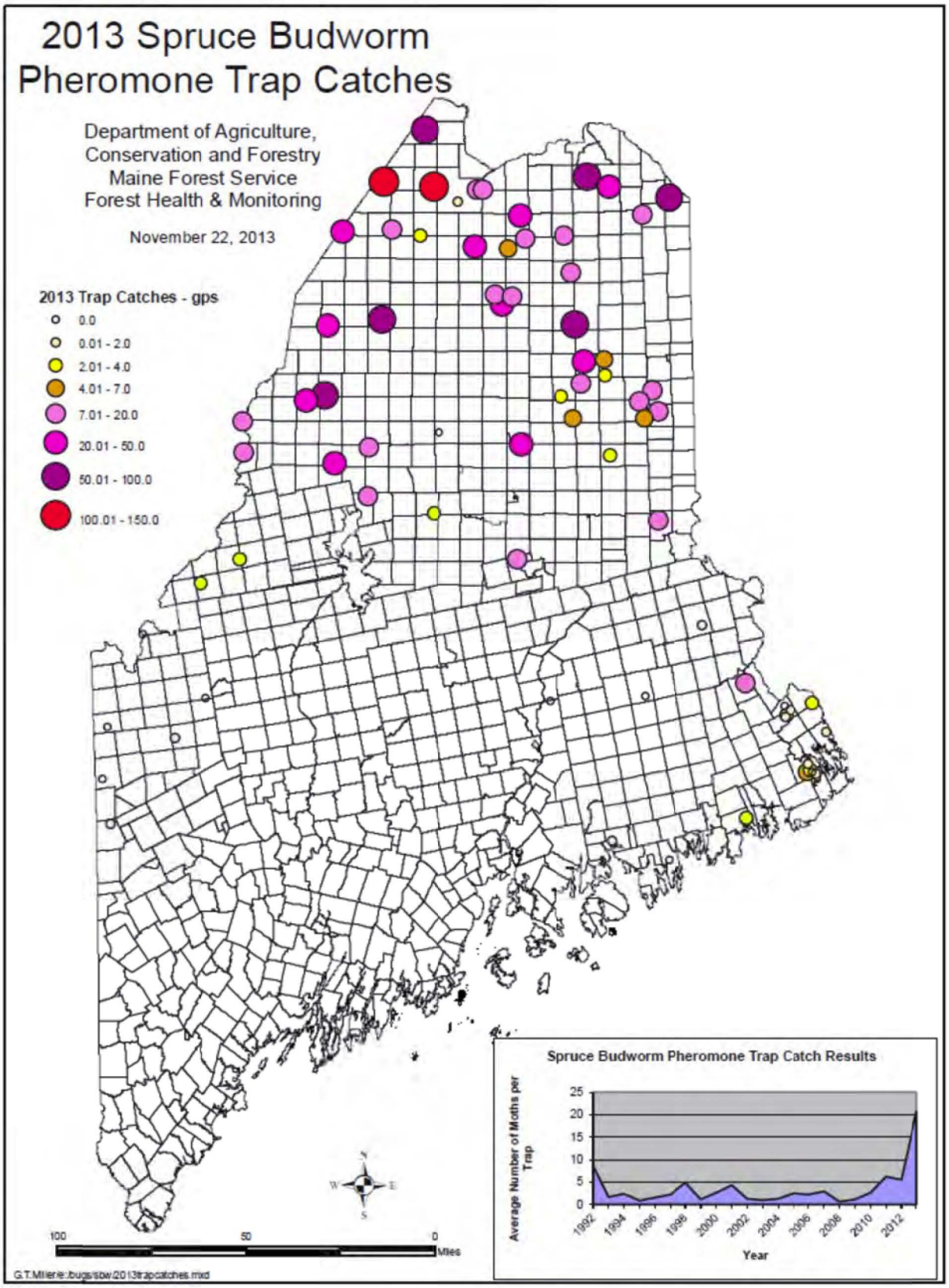


The last Maine spruce budworm outbreak started forty years ago in the early 1970's. The forest has once again matured and could support a spruce budworm outbreak. This insect is extreme in its population size going from rare when the spruce and fir forest is young to huge numbers during an outbreak that kills trees once the forest matures. The upward trend in moth catches and the outbreak in Quebec portend a population explosion in the near future.

Spruce budworm overwinter as tiny larvae on host trees. The larvae emerge before budbreak and mine buds, last year's needles and male pollen cones. They then move to the new foliage feeding on it and spinning silk between the needles and shoots. Once the new foliage has been consumed the larvae move to the old foliage feeding there until they are full grown. Spruce budworm pupate on the trees and the adults emerge in late June through July.

There is increased need for vigilance, because budworm defoliation could very well show up in Maine in the next year. Look for needle mining in early spring, defoliation in June, and moth flights in July. Please report any potential spruce budworm damage. The MFS will increase monitoring efforts for this serious pest, work with landowners to prepare for an outbreak in the next 1-3 years and stay in communication with our Canadian counterparts who are already dealing with a spruce budworm outbreak in Quebec that is currently spreading into New Brunswick.

Figure 6. 2013 Spruce budworm pheromone trap locations an l catches in Maine.



Insects: Hardwood Pests

Aspen Leafroller Complex
Host(s): Quaking Aspen (*Populus tremuloides*)

Quaking aspen has had leaf roller damage on it for a number of years now particularly in the central part of the state. Although large aspen tortrix is responsible for damage to aspen in some locations, over a broader area it is a complex of species that is causing low levels of damage in Kennebec, Penobscot and Aroostook Counties.

Bare-patched Oak Leafroller
Pseudexentera spoliana (cressoniana)
Host(s): Red Oak (*Quercus rubra*)

This is a tiny moth that flies early in the spring and lays its eggs on the buds of red oaks. The larvae hatch, initially feed on the buds, then roll the leaves from the tip down and feed inside the leafroll. They finish up feeding in June and drop to the ground to pupate and stay there until the following spring.

It has only rarely been reported as a problem. Defoliation from this moth was markedly less in 2013. Only light damage could be detected this year in most of the areas affected by the leafroller in 2012. The Cherryfield area (Washington County) did have 458 acres of moderate defoliation detectable from the air.

Birch Leafminer
Messa nana* or *Fenusa pusilla
Host(s): Birch (*Betula* spp.)

Birch trees in northern parts of Aroostook, Franklin, Penobscot, Piscataquis and Somerset Counties as well as Hancock and Washington Counties are showing light to occasionally moderate damage from birch leafminers as well as anthracnose. Birch is mostly scattered in small stands other than at higher elevations.

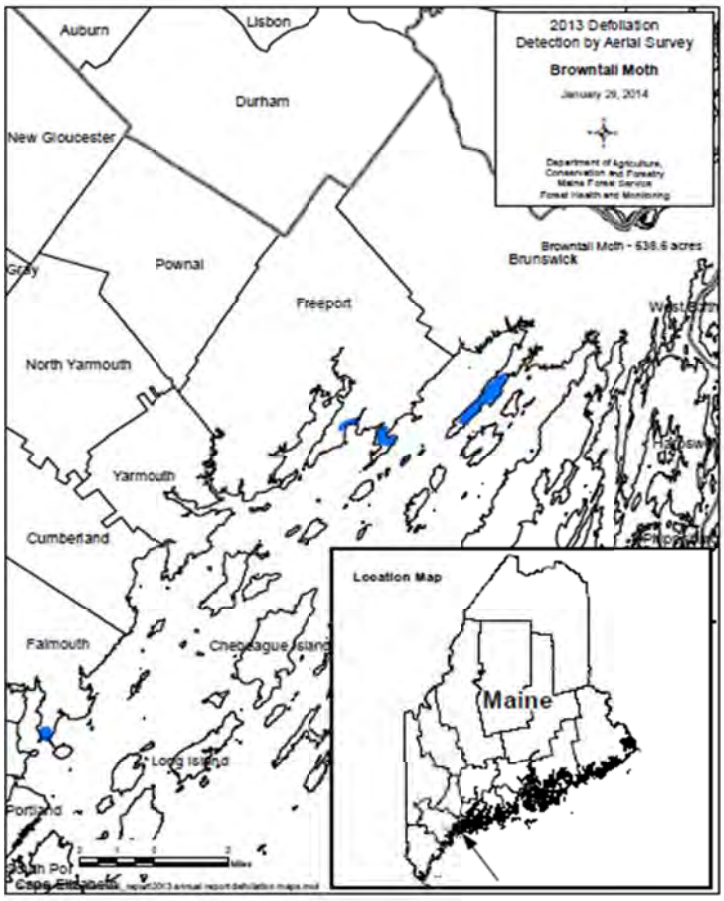
Browntail Moth
Euproctis chrysorrhoea
Host(s): Red Oak (*Quercus rubra*)

Defoliation from this pest was mapped on 677 acres in Freeport, Brunswick and Falmouth (Cumberland County), down from 1,141 acres mapped in 2012.

Winter web surveys conducted in January and February of 2014 indicate browntail moth populations continuing to be moderate to high in parts of Bath, Topsham, Bowdoinham (Sagadahoc County), and Brunswick (Cumberland County). The winter weather does not affect browntail moth populations to any extent so expect caterpillars and possible defoliation in locations with webs this spring.

Field trials for the naturally-occurring BTM nucleopolyhedrovirus, EcNPV performed in May, 2011 in Bowdoinham (Sagadahoc County), and in September, 2011 in Freeport were checked for long term control of the browntail. In 2012 there were no larva in Bowdoinham and larvae from Freeport showed signs of the virus but were overtaken by the fungal disease *Entomophaga aulicae*. There were no larvae in either location in 2013. We will continue monitoring these sites.

Figure 7. Browntail moth defoliation in 2013.



Bruce Spanworm
Operophtera bruceata
Host(s): Maples (*Acer* spp.), Aspen (*Populus* spp.), American Beech (*Fagus grandifolia*), Birch (*Betula* spp.), and other hardwoods

Impact from Bruce spanworm declined in 2013. In 2012 624 acres of moderate defoliation were mapped through aerial survey. Only light damage from this early season defoliator was found in T2 R8 NWP (Penobscot County) in 2013. Feeding was on sugar and red maples, birch, beech, and aspen

For a second year larval collections were made in late May for a study at U Mass. Thank you to the Penobscot Nation for cooperating with the collecting.

Bruce spanworm overwinter as eggs on host trees. The tiny green inchworms hatch at bud break and feed on the expanding new foliage causing the leaves to look like Swiss cheese. When the larvae finish feeding they drop to the ground and pupate in the soil. The adults emerge in November. Adult females have no wings and crawl up on host trees where the males fly to them to mate. Males are very fragile looking moths that are beige with very light tan strips. This native insect is a very close relative of the invasive winter moth that is a serious problem in Massachusetts (see winter moth below for more information).

Any reports of large numbers of moths in the fall (either last year or in the future) or larvae feeding or damage in the spring would be greatly appreciated.

Carpenterworm
Prionoxystus robiniae
Host(s): Ash (*Fraxinus* spp.), Oak (*Quercus* spp.), Birch (*Betula* spp.), and other hardwoods

We have been getting more calls about what is apparently carpenterworm damage in recent years. This is an insect with a broad host range and distribution across the continent, and is known from Maine. However there are no specimens in the MFS insect collection (an admittedly crude measure of abundance). During the 2012-13 winter we received three calls regarding damage to ash from what appeared to be carpenterworm; three more calls than is usual and one of these was fairly substantial damage to sawlogs. In response, this summer we put out pheromone traps in four locations to verify the causal agent and recovered multiple carpenterworm male moths at the Fryeburg (Oxford County) site. The other two sites trapped were in Pleasant Ridge (Somerset County) and Sidney (Kennebec County). The traps were set out in May 15th. The Fryeburg trap was retrieved on August 13th and the other two traps were taken down on July 24th.

Although we have confirmed the damage agent, the question remains: is carpenterworm more prevalent in Maine now than in the past or are people more aware of woodborer damage and contacting the MFS about it due to the outreach effort about invasive wooodborers? The literature says the moths fly April – early July and we are reaching the northern end of their range. So catching moths in Fryeburg and not in Pleasant Ridge or Sidney is probably not because the trap was taken down later. It is more likely that the carpeterworms had infested the trees at the latter two sites in previous years and had moved on to another location.

Fall Cankerworm
Alsophila pometaria
Host(s): Red Oak (*Quercus rubra*)

This hardwood defoliator has periodically appeared in Maine in damaging numbers. After checking the area on the ground, 233 acres of moderate to severe defoliation were mapped aerially. The forest type was primarily red oak in Pittston (Kennebec County) and Shapleigh (York County). This covers the same geometric area as, but a different geographic area than last year's defoliation in Clinton (Kennebec County) and Burnham (Waldo County).

Fall Webworm
Hyphantria cunea
Host(s): Ashes (*Fraxinus* spp.), Apples (*Malus* spp.), Cherries (*Prunus* spp.), Oaks (*Quercus* spp.), Birches (*Betula* spp.), and other hardwoods

Fall webworms create large webs in hardwood trees, especially ash and apple, starting in mid-summer. The larvae feed inside the webs so the webs expand as the larvae grow and need more leaves to eat. Fall webworm numbers were low across the state with the exception of moderate numbers in York County.

Forest Tent Caterpillar
Malacosoma disstria
Host(s): Aspens (*Populus* spp.) and other hardwoods

No defoliation from forest tent caterpillar; populations remained low in 2013. Forest tent caterpillars feed on hardwood foliage in the spring especially on maple. Although they are called tent caterpillars they do not form webs like their relatives.

Gypsy Moth
Lymantria dispar
Host(s): Apple (*Malus* spp.), Aspen (*Populus* spp.), Basswood (*Tilia americana*), Birch (*Betula* spp.), Larch (*Larix laricina*), Oak (*Quercus* spp.), and others (>300 trees and shrubs)

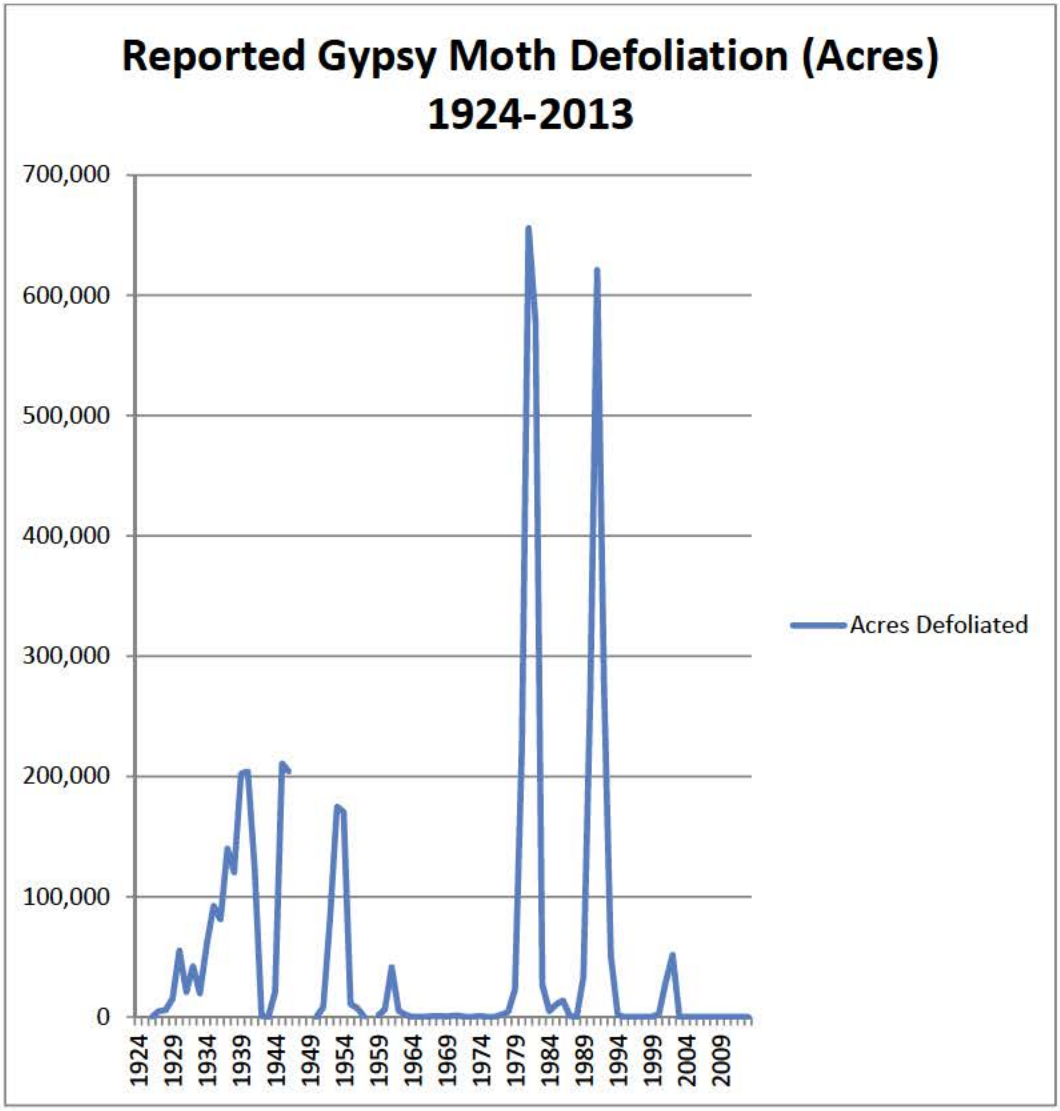
Fifty three (53) acres of defoliation resulting from gypsy moth larval feeding was recorded in 2013, this is the first year gypsy moth defoliation has been detected during aerial survey since 2002 (Table 5, Figure 8). The two defoliated areas were on an island in Grand Lake in Orient (Aroostook County) and on the shoreline of a small pond in Princeton (Washington County). Numbers were low in the 2013 fall egg mass survey plots within the generally infested area.

Table 5. Total acres defoliated by gypsy moth in Maine by year from 1924 to 2013

Year	Acres Defoliated	Year	Acres Defoliated	Year	Acres Defoliated	Year	Acres Defoliated
1924	0.71	1947		1970	1,080	1993	50,694
1925		1948	60	1971	820	1994	1,706
1926	1	1949		1972	40	1995	0
1927	4,985	1950	2	1973	490	1996	100
1928	5,575	1951	8,195	1974	860	1997	<100
1929	15,187	1952	82,715	1975	110	1998	0
1930	55,174	1953	174,999	1976	100	1999	0
1931	20,938	1954	170,485	1977	2,010	2000	2,543
1932	42,298	1955	10,810	1978	4,120	2001	29,365
1933	19,718	1956	7,285	1979	23,350	2002	51,500
1934	60,403	1957	120	1980	223,810	2003	0
1935	92,630	1958		1981	655,841	2004	0
1936	80,944	1959	1,000	1982	578,220	2005	0
1937	140,026	1960	6,350	1983	26,353	2006	0
1938	120,432	1961	41,245	1984	4,881	2007	0
1939	202,193	1962	5,198	1985	10,496	2008	0
1940	204,041	1963	1,970	1986	13,697	2009	0
1941	122,386	1964	<100	1987	849	2010	0
1942	850	1965	<100	1988	100	2011	0
1943	10	1966	30	1989	34,280	2012	0
1944	21,221	1967	825	1990	27,0432	2013	53
1945	210,881	1968	777	1991	62,0933		
1946	203,813	1969	460	1992	278,485		

Sources: 2001 Annual Summary Report (MFS); 2002-2012 Federal Reports (USFS)

Figure 8. Acres of gypsy moth defoliation in Maine by year: 1924-2013



The MFS deployed ninety eight (98) pheromone baited milk carton traps in towns adjacent to the gypsy moth quarantine zone (transition zone). These traps captured approximately 8,000 male moths. More than half of the traps had greater than 50 moths. This was expected as targeted areas were adjacent to locations with high counts the previous year.

Egg mass scouting conducted since October 2012 uncovered positives in seventeen new towns (Table 6). The quarantine area will need to be changed to accommodate the expansion of this invasive insect's distribution, which will require revision of the department rule. The revision process includes opportunity for public comment. Some towns without detected egg masses will be proposed for inclusion in the new, expanded quarantine area (Table 7, Figure 9).

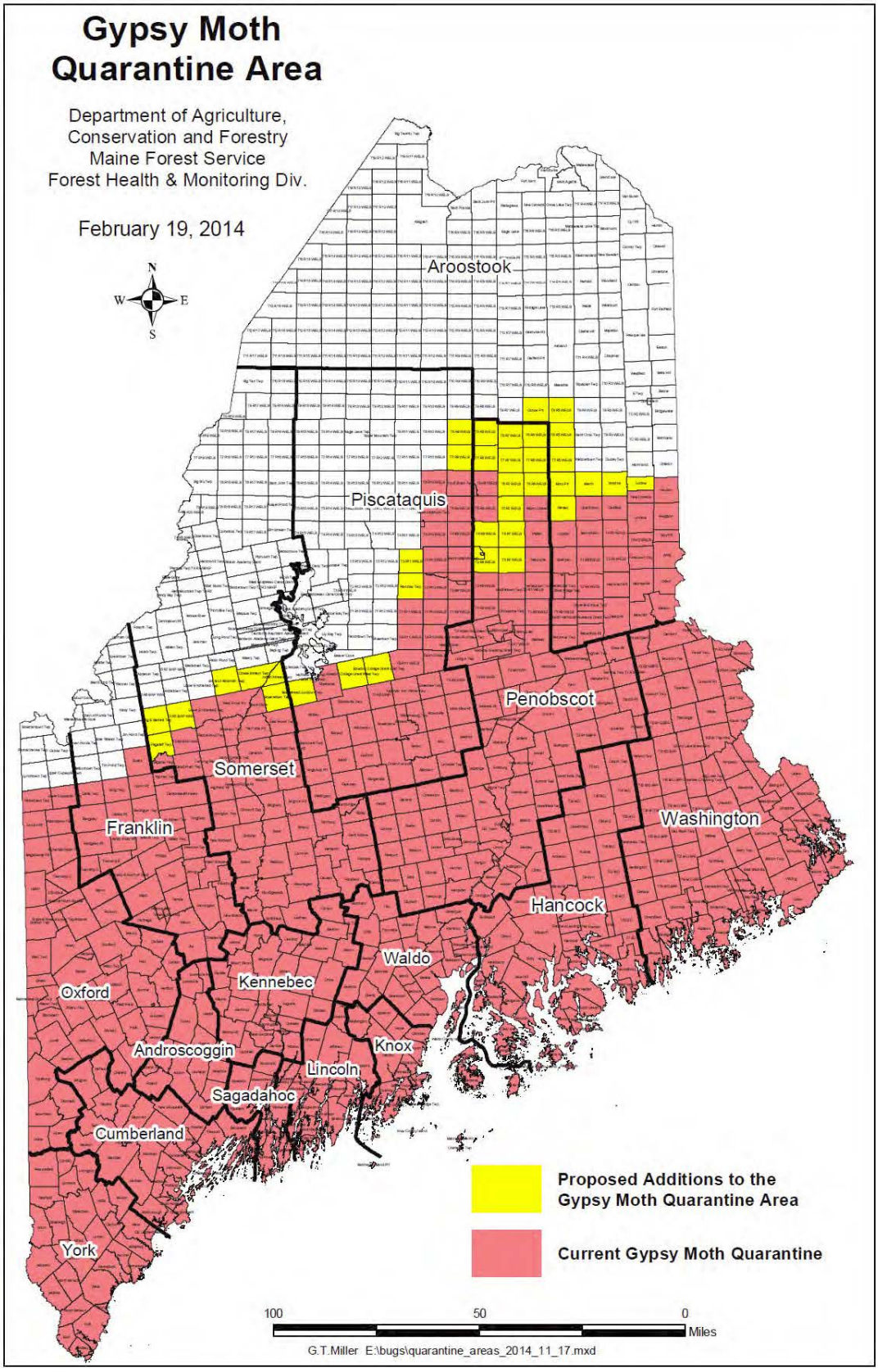
Table 6. Towns outside the current quarantine area with gypsy moth egg mass detections in 2012-2013.

Year	County	Town	Substrate/Area Description
2012	Penobscot	T6 R7 WELS	Trap vicinity
2012	Penobscot	T7 R8 WELS	Roadside
2012	Piscataquis	T3 R11 WELS	Pullout
2012	Piscataquis	T7 R9 WELS	Trap vicinity
2012	Somerset	Flagstaff Twp.	White birch
2013	Aroostook	Moro Plt.	Red maple, Rte. 11
2013	Aroostook	T7 R5 WELS	Apple, Rte. 11
2013	Aroostook	T9 R5 WELS	Outhouse, rest area
2013	Penobscot	T6 R6 WELS	Black cherry
2013	Penobscot	T8 R6 WELS	Aspen, roadside
2013	Penobscot	T8 R8 WELS	Aspen by outhouse
2013	Piscataquis	Bowdoin College Grant East Twp.	Picnic table, primitive campsite
2013	Somerset	Chase Stream Twp.	Aspen, roadside
2013	Somerset	Indian Stream Twp.	White birch, near boat launch
2013	Somerset	Johnson Mountain Twp.	American beech, beside Rte 201
2013	Somerset	Squaretown Twp.	White birch, primitive campsite
2013	Somerset	T3 R5 BKP WKR	White birch, roadside

Table 7. List of towns without a second gypsy moth life stage detected proposed for inclusion in expanded quarantine area.

County	Township	Comments
Aroostook	Hersey	Trap catch trend ↑ (76, 125, 206, 260)
Aroostook	Ludlow	Trap catch trend ↑ (4, 15, 36, 120)
Aroostook	Merrill	Trap catch trend ↑ (18, 60, 124, 228)
Aroostook	Oxbow Plt	High trap catch 2013 (1st year survey): 150
Aroostook	Smyrna	Trap catch trend ↑ (15, 30, 103, 122)
Aroostook	T8 R5 WELS	Bordered on 3 sides by towns proposed for inclusion
Franklin	Carrabassett Valley	Omitted in previous revisions due to use of old names
Oxford	Otisfield	Omitted in previous revisions
Oxford	West Paris	Omitted in previous revisions
Penobscot	T3 R8 WELS	Not trapped due to access difficulties , bordered on all sides by towns proposed for inclusion
Penobscot	T4 R7 WELS	Trap catch trend ↑ (137, 258, 320)
Penobscot	T4 R8 WELS	Not trapped due to access difficulties , bordered on all sides by towns proposed for inclusion
Penobscot	T5 R7 WELS	Trap catch trend ↑ (134, 278, 700)
Penobscot	T7 R6 WELS	Bordered on 3 sides by towns proposed for inclusion
Penobscot	T7 R7 WELS	Trap catch trend ↑ (138, 294, 290, 300)
Penobscot	T8 R7 WELS	Not trapped due to access difficulties , bordered on 3 sides by towns proposed for inclusion
Piscataquis	Bowdoin College Grant West Twp	Bordered on 3 sides by towns proposed for inclusion
Piscataquis	Moosehead Junction Twp	Trap catch trend ↑, but low (5, 19, 26, 52) and bordered on 3 sides by towns proposed for inclusion
Piscataquis	Rainbow Twp	Trap catch trend ↑, but low (5, 19, 26, 52); bordered on 3 sides by towns proposed for inclusion and difficult to access
Piscataquis	T8 R9 WELS	High trap catch 2013 (1st year survey): 130
Somerset	King and Bartlett Twp	Trap catch trend ↑ (8, 5, no trap, 128) and difficult access due to gates

Figure 9. Map of area currently under quarantine for gypsy moth and proposed expansion.



Hickory Tussock Caterpillar
Lophocampa caryae
Host(s): Hardwoods

Numbers of hickory tussock caterpillars were reduced in 2013. No defoliation reported. Rashes caused by contact with these caterpillars will always plague the unwary across the state of Maine in late summer. After feeding on the foliage of hardwood trees the caterpillars tend to wander looking for overwintering sites. They are attractive and active and this is when people usually encounter them. Numbers should continue to drop.

Phylloxera
Host: White Oak (*Quercus alba*)

White oak, *Quercus alba*, is a native species found in southern Maine and is approaching its historical northern limit in Waldoboro, Maine. In the past it has been a significant component of the south coastal forest but numbers declined after repeated defoliation by gypsy moth in the mid-twentieth century. None the less it is still easy to find white oak in Lincoln County.

A landowner planted 500 white oak seedlings in 1997 on his property on Reef Road, Waldoboro. He special ordered the stock from a Maine nursery and they obtained the trees from a nursery in Connecticut (personal communication with landowner). In September of 2008 the landowner contacted the Maine Forest Service concerned that his saplings were dying.

The trunks of the trees were coated with tiny insects that were present only on the white oaks and on the majority of that species in the planting. Checks of native white oaks in Woolwich, Wiscasset and Whitefield produced no sign of the insects on trees in those towns. They were only in the stand on Reef Road; the survey was by no means exhaustive and should be repeated.

Preliminary identification of the insects indicated that they were Hemipterans in the family Phylloxeridae. These are small sucking insects related to aphids and adelgids with few species in North America and most of them causing galls. Insect samples were taken on September 8, 2008 and sent to the Systemic Entomology Laboratory (SEL). They were confirmed as *Phylloxera* but the species was unknown and they wanted more samples. No *Phylloxera* were found in 2009-2011 but in 2012 they appeared again and a second samples was sent to the SEL lab. We are still waiting to hear back from them. Requests for a response have gone unanswered.

The landowner sprayed the trees with Bonide horticultural/dormant oil (3 tbls/gallon) September 23-26, 2008. He used 8 gallons to spray 500 trees. The trees were treated again in 2012 when the *Phylloxera* reappeared. The *Phylloxera* were again present in August of 2013. Some of the trees were top killed. Although this could be from the *Phylloxera* the landowner has been pruning the trees very heavily and that may be a contributing factor in their failure to thrive. The trees were treated again with Bonide in 2013. In November some trees still had *Phylloxera* on them, the owner did not keep records of rain events so the Bonide may have been washed off before it smothered the *Phylloxera*.

A University of Maine student, Nick Sparks, was interested in following up on problem and he assisted in taking baseline data on 64 oak trees: GPS, DBH, height, live crown ratio, dieback and pruning.

This is a small problem at this point in time on a species that is not of major importance but we do not know what this insect is or where it came from. There is no information on any *Phylloxera* having similar biology and I have not found anyone working on this group of insects. This should be pursued in more detail.

Winter Moth
Operophtera brumata
Hosts(s): Oaks (*Quercus* spp.), Maples (*Acer* spp.), Apple (*Malus* spp.) Ashes (*Fraxinus* spp.), Birches (*Betula* spp.), and other trees and shrubs

Winter moth is firmly established along the southern coast of Maine from Kittery (York County) to Bar Harbor (Hancock County). The MFS deployed a handful of pheromone traps in 2012 to confirm the presence of the moth in areas where a few male moths had been picked up in an early survey in 2005-06. Then a news story in early December 2012 included a request for moths to be sent in to the Maine Forest Service Entomology Lab. This resulted in the public submitting over 460 moths in more than 140 samples from Kittery to Bar Harbor. This citizen response allowed us to tentatively predict the potential for winter moth defoliation in Maine in 2013.

Defoliation was moderate to heavy in scattered locations along the coast from Cape Elizabeth (Cumberland County) to Bristol (Lincoln County) and matched fairly well to the risk map developed from the submitted samples. Total area defoliated was 5,180 acres. Light defoliation was observed in many additional areas close to the coast in York, Cumberland, Sagadahoc, Lincoln and Knox Counties. Additionally, male moths were positively confirmed by dissection in Hancock County although no defoliation was found in 2013.

The parasitoid *Cyzenis albicans* was released in two locations in cooperation with Joe Elkinton, University of Massachusetts. One release site was in Harpswell and the second in Cape Elizabeth where there was even more defoliation than in Harpswell. Additional releases will be made in the future with Vinalhaven high on the list of release sites. Concerned citizens from that island community were proactive in reaching out to their congressional delegation about the winter moth problem, potential control and continuing the effort to bring this invasive insect into balance with the Maine environment.

The MFS set up a series of long-term winter moth plots in Harpswell, Brunswick and Topsham that the USDA-Forest Service will be monitoring to assess the impact of winter moth on the forest. The plots were set up in heavily defoliated, lightly defoliated and no defoliation areas so that the progression of the infestation can be followed.

The University of Maine has a graduate student working on winter moth. Kaitlyn O'Donnell is looking at a variety of issues involving winter moth. The objectives of her thesis project are:

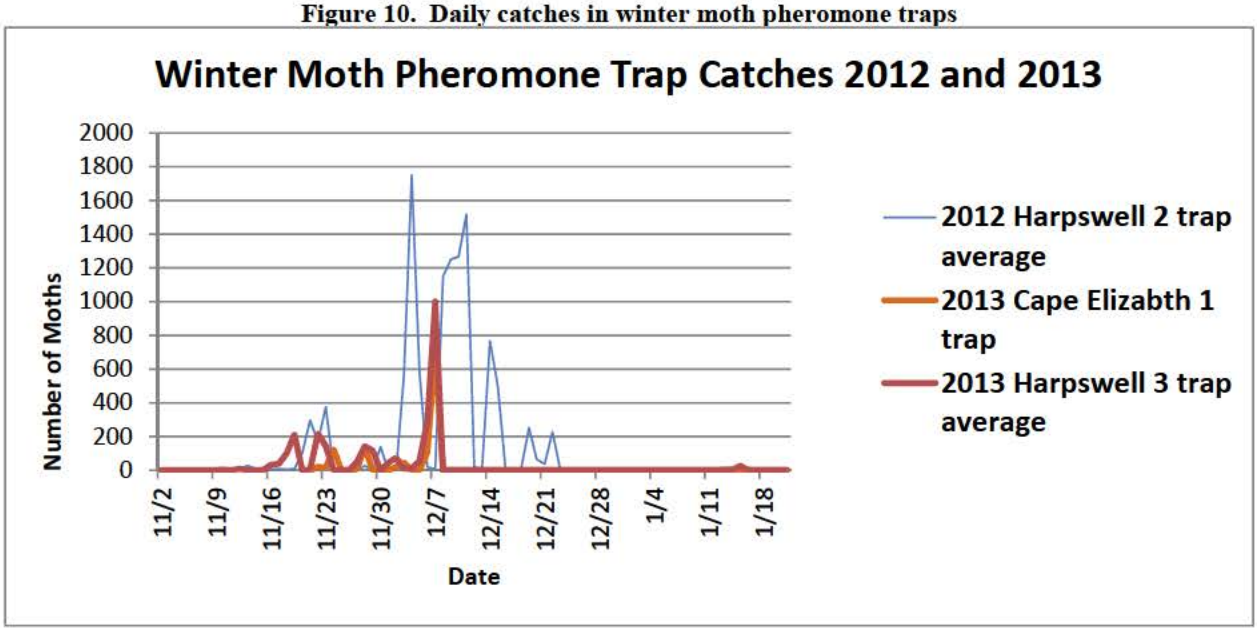
- Study the winter moth larval development and survival on seven different host plants: Oak, red maple, birch, pin cherry, apple, highbush blueberry and lowbush blueberry in the lab and the field
- Assess the risk winter moth poses to the lowbush blueberry crop in Maine
- Sample field collected winter moth larvae for disease and identify any viruses found
- Monitor the population distribution and density of winter moth in the town of Harpswell, Maine
- Describe the phenology of the winter moth population in southern Maine

The MFS surveyed for winter moth using pheromone traps this December to determine where winter moth populations are heaviest. Traps were deployed in 62 towns along the coast and along a transect inland from known infested areas. We also put out a request for people seeing lots of moths at lights in December to report them using a Doodle Poll on the web. Karen Coluzzi, ACF Plant Industry entomologist, put together the information from over 700 reports of where, when and how many moths people saw.

We also looked at where the moths pupate using emergence traps. This project is in conjunction with the Harpswell Coastal Academy (HCA). The students helped monitor the traps and collect the data. The MFS is also working with HCA to investigate weather and moth emergence correlations.

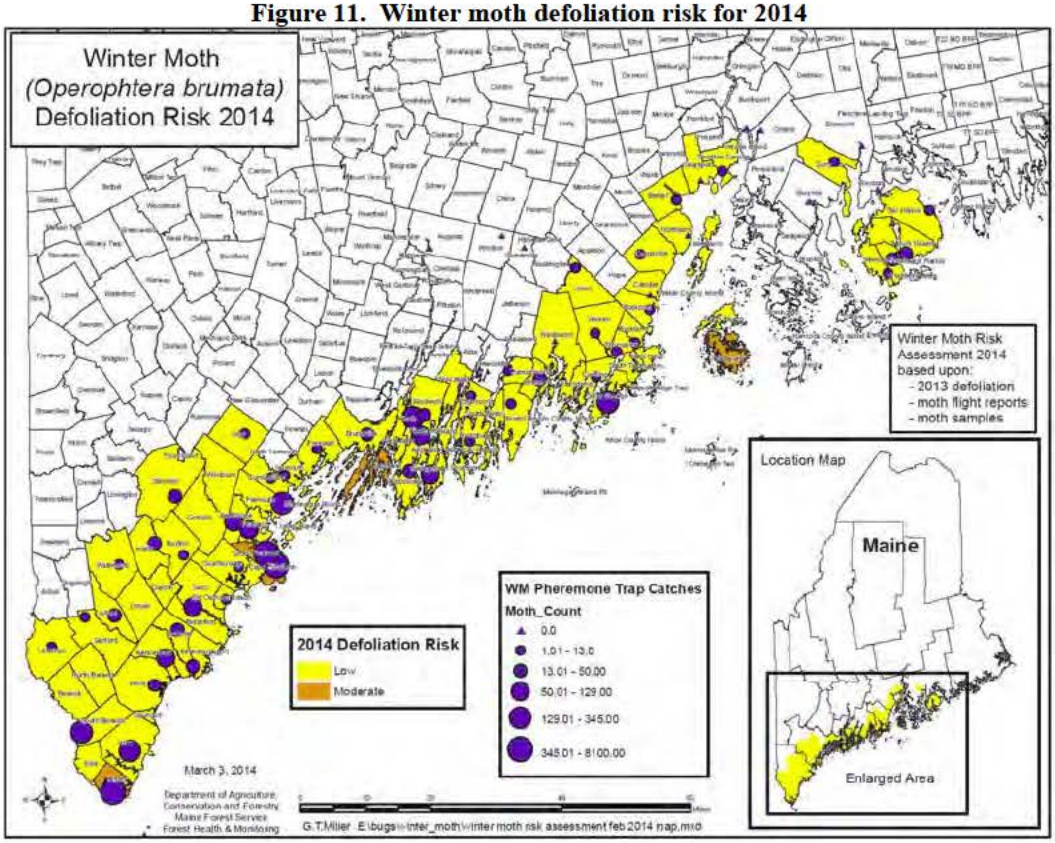
The winter moth adults started emerging in November and the moth flights took off on December 7th similar to what happened in 2012. Then a major snowstorm moved in followed by cold temperatures and then an ice storm. Continued monitoring and ground surveys showed that the winter moth flights were halted by the winter weather (Figure 10). Instead of nine nights of massive moth flights as in 2012 there was only one night.

Figure 10. Daily catches in winter moth pheromone traps



Based on pheromone trap catches, December ground surveys, and reports from citizens **the predicted risk of defoliation in 2014 is down dramatically from 2013 (Figure 11) with, at most, moderate defoliation.**

Figure 11. Winter moth defoliation risk for 2014



Insects: Invasive Forest Insects Not Yet Detected in Maine

There have been no confirmed reports of the following insects in Maine: Asian longhorned beetle (ALB), brown spruce longhorned beetle (BSLB) and emerald ash borer (EAB). All three are woodboring beetles and can move in firewood and other untreated solid wood material. Because of this mode of transport and difficulty in detecting nascent populations of these insects it is important to realize that we cannot say with certainty that these insects are not in Maine, only that they have not yet been found in Maine. Lifestyles make brown spruce longhorned beetle and emerald ash borer more easily moved than Asian longhorned beetle, but firewood movement has been tied to spread of all three of these insects. **All are serious threats to Maine's forest and our forest-dependent economy.**

If you suspect you have found these insects or their damage please contact us as soon as possible: forestinfo@maine.gov; (207) 287-2431 or 1-800-367-0223 (in Maine).

If you have found damage you suspect was made by any of these insects, please note the location and take pictures if possible. Pictures can be sent to forestinfo@maine.gov. Do not move the damaged material unless you can do so safely—two layers of contractor-grade garbage bag tightly sealed will contain these pests short-term.

If you suspect you have found any of these insects please collect a sample in a secure container (pill bottles, or other sealed plastic or glass containers work well). Store the sample in a cool location such as a refrigerator or freezer until you can contact our office for identification of the specimen.

If you use social media you can follow news about these insects on Twitter (@MaineBugWatch or Facebook (Maine Bug Watch).

Asian Longhorned Beetle
Anoplophora glabripennis
Host(s): Maples (*Acer* spp.) and other hardwoods

No Asian longhorned beetle detected to date.

Panel traps with 6 lure components (alcohol, aldehyde, linalool, Z3-hexenol (leaf alcohol), caryophyllene and linalool oxide) were deployed in eight locations from July through September. These high risk sites included: three bark mulch processing plants, two in Androscoggin County and one in Sagadahoc County; three biomass plants one each in Androscoggin, Cumberland, Somerset Counties; and two importers in Hancock County. No Asian longhorned beetles were recovered. See Appendix A for more information on the 2013 survey

Outreach efforts in conjunction with Maine Agriculture CAPS program continue.

Images of the beetle, its look-alikes and the damage it causes can be found at: www.albmaine.org.

Brown Spruce Longhorned Beetle
Tetropium fuscum
Host(s): Primarily spruce (*Picea* spp.), occasionally Fir (*Abies* spp.), Pine (*Pinus* spp.), and Larch (*Larix* spp.)

A brown spruce longhorned beetle survey was undertaken using baited panel traps in 21 locations as part of a survey funded by the USDA APHIS CAPS program. Traps were set in Aroostook County (5 sites), Cumberland County (5 sites), Franklin County (4 sites), Lincoln County (1 site), Oxford County (3 sites), Piscataquis County (1 site) Somerset County (2 sites). Locations were chosen based on risk of transported wood including forest products and firewood. See Appendix B for more information on the 2013 survey.

Trap samples are being processed. No brown spruce longhorned beetle found to date.

Stressed (e.g. drought, root disease), dying, recently felled, *or healthy* trees can be attacked. Middle-aged and mature spruce trees are preferred. Affected trees may exhibit dying crowns, excessive resin flow down the bole, flattened larval galleries packed with fine-grained frass beneath the bark, and L-shaped pupation galleries into the sapwood.

Emerald Ash Borer
Agrilus planipennis
Host(s): Ash (*Fraxinus* spp.)

The MFS continues to work with cooperators to look for this destructive insect that has already become established as close as New Hampshire, northeastern Massachusetts and south of Montreal (See Appendix A). Emerald ash borer (EAB) is known to be within about 30 miles of our western border.

Emerald ash borer attacks all species of ash (*Fraxinus* spp.) and threatens the survival of ash on our continent. Infested trees often exhibit crown dieback from the top down, epicormic (excessive) shoots, and bark splits. Serpentine larval feeding tunnels can be found etched into the inner bark and sapwood. Pupation occurs either in the sapwood or inner bark. Emerging adults create 1/8th inch wide "D" shaped exit holes.

Woodpeckers often feed heavily on EAB larvae and pupae, especially during the fall, winter, and early spring. As they feed, they flick off the brown outer bark, exposing the blonde inner bark. This feeding damage is highly visible and is a good sign that EAB may be present. The last two new infestations in MA and NH were found because of woodpecker feeding.

See Appendix C for more information on 2013 survey activities.

Insects: Miscellaneous

Wood Gnat
Sylvicola fenestralis
Update: We continue to work on the problem of wood gnats breeding on and under the algal/fungal mat growing on the log piles at a lumber mill. The wood gnats swarm in large numbers during the summer months and are a nuisance for the neighbors. The problem is not solved yet but we came up with some possible places where the control process could be altered to hopefully reduce the number of gnats.

Diseases and Injuries

Native Diseases and Injuries

Overview: Principal activities accomplished by the Forest Pathology program during the 2013 year included co-authorship on four published abstracts, two newspaper interviews, and twelve seminar presentations on various aspects of forest and shade tree pathology and forest health. Over 230 tree disease assists to landowners, homeowners, foresters, and others were documented, including over 30 separate on-site visits. Additional specific monitoring and evaluation work continued for hemlock shoot blight (*Sirococcus tsugae*), pine shoot blight (*Sirococcus conigenus*), white pine needle diseases (*Lecanosticta acicola* and others), and European larch canker (*Lachnellula willkommii*).

Anthracnoses of Hardwoods
Host(s): Ashes (*Fraxinus* spp.), Birches (*Betula* spp.), Maples (*Acer* spp.), and Oaks (*Quercus* spp.)

Many anthracnoses and leaf spots of hardwoods were prevalent throughout the 2013 growing season. A long period of wet spring weather continued from late May through the month of June, resulting in significantly high infection levels in many tree species. The most seriously affected were the oaks. The effects of the anthracnose on oaks were magnified by previous leaf damage resulting from late spring frosts that occurred from May 12th through May 14th. The frost damage occurred sporadically throughout most of the range of oaks, but oaks in central and coastal areas appeared to be most heavily damaged. All oak species were affected, but damage to red oaks was most noticeable. Observations revealed a wide range of individual tree response to the combination of damage from frost and anthracnose. Oaks with more than two-thirds of their crown damaged could often be found adjacent to individuals showing only a trace of damage. Specific observations and reports of the major leaf diseases follow.

***Ash Anthracnose and Leaf Spots*:** *Gnomoniella fraxini* was found on ashes in Clinton (Kennebec County) and from Damariscotta (Lincoln County). Ash leaf spot (*Cristulariella moricola* most often and *Mycosphaerella fraxinicola* less frequently) was commonly observed in mid- to late summer, and was recorded from Dover-Foxcroft (Piscataquis County), Troy (Waldo County), and Augusta (Kennebec County).

***Birch Anthracnose*:** Birch anthracnose (*Discula betulina*) was common on paper and grey birches, and occasionally on yellow birches throughout Maine, and became especially noticeable in late summer. The disease was reported from Augusta and Sidney (Kennebec County), Union (Knox County), Brunswick (Cumberland County), and Monhegan Island Plantation.

***Maple Anthracnose*:** Damage from anthracnose diseases on native maple species was very minor. One report of maple anthracnose was recorded from Waldo County.

***Oak Anthracnose and Frost*:** A high incidence of leaf deformities, including cupping, stunting, leaf-spotting, marginal necrosis and defoliation occurred on oaks in many areas throughout the state. Occurrences of both frost damage and anthracnose on the same individual often complicated the diagnoses. The primary pathogen identified was *Apiognomonia quercina*. Specific reports of oak damage were recorded from the following towns: Sabattus (Androscoggin County), Brunswick, Cape Elizabeth, Cumberland, Naples, and Windham (Cumberland County), Chesterville (Franklin County), Bar Harbor, Brooksville, Deer Isle, Hancock, and Somesville (Hancock County), Albion, Augusta, Chelsea, China, Litchfield, Windsor, and Winthrop (Kennebec County), Cushing, Hope, and Rockport (Knox County), Boothbay, Bremen, Damariscotta, Jefferson, and Whitefield (Lincoln County), Hampden and Orono (Penobscot County), Greenville (Piscataquis County), Topsham (Sagadahoc County), Lincolnville, Northport, and Stockton Springs (Waldo County), Grand Lake Stream (Washington County), and Kennebunk (York County).

Arborvitae Root Rot
***Armillaria* spp.**
Host(s): Arborvitae (*Thuja occidentalis*)
Incidence of *Armillaria* root rot on northern white-cedar appears to fluctuate greatly from year to year, depending on the severity of the winter season. This year, *Armillaria* root rot was noted from only two locations; Jefferson (Lincoln County) and New Gloucester (Cumberland County). A typical symptom of the root disease is a "sectoring" of the affected plants, where one or a few of the multiple stems of an individual plant will redden and die, leaving the other stems apparently unaffected for some time.

Ash Leaf and Twig Rust
Puccinia sparganioides
Host(s): White Ash (*Fraxinus americana*), Green Ash (*F. pennsylvanica*)

A perennial problem of ashes growing along Maine coastal areas, damage from ash leaf rust was low to moderate in 2013. The disease was formally reported from three towns, Kennebunk and Eliot (York County) and from Thomaston (Knox County). Significant tree decline and mortality of the ashes is occurring in the Eliot stand. The decline is probably a result of repeated consecutive annual defoliations from this disease. Elsewhere along the mid- and south coastal areas the disease, while present, was not notably severe.

Caliciopsis Canker
Caliciopsis pinea
Host(s): White Pine (*Pinus strobus*)

This disease has been reported as causing substantial damage to white pines in some stands in neighboring New Hampshire, but has not yet been found occurring as aggressively in Maine. Efforts are continuing to develop a formal survey for this disease in cooperation with USDA Forest Service and other State partners. The investigations are expected to elucidate some of the basic biology of the pathogen, and to assess its present and potential impact to the white pine resource in Maine and the region. *Caliciopsis* canker was reported from white pine stands in Belfast (Waldo County) and Norridgewock (Somerset County).

Cytospora Canker
Cytospora abietis
Host(s): Balsam Fir (*Abies balsamea)*, Concolor Fir (*A. concolor*)

Primarily a problem on ornamental trees, and most commonly found in Maine on Concolor firs, *Cytospora* canker was diagnosed affecting tree plantings in Lewiston (Androscoggin County). Concolor firs were again the host.

Fir Needle Casts
Lirula nervata, L. mirabilis, Isthmiella faullii, Rhizosphaera pini
Host(s): Balsam Fir (*Abies balsamea)*, Fraser Fir (*A. fraseri*)

As with the hardwood anthracnose disease, the incidence and severity of many conifer needle diseases was also evident in 2013. Reports of fir needle casts come primarily from Christmas tree growers, but moderate to high infection levels were noted in many forest stands this year as well. Needle infections by *Rhizosphaera pini* and *Lirula nervata* were again the most commonly encountered. Specific location noted for fir needle casts included Corinth (Penobscot County), Falmouth (Cumberland County), Liberty (Waldo County), and Sherman (Aroostook County).

Fir Tip Blight
Delphinella balsameae
Host(s): Balsam Fir (*Abies balsamea)*, Concolor Fir (*A. concolor*)

Incidence of *Delphinella* tip blight was recorded on Concolor fir from Poland (Androscoggin County) and Boothbay Harbor (Lincoln County). In both instances, the disease was considered to be very severe. Despite these reports, the statewide incidence of the disease was apparently lower than in recent past years, and no reports were received or known of the disease causing damage to balsam fir in 2013.

Fir Branch Dieback
Cause Unknown
Host(s): Balsam Fir (*Abies balsamea)*

Numerous reports were investigated of branch "flagging" in balsam fir. The symptoms developed during the late winter and early spring, and became most apparent in April and May. Occasional, scattered trees of all ages were showing symptoms of needles that were discolored to a tan or reddish appearance.

No specific pathogen or insect was identified; a few but not all of the twigs were injured (fed on) presumably by pine sawyer beetle adults. However, this did not account for all the damage or the severity of damage on some individual trees. Several hypotheses for the cause of damage include fine root-tip injury due to the excessively warm late winter of last year (2012), to root and butt rot activity. It may be that the visible dieback is a non-specific symptom of tree stress that develops from any of a number of causes, or that is related to a natural branch shedding process that was triggered by such stress. Symptomatic trees were examined in Arrowsic (Sagadahoc County), Litchfield and Whitefield (Kennebec County), Acton (York County), East Sebago and Windham (Cumberland County), and Livermore and Richmond (Androscoggin County).

Hemlock Shoot Blight
Sirococcus tsugae
Host(s): Eastern Hemlock (*Tsuga canadensis*)

Hemlock shoot blight is prevalent throughout the State, wherever hemlocks are found. Survey work continued this year, with most effort in Maine spent in assisting USDA Forest Service personnel with intensive, individual tree assessments of the disease at the Massabesic Experimental Forest in Alfred, Maine. Twenty-four plots in Maine were surveyed for hemlock shoot blight during 2012 (two at the Massabesic Experimental Forest and 22 FIA plots). This year, data analysis by Dr. I Munck, USDA Forest Service has shown that hemlocks in only three plot locations in Maine had no symptoms; 19 plots had trees with up to 10% of shoots affected, and two plots had trees with up to 25% of shoots infected. Spores of the pathogen were recovered from shoot samples from 13 plots; pathogen cultures were recovered from shoot samples from 11 plots, and the fungus was confirmed with PCR techniques from 11 plots. New reports of hemlock shoot blight occurrence were also obtained from Brunswick and Gorham (Cumberland County), Chelsea (Kennebec County), and Tenants Harbor (Knox County).

Herbicide Injury
Mortality and severe damage to white pines and other landscape trees was observed in several locations that was likely caused by the application the lawn herbicide Imprelis. Although the material was removed from the market within months of its release, damage to trees that were exposed to the chemical continue to show effects more than a year after application. Significant losses to landscape tree were observed or reported from Hampden and Old Town (Penobscot County), and from Portland and Westbrook (Cumberland County). Another herbicide incident was observed in Holden (Penobscot County) affecting bigtooth aspens, but the chemical agent responsible was not identified.

Heterobasidion Root Rot
Heterobasidion irregulare **(=*Fomes annosus* =*Heterobasidion annosum*)**
Host(s): Red Pine (*Pinus resinosa*), White Pine (*P. strobus*), Norway Spruce (*Picea abies*), and others

Heterobasidion root rot in red pine stands has been a moderate concern in Maine for many decades. However, with an increasing number of red pine plantations reaching an age requiring commercial thinning, the disease is expected to become more important. The disease is known to occur in Androscoggin, Cumberland, Franklin, Kennebec, Lincoln, Oxford, Penobscot, Piscataquis, Sagadahoc, Somerset, Waldo, and York counties. It likely occurs in other counties, as well. In 2013, a 45-year-old stand of Norway spruce in Dover Foxcroft (Piscataquis County) was diagnosed with the root rot.

Injuries/Mechanical Damage:
Several unrelated incidents of tree injuries and mechanical damage were noted. Some of the more interesting included internal decay resulting from mechanical injury to a "champion" Horse-chestnut in Gouldsboro (Hancock County), injuries to sugar maples in a sugarbush from ice and storm damage in New Gloucester (Cumberland County), damage to balsam fir leaders from bird feeding activity (most probably pine grosbeaks), and severe damage to white pines and other conifers by salt spray resulting from Hurricane Sandy along extensive mid- and south-coastal areas.

Phomopsis **spp. Galls:**
Phomopsis **spp.**
Host(s): Oaks (*Quercus* spp.)

Branch and stem infections by the gall-forming fungus *Phomopsis* were diagnosed from Monmouth and Vienna (Kennebec County). This disease is known to cause branch galls so numerous on affected trees that crown dieback and even mortality can result. Removal and salvage of heavily-infected trees from the stand is the recommended management option, but because the galls reportedly become non-infectious early in their development, it is unlikely pruning and removing galls or gall-affected trees results in any real sanitation effect.

Pine Tip Blight
Diplodia pinea **(*Sphaeropsis sapinea)***
Host(s): Red Pine (*Pinus* resinosa), Scots Pine (*P. sylvestris*), and Austrian Pine (*Pinus nigra*)

Diplodia tip blight is widespread and moderately damaging to exotic hard pines (Scots, Austrian, and Mugho pines) throughout the state. Red pines which may show some symptoms of tip blight and shoot blight are commonly infected with both *Diplodia pinea* and *Sirococcus conigenus* (described further below). A severe epidemic of rapid red pine mortality on Mount Desert Island, and especially along Somes Sound in Northeast Harbor, has been attributed in large part to infection by *S. conigenus*. However, *D. pinea* is also commonly present and was recovered from affected trees.

Poplar Leaf Spot
Septoria populicola
Host(s): Quaking Aspen (*Populus tremuloides*) and other *Populus* spp.

This leaf disease is widespread throughout Maine, and is commonly seen every year during mid- to late summer. Samples of the disease were recorded in 2013 from Camden (Knox County).

Red Bark
***Trentepohlia* spp.**
Substrate: Bark surfaces of most hardwoods and conifers

A few years ago some concern was expressed about the apparent recent widespread occurrence of a condition known as "red bark" on trees throughout the Northeastern United States. The condition is the result of the development of an alga (most commonly algal species in the genus *Trentepohlia*) which impart a rusty-red to pinkish hue to bark upon which it grows. Several species can combine in a mutualism with certain fungi to form some lichens. While neither the alga nor the lichens are known or thought to be harmful to trees, the cause of the apparent increase in populations of the alga is unknown. The condition has been found in Maine from Houlton (on sugar maples) to York (on white pines and hemlocks) and many locations in between. This year specific reports of the condition on white pines were obtained from Fairfield (Kennebec County) and Brunswick (Cumberland County).

***Sirococcus* Shoot Blight**
Sirococcus conigenus
Host(s): Red Pine (*Pinus resinosa)* and other hard pine spp.

Sirococcus shoot blight is now regarded as the single most serious threat to red pine in natural stands and in plantations in Maine. As a result of nearly a decade of consecutive spring and early summer seasons of above-average precipitation, the disease is established throughout the State and is causing significant mortality in immature, mature and reproduction stands in several regions of the State. The neighboring Canadian province of New Brunswick has also recently reported significant losses in red pine to this disease. This year, heavy mortality of large, mature red pines in natural stands in Acadia National Park and in neighboring towns on Mount Desert Island has occurred. Significant damage has also been recorded previously from plantations in Hancock and Washington counties, and in central Maine (Somerset County). This year, heavy infection levels and mortality has been documented from Belfast (Waldo County), Van Buren and Madawaska (Aroostook County), T6R1 NBPP (Washington County), Acadia National Park and Somesville (Hancock County) and Brunswick (Cumberland County).

Spruce Needle Cast
Rhizosphaera kalkhoffii
Host(s): White Spruce (*Picea glauca*) and Colorado Blue Spruce (*P. pungens*)

Numbers of reports for this disease were fewer than in recent past years, but the disease was diagnosed from Fryeburg (Oxford County), Oakland (Kennebec County), Palmyra (Somerset County), Whitefield (Lincoln County), Litchfield (Kennebec County) and Kennebunk (York County).

Tar Leaf Spot
Rhytisma acerinum
Host(s): Norway Maple (*Acer platanoides*) and occasionally other *Acer* spp.

Communities most affected by tar leaf spot on Norway maples were Warren and Thomaston (Knox County) and Presque Isle (Aroostook County). In those towns, leaves were heavily infected and trees appeared "scorched" by early August. Some level of the disease is found wherever in Maine Norway maples have been planted.

Verticillium Wilt
Verticillium spp.
Host(s): Maples (*Acer* spp.) and many other hardwoods

A single incidence of *Verticillium* wilt was diagnosed on Norway maple in Westbrook (Cumberland County). The disease is known to occur commonly, especially on Norway maples, and usually causes only minor branch dieback in any single year.

White Pine Needle Cast and Needle Blight
Mycosphaerella dearnessii (= Lecanosticta acicola), Lophophacidium dooksii* (=*Canavirgella banfieldii*), and *Bifusella linearis
Host(s): White Pine (*Pinus strobus*)

This disease complex is increasingly becoming a threat to the white pine resource throughout the Northeastern United States. Now entering the seventh year of the documented epidemic, affected trees continue to show weakening due to the stress caused by the reduction in foliage and photosynthetic efficiency. Most at risk appear to be white pines that are mature or over-mature, and those growing on marginal sites such as along shallow and rocky stream edges and shorelines, low, wet sites, and in unmanaged and over-stocked stands. However, all affected pines, even those on good sites and with little crown competition exhibit thin crowns, often with off-color foliage, and a pronounced increased rate of shedding of the lower branches. As part of a region-wide study coordinated by USDA Forest Service personnel, two permanent plots in Maine were again assessed for white pine needle disease symptoms, and a network of six Maine locations were used to monitor for weather conditions throughout the year. In 2013, occurrence of the white pine needle disease complex was identified from Liberty, Palermo (Waldo County), Ellsworth (Hancock County), Waterville (Kennebec County), Madison (Somerset County), Gray (Cumberland County), Porter (Oxford County) and Rangeley (Franklin County). The disease remains widespread but most severe throughout central, western, and southern Maine.

Non- Native Diseases

Dutch Elm Disease
Ophiostoma ulmi* and *Ophiostoma novo-ulmi
Host(s): American Elm (*Ulmus americana*)

Dutch elm disease was again apparent throughout Maine, and was especially noticeable on younger (smaller) trees along rural roadways and highways. The majority of affected trees observed this year were under 12 inches in diameter. The pervasive occurrence of the disease is well-known, and there is no new information to indicate that the moderately high disease levels are either increasing or decreasing.

European Larch Canker
Lachnellula willkommii
Host(s): Eastern Larch (*Larix laricina*), European Larch (*L. decidua*) and Japanese Larch (*L. leptolepis*)

The majority of survey time for European larch canker was spent on searching for the disease in "buffer" towns already within the quarantine zone, on re-measurement of a long-term study plot of disease intensification in Deblois (Washington County), and on a re-survey of the Brunswick (Cumberland County) site where an eradication attempt is underway. The Brunswick site is located outside the current quarantine boundary.

No new locations of European larch canker were identified in the 2013 survey. However, four additional trees were identified with the disease at the Brunswick eradication site. All infected trees were non-native (European) larch. Those trees are slated for removal and disposal by the landowner later this winter. The identification of these additional infected trees will require that annual surveys of the area be conducted for several more years, to ensure

complete disease control. Cankers found on the infected trees were judged to be of some age, and were most probably extant before the eradication effort began but were missed in annual surveys since 2008.

The re-measured plot (Deblois) for the disease intensification research is the only plot of the five established to remain actively studied. Established two years after the initial plots, and because rate of disease intensification lagged slightly behind the other plots, the Deblois plot has continued to be monitored. This year, a dramatic increase in disease occurrence over 2012 levels was recorded, with twice the number of branch cankers, 1.5 times the number of stem cankers, and 1.5 times the number of trees affected with branch cankers, stem cankers, or both **(**55 trees in 2012 to 82 trees in 2013). The disease intensification curve for this plot is in line with and supports the data from the other plots. Disease incidence develops slowly at first, and then increases at an increasing rate as more infections develop. A summary of the now 13-year study is underway.

Lophodermium Needlecast
Lophodermium pinastri
Host(s): Scots Pine (*Pinus sylvestris*) and other hard pine spp.

Lophodermium needlecast was identified from a small plantation of Scots pine in Lewiston (Androscoggin County). The pines were heavily defoliated, and it is likely the disease had been intensifying there for several years. The needlecast is also common to ornamental and roadside plantings of Scots pine, and can be commonly observed on pines along the U.S. Interstate roadway rights-of-way.

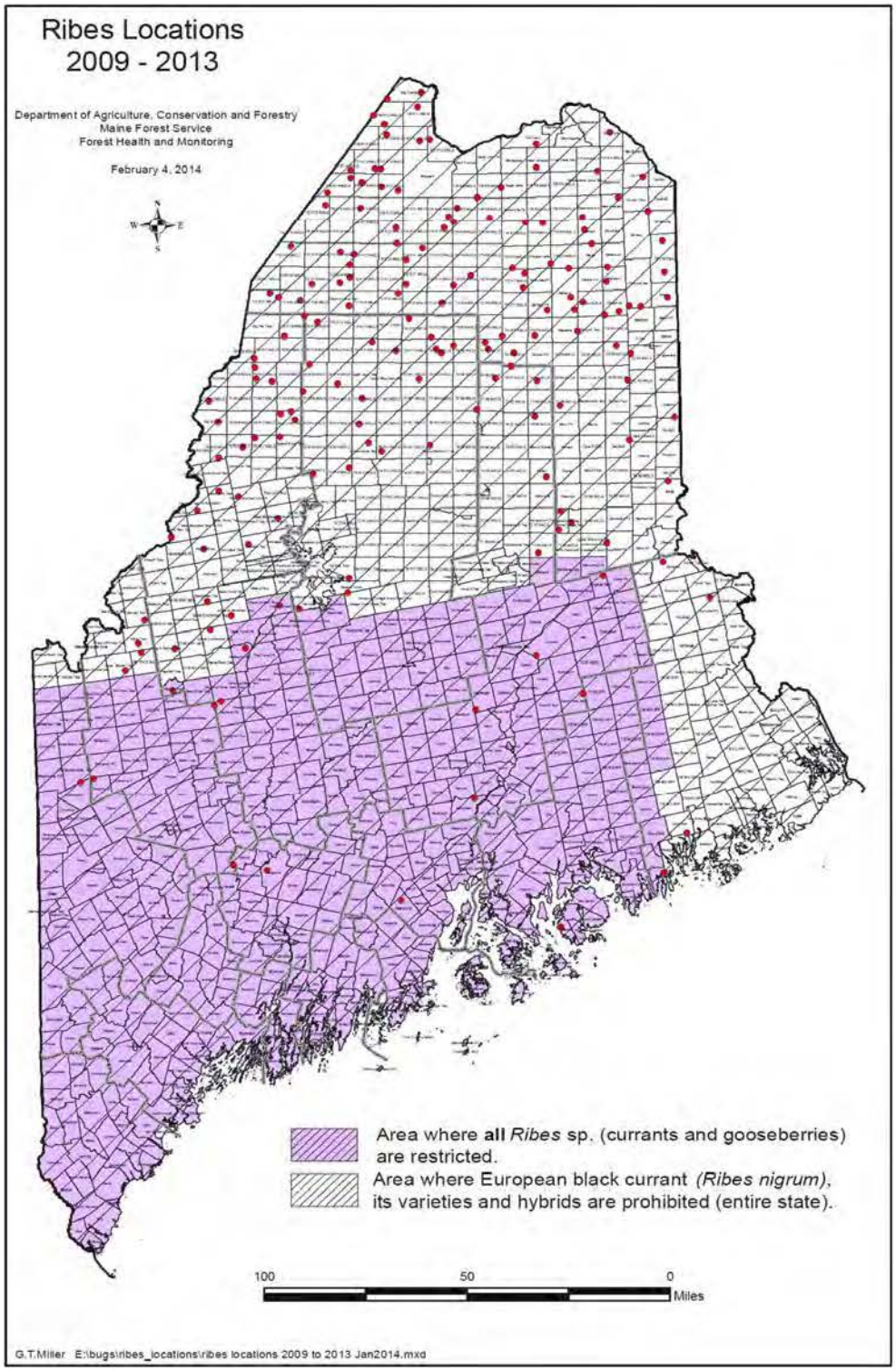
White Pine Blister Rust
Cronartium ribicola
Host(s): White Pine (*Pinus strobus*)

An increased interest and concern has developed regarding white pine blister rust with the discovery of a new strain of the pathogen now able to infect previously resistant or immune species and cultivars of *Ribes.* Although the quarantine for *Ribes* spp. in Maine has never allowed for the planting or cultivation of the resistant or immune cultivars, they have been allowed in neighboring New Hampshire and several other northeastern states. The level of risk now associated with this pathogen mutation is now under study by the USDA Forest Service. Development of the new pathogen strain provides a strong justification to continue the existing Maine quarantine regulations. White pine blister remains a threat, especially to younger (seedling, sapling and pole-size) white pine stands. Landowner assistance for the identification and management options for white pine blister rust were conducted in the towns of Addison (Washington County), Liberty (Waldo County), and Norridgewock and Palmyra (Somerset County).

Due to concern over the new strain *Cronartium ribicola*, several states are now re-examining the etiology of the disease. An intensive State program of Ribes eradication was conducted in Maine for nearly 80 years, until the early 1990's. Because an active State program of *Ribes* eradication has not been mounted for nearly 20 years, a better assessment of the *Ribes* populations in Maine, both in terms of species present, species distribution, and population numbers is timely.

A preliminary effort to assess the status of *Ribes* populations in Maine was begun with an analysis of FIA plots that have had *Ribes* species recorded and measured between 2009 and 2013. The maps below show the distribution of the FIA plots with *Ribes* present, and the quarantine boundary for *Ribes* control. Of 172 FIA plots recorded with *Ribes* present, 155 plots (90%) are outside the quarantine boundary, and only17 plots (10%) within the quarantine area. This, in conjunction with an intensive survey of white pine for blister rust incidence conducted in 1988 (http://library.umaine.edu/cfru/pubs/CFRU181.pdf) clearly shows the effectiveness of the *Ribes* eradication program in reducing populations of the *Ribes* host and disease incidence on pine. What is surprising is that the effect of the *Ribes* removals has apparently lasted now for over twenty years. Certainly *Ribes* eradication efforts by individual landowners will also account for some of these long-term effects in *Ribes* population suppression, but the initial intensive State and Federal programs are still paying dividends in protecting Maine's white pine resource.

Figure 12. A comparison of the number and location of FIA plots with *Ribes* species present outside the quarantine zone, with the number and location of those within the quarantine zone in Maine.



Division Activities

Aerial Survey

Aerial survey flights were flown from June into September 2013 for both delineating forest pest problems and overflights detecting potential damage and stress situations. Damage by the following pests was mapped: Bare-patched Oak Leafroller (*Pseudexentera spoliana (cressoniana)*), browntail moth (*Euproctis chrysorrhoea*), fall cankerworm (*Alsophila pometaria*), gypsy moth (*Lymantria dispar*), and winter moth (*Operophtera brumata*). Trees along the margins of ponds, beaver flowages, heaths etc. are in poor health across the entire state due to fluctuating water levels in recent years. Birch at high elevations is in poor condition overall. Beech in northwestern parts of the state where beech bark disease is killing trees on the hardwood ridges is also noticeable.

We continue to balance the need to survey the forest with the cost of flights. The survey flights were made in either a Cessna 185 or 305 (a Korean War observation plane) float plane. In addition, trained, unaccompanied MFS pilots conduct initial aerial reconnaissance in sections of the state where no new detectable stress events are anticipated. This effort is incorporated into fire detection and other MFS routine flight activities. If they see anything unusual in the forest they give a call to the Entomology Lab. We also solicit ancillary ad hoc reports from outside cooperators. These efforts augment our internal capacity and provide a cost effective initial detection tool for triggering targeted survey and evaluation.

We have been using digital aerial sketch mapping (DASM) for the past seven years and find it an improvement over using paper maps and a pencil. Although like any other electronic devise it is always wise to bring a mechanical backup. The computers and software are supplied through a grant with the USDA Forest Service who also help trouble shoot problems both in the air and in interpreting the data. Greg Miller, MFS GIS Coordinator, handles the data and produces maps from the surveys.

Ants

The Maine Forest Service has continued its relationship with Dr. Aaron Ellison at the Harvard Forest, MA. In 2013 he led a research collecting trip to the Traveler Mountain area of Baxter State Park. During the week of July 9, 2013 samples of workers from 266 nests representing 27 species were collected. Of these, 13 are new records for Piscataquis County, and one, *Formica adamsi*, is a new species record not only for Maine but also for all of New England. Specimens collected were identified and catalogued with voucher specimens of Baxter S.P. species deposited in the MFS Entomology Laboratory Insect Collection. Four of these were new species for the MFS collection as well.

The State greatly benefits from these cooperative projects that require a small amount of coordination and produce results difficult to obtain in any other way. This type of information is the basis for understanding ecosystems, documenting presence of beneficial and potential pest organisms, tracking expansion and contraction of ranges in response to climate and other factors, and making management decisions.

Bioblitzes at Acadia National Park

The Maine Forest Service has been co-sponsoring bioblitzes in Acadia National Park (ANP) for the past ten years along with ANP, the Maine Entomological Society and the University of Maine. A bioblitz is a 24-hour period of time when as many different species are collected as possible within a certain area. The ANP blitzes have focused on one insect (or spider) taxon each year; for example beetles, or moths & butterflies. Eight of these blitzes have been focused on the little studied Schoodic Point section of ANP and two have taken place on Mount Desert Island. The 2013 blitz focused on beetles (Coleoptera) on Mount Desert Island. Participation and support of these events has a number of paybacks for the MFS. We have an opportunity to survey the insects in an area rarely studied or heavily used, we learn of invasive species that may be found there, we develop and maintain interagency connections, we build new relationships with participating taxonomists and we spark an interest in participants for forest insects. Plus, excess specimens are deposited in the MFS collection. The MFS provides lab and field equipment, personnel to assist in running the blitz, and participants for collecting, processing and identifying specimens.

A publication covering the first nine blitzes was published in September 2012: Chandler, D. S., D. Manski, C. Donahue and A. Alyokhin. 2012. **Biodiversity of the Schoodic Peninsula: Results of the Insect and Arachnid**

Bioblitzes at the Schoodic District of Acadia National Park, Maine. Maine Agricultural & Forest Experiment Station *Technical Bulletin 206.* 210 pages.
http://www.umaine.edu/mafes/elec_pubs/techbulletins/tb206.pdf.
A few hard copies are still available from the MFS Lab.

For more information on the blitzes go to: http://www nps.gov/acad/naturescience/bioblitz.htm

Firewood and Invasive Insects Awareness Campaign

Once again, a major focus this year was training and outreach on the issue of how firewood movement spreads invasive pests. For a fourth year, the Maine Forest Service partnered with the DACF Division of Animal and Plant Health and on invasive insect outreach - in particular the Asian longhorned beetle (ALB) and emerald ash borer (EAB). This project included training volunteers to take the invasive insect issue to the public and putting the message out in as many venues as possible. Similar activities occurred in other states across the northeast.

On April 1, 2010, emergency legislation was passed banning the movement of firewood from out-of-state into Maine. The regulation went into effect on the Labor Day weekend of 2010. Several out-of-state firewood exchanges have been held since then at the northbound Kittery rest stop to raise awareness of the new legislation and the link between invasive insects and firewood.

Tens of thousands of pieces of literature have been handed out over the past years. Materials for outreach were supplied by the USDA Forest Service, and USDA APHIS, PPQ. In addition to using the already popular "Marshmallow" ad, we borrowed heavily from a model developed and shared by the Iowa Dept of Agriculture (Thank you, Iowa) to design a Maine-specific "*Guns, ~~Bugs~~, Ammo, Camo*" to reach hunters with the message to leave firewood at home. A second poster on the same slightly humorous theme aimed at ice fishermen was "*~~Shiners~~, ~~Smelts~~, ~~Bugs~~: Out-of-State Bait and Firewood Not Wanted*". Both have proved to be very popular. Then we partnered with the Capital Area Technical Center and graphics art student Kalyn Van Valkenburgh designed a new 'Bugmobile' poster that has had a lot of positive feedback.

Wallet cards, bookmarks, posters, flyers and factsheets were put up or distributed in town offices, convenience stores, libraries, at trail heads and other venues. The "*Leave Your Firewood at Home*" and/or "*Be on the Lookout for Invasive Insects*" message were promoted at fairs, festivals, camper shows, outdoor shows, various industry shows, and other gatherings. We ran multiple training sessions for roadside tree trimming crews and loggers as these are some of the folks "on the frontline" when it comes to looking at trees. In cooperation with the Maine DOT, training sessions were held for municipal and Public Works personnel on how to recognize invasive insects if encountered during their work on park and roadside trees.

Several ads in various camping magazines and newspaper supplements were printed. The goal of these ads was to reach out-of-state campers before they left home with their firewood. Notices about the new out-of-state firewood ban were printed and given to campground owners to help them inform their out-of-state campers of the new legislation **before** they came to Maine. Groups with an outdoor connection were contacted and asked to put a message on their website promoting leaving firewood at home. Maine State Parks, Maine Campground Owners Association (MECOA) and a race track that has camping all have notices about firewood as do some individual campgrounds.

The effort to educate the public about firewood is a broad program across the Northeast with funding from both USDA Forest Service and USDA-APHIS. These agencies have also put their time and effort into the outreach effort along with states and private groups. The Nature Conservancy's "*Don't Move Firewood*" campaign has also been instrumental in spreading the word through their internet presence, videos and PSA's.

The DACF Division of Animal and Plant Health heads up the Forest Pest Outreach Volunteers program. This program trains volunteers to be able to identify potential forest pests and to provide them with support to go into their communities and train more people.

Insect Collection

The Maine Forest Service Insect Collection has over 60,000 specimens in the reference portion of the collection. Additionally there are now more than 5,000 ant specimens stored in alcohol, more than 60,000 spider records, and in excess of 10,000 bark beetle and woodborer specimens. Besides having most of the specimens themselves here we also have computerized records of all this material. We are continually adding to the collection and upgrading it as time – *and volunteers* – allow. Without the assistance provided by Maine Entomological Society and other volunteers we would not be able to maintain and manage this valuable reference collection.

In 2010 the MFS took ownership of thousands of insect samples collected by the University of Maine that had never been fully processed. The samples are stored at the Maine State Museum warehouse and are slowly being processed by volunteers from the Maine Entomological Society. Samples were collected from a variety of forested sites with the bulk of the collection coming from the USDA-FS Penobscot Experimental Forest in Bradley. This work will result in information about the insects that live in these locations. Already two rare wasps have been identified and a beetle that is considered rare has been recovered from a number of the samples processed to date. More information will be forthcoming as the specimens get identified and catalogued. More help is needed if anyone is interested!

Light Trap Survey

The Maine Forest Service has been monitoring forest insect pest populations with an array of light traps across the State for over 70 years. Twenty traps were run in 2013 in locations from South Berwick to Allagash to Topsfield (Table 8). Rothamstead light traps are used in most locations with blacklight traps at the remaining sites. The Rothamstead trap has a 150W light bulb inside a protective casing with an entry for moths. The moths fall down a funnel into a can where they die. Blacklight traps have metal fins that the moths hit as they fly toward the light and then fall down into a collecting can. One light trap runs on batteries as there is no power at Frost Pond. Trap operators collect the catch on a daily basis and send the catch in weekly to be processed. The timeframe for trap operation in 2013 ranged from 30 to 45 days depending on the location and flight season of the moths of interest. The results are used in predicting forest pest outbreaks. A heartfelt thank you goes out to the trap operators each year. Although it is not difficult to operate a trap and they are minimally compensated for it, attention to detail and daily attendance is required and very much appreciated.

A checklist of significant insect defoliators is used in sorting the moth catch material. Trap catch records for some of these insects are available for over 30 years' worth of trapping. Other insects that are trapped and occur in unusual numbers or have not been seen before are noted in the light trap records. A portion of the moth catch is saved for use in outreach programs during the remainder of the year. Pest populations of significance are reported in the appropriate section of this report. These traps are also used to monitor for invasive species coming into the State.

Public Assistance

Public assistance from the Forest Insect and Disease Program takes many forms. We speak at workshops and field days to a broad range of audiences, write articles for our own and other publications, speak with television, newspaper and radio journalists, answer questions at trade shows and other venues, and answer the many questions that come in by phone calls, e-mails and walk-in visitors.

In 2013, the Department of Agriculture, Conservation & Forestry launched a new website, www.maine.gov/dacf. FHM factsheets, quarantine information, conditions reports and other select pages were brought over in the move; other pages do not yet have a new home and still others may not be transferred. Please update your bookmarks and links to our pages. The program home page can be found at: http://maine.gov/dacf/mfs/forest_health/index htm. The goal of the department with the new website is to make on-line information more accessible. If you are having difficulty locating a specific page, please let us know.

Many subscribers noted that the Conditions Reports were infrequent in the 2013 growing season. Project demands and lost staff time limited our ability to produce more frequent reports—especially more labor-intensive paper copy. Electronic subscribers received some additional updates in the fall and winter. Many subscribers have chosen to receive the electronic notices of our reports (more than 650); however, we still have close to 100 paper subscribers. Continuing paper copies may seem outdated, but subscribers are an important part of our forest pest detection network.

Table 8. 2013 Light trap locations.

Trap Location	County	Start date	End date	Number of nights
Allagash	AROOSTOOK	7/3/2013	7/31/2013	30
Ashland	AROOSTOOK	7/3/2013	7/31/2013	30
Bowerbank	PISCATAQUIS	6/17/2013	7/31/2013	45
Calais	WASHINGTON	6/17/2013	7/31/2013	45
Crystal	AROOSTOOK	7/3/2013	7/31/2013	30
Exeter	PENOBSCOT	6/17/2013	7/31/2013	45
Frost Pond – T3 R11 WELS	PISCATAQUIS	6/17/2013	7/31/2013	45
Haynesville	AROOSTOOK	6/17/2013	7/31/2013	45
Hope	KNOX	6/17/2013	7/31/2013	45
Kingfield	FRANKLIN	7/3/2013	7/31/2013	30
Millinocket	PENOBSCOT	6/17/2013	7/31/2013	45
Mount Vernon	KENNEBEC	6/17/2013	7/31/2013	45
New Sweden	AROOSTOOK	7/3/2013	7/31/2013	30
Rangeley	FRANKLIN	6/17/2013	7/31/2013	45
Sedgwick	HANCOCK	6/17/2013	7/31/2013	45
Shirley	PISCATAQUIS	6/17/2013	7/31/2013	45
South Berwick	YORK	6/17/2013	7/31/2013	45
Ste. Aurelie - Big Six Twp	SOMERSET	7/3/2013	7/31/2013	30
Topsfield	WASHINGTON	6/17/2013	7/31/2013	45

Quarantine Administration

The unit administers state quarantines on European larch canker, gypsy moth, hemlock woolly adelgid, pine shoot beetle and white pine blister rust. Parallel federal quarantines exist for European larch canker, gypsy moth and pine shoot beetle. Each quarantine lists regulated articles and areas. Compliance agreements, usually held by receivers, allow controlled movement of regulated articles out of the regulated area for the European larch canker, gypsy moth, hemlock woolly adelgid and pine shoot beetle quarantines. **Questions about forestry related quarantines and moving regulated material and requests for compliance agreements can be directed to Allison Kanoti, e-mail: allison m kanoti@maine.gov; phone: (207)-287-2431; Maine Forest Service Insect and Disease Lab, 168 State House Station, Augusta, ME 04333-0168.** More information on the quarantines is contained in **Appendix D: Forestry Related Quarantines in Maine – 2013.**

Maine Forest Service
DEPARTMENT OF AGRICULTURE, CONSERVATION & FORESTRY
INSECT & DISEASE MANAGEMENT PUBLICATIONS
Technical Report Series

No. **Title**

1. LaBonte, G.A. The Saddled Prominent Outbreak of 1970-1971 and Its Damages. March, 1978. 20 pp.
2. Dearborn, R.G., H. Trial, Jr., D. Struble and M. Devine. The Saddled Prominent Complex in Maine with Special Consideration of Eastern Maine Conditions. March, 1978. 20 pp.
3. Maine Forest Service, Entomology Division. Spruce Budworm in Maine: 1977. March, 1978. 80 pp.
4. Devine, M.E., H. Trial, Jr. and N.M. Kotchian. Assessment of Spruce Budworm Damage in the Moosehorn National Wildlife Refuge. August, 1978. 32 pp.
5. Struble, D., H. Trial, Jr. and R. Ford. Comparison of Two Rates of Sevin-4-Oil for Spruce Budworm Control in Maine: 1976. August, 1978. 28 pp.
6. Morrison, T.A. and J.B. Dimond. Field Trials for Control of Spruce Budworm in Maine: A History and Bibliography. September, 1978. 13 pp.
7. Bradbury, R. Spruce Budworm Parasitic Survey in Maine with Special Reference to the 1978 Season. December, 1978. **Unpublished**.
8. Trial, Jr., H. and A. Thurston. Spruce Budworm in Maine: 1978. December, 1978. 109 pp.
9. Trial, Jr., H., W. Kemp and D. Struble. Evaluation of Split Application and Reduced Dosages of Sevin-4-Oil for Spruce Budworm Control in Maine: 1978. November, 1979. 30 pp.
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11. Dimond, J.B., M. Kittredge, D. Schaufler and D. Pratt. *Bacillus thuringiensis*: Operational Project - Spruce Budworm Control in Maine 1978. 1978. 36 pp.
12. Kemp, W.P., H. Trial, Jr. and D. Struble. Sampling and Analysis Design for Departmental Insecticide Monitoring. February, 1979. 32 pp.
13. Connor, J.Y. and H. Trial, Jr. *Bacillus thuringiensis*: Operational Project - Spruce Budworm Control in Maine 1979. November, 1979. 20 pp.
14. Trial, Jr., H. and A. Thurston. Spruce Budworm in Maine: 1979. March, 1980. 111 pp.
15. Bradbury, R.L. and G.A. LaBonte. Winter Mortality of Gypsy Moth Egg Masses in Maine. November, 1980. 4 pp.
16. Devine, M.E. and J.Y. Connor. Resurvey of Spruce Budworm Damage in the Moosehorn National Wildlife Refuge. February, 1981. 21 pp.
17. Trial, Jr., H. and M.E. Devine. Spruce Budworm in Maine: Biological Conditions in 1980 and Expected Infestation Conditions for 1981. February, 1981. 64 pp.
18. Trial, Jr., H. and M.E. Devine. Spruce Budworm in Maine: Results of the 1981 Project, Biological Conditions in 1981, and Expected Infestation Conditions for 1982. April, 1982. 83 pp.
19. Trial, Jr., H. and M.E. Devine. Spruce Budworm in Maine: Results of the 1982 Project, Biological Conditions in 1982, and Expected Infestation Conditions for 1983. March, 1983. 76 pp.
20. Trial, Jr., H. and M.E. Devine. Spruce Budworm in Maine: Results of the 1983 Project, Biological Conditions in 1983, and Expected Infestation Conditions for 1984. May, 1984. 75 pp.
21. LaBonte, G.A. Control of the Red Oak Leaf-Mining Sawfly. August, 1984. 7 pp.
22. Dearborn, R.G., R. Bradbury and G. Russell. The Forest Insect Survey of Maine -Order Hymenoptera. May, 1983. 101 pp.
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24. Trial, Jr., H. and M.E. Devine. Spruce Budworm in Maine, Results of the 1985 Project, Biological Conditions in 1985 and Expected Infestation Conditions for 1986. August, 1986. 71 pp.

25. Bradbury, R.L. Efficacy of Selected Insecticides Against the White Pine Weevil (Coleoptera: Curculionidae). November, 1986. 8 pp.

26. Trial, Jr., H. and J.B. Dimond. An Aerial Field Trial Evaluating Split Applications and New Formulations of *Bacillus thuriengiensis* Against the Spruce Budworm, *Choristoneura fumiferana* in Maine. March, 1988. 20 pp.

27. Bradbury, R.L. An Economic Assessment of the White Pine Blister Rust Control Program in Maine. January, 1989. 17 pp.

28. Trial, Jr., H. Spruce Budworm in Maine: The End of the Outbreak, Biological Conditions in 1986, 1987, and 1988, and a Look at the Future. October, 1989. 50 pp.

29. Granger, C.A. Forest Health Research and Monitoring Activity in Maine 1989-90. April, 1990. 30 pp.

30. Trial, Jr., H. and J.G. Trial. The Distribution of Eastern Hemlock Looper {*Lambdina fiscellaria* (Gn.)} Eggs on Eastern Hemlock {*Tsuga canadensis* (L.) Carr} and Development of an Egg Sampling Method on Hemlock. February, 1991. 12 pp.

31. Trial, Jr., H. and J.G. Trial. A Method to Predict Defoliation of Eastern Hemlock {*Tsuga canadensis* (L.) Carr} by Eastern Hemlock Looper {*Lambdina fiscellaria* (Gn.)} using Egg Sampling. September, 1992. 12 pp.

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38. Bradbury, R.L. The Browntail Moth, *Euproctis chrysorrhoea*, Summary of Maine Forest Service Activities For 1995. March 1998. 12 pp.

39. Donahue, C. and K. Murray. Maine's Forest Insect and Disease Historical Database: Database Development and Analyses of 16 Years (1980-1995) of General Survey Data. February 1999. 17 pp.

40. Bradbury, R.L. The Browntail Moth, *Euproctis chrysorrhoea*, Summary of Maine Forest Service Activities for 1996. October 1999. 13 pp.

41. Foss, K.A. Variations in Ground Beetle (Coleoptera: Carabidae) Populations Across Ecological Habitats for the Stetson Brook Watershed in Lewiston, Maine. October 2001. 2- pp. + i-ii.

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Appendices

Appendix A

2013 Asian Longhorned Beetle Survey

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The Asian longhorned beetle, *Anoplophora glabripennis*, (ALB) is a woodboring insect that attacks a wide range of hardwoods including all species of maple, birch, elm, poplar and willow (www maine.gov/alb). Damage by the beetle would impact the health of our forests, appearance of our neighborhoods and integrity of our infrastructure. In addition, it would lead to losses in the forest products, maple sugaring and tourism industries and require a costly control effort. ALB has been found in Massachusetts, New York, New Jersey, Ontario and Ohio. Additional infested trees are likely to be detected outside the current regulated areas in MA and NY. New infestations in the Northeast are of particular concern, given their proximity to large tracts of forests and watersheds.

High risk sites in Maine include:

- Biomass plants that in the past have accepted biomass from the Worchester, MA ALB quarantine area
- Bark mulch producers who get material from a wide variety of sources
- Importers that receive materials in packing crates directly from China

Methods:

Traps were placed in the field in the first week of July, sampled every other week and retrieved the second week of October.

Panel traps were coated with diluted Fluon, hung in host trees and baited with a combination of plant volatiles and male-produced pheromones.

Setting up ALB traps:

- Select maple trees or an ALB preferred host tree unless none are available in the area.
- Select trees that are either open grown or edge trees, if an edge tree use the open side for trap placement.
- Traps placed on interior trees are less likely to catch beetles, as these are flight intercept traps.
- Select a sturdy lower canopy limb that angles slightly up
  - High enough off so that the base of the trap will be at least 3 meters off the ground.
  - Traps placed higher off the ground are better if that is where the lower canopy is on the tree.

- Hang all lures in center of trap.
  - Male produced pheromone
    - Alcohol component
    - Aldehyde component
  - Plant Volatiles
    - Caryophyllene
    - Z3-hexenol
    - Linalool

Sites for 2013 Asian Longhorned Beetle Survey

County	Town		Tree Species	Tree DBH (inches)	Trap Height (feet)	Latitude	Longitude	Duration
Sagadahoc	Richmond	bark mulch plant	*Acer rubrum*	12.1	16	44.09994	-069.86548	88
Cumberland	Westbrook	biomass plant	*Acer platanoides*	10.5	12	43.67939	-70.35824	93
Androscoggin	Poland Springs	bark mulch plant	*Acer rubrum*	10	11	44.03030	-070.32574	95
Androscoggin	Auburn	bark mulch plant	*Acer rubrum*	7.5	14	44.05485	-070.29536	95
Androscoggin	Livermore Falls	biomass plant	*Populus tremuloides*	4.2	8	44.416667	-070.15	98
Somerset	Skowhegan	biomass plant	*Acer rubrum*	10.4	8	44.416667	-070.15	90
Hancock	Trenton	importer	*Acer rubrum*		8	44.31734	-068.61293	98
Hancock	Sedgwick	importer	*Acer rubrum*		8	44.44510	-068.37141	97

All samples were screened for ALB and other potential invasive insects. No target or other invasives were found in any samples.

Appendix B
2013 Invasive Conifer Insect Survey

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Background

The forests of *Pinaceae* species are a strategic national resource, used for lumber, plywood stock, pulpwood, and increasingly as a potential feedstock for biomass. Exotic pests continue to pose serious threats to these resources in the U.S. This threat has resulted in actual or potential regulatory action for a number of species (eg: pine shoot beetle; European woodwasp).

The specific objective of this project is to conduct a survey to determine presence or absence of four exotic pests of conifers, three of which are listed on the AHP Priority Pest List; pine beauty moth (*Panolis flammea*), pine tree lappet (*Dendrolimus pini*) and Siberian silk moth (*Dendrolimus sibiricus*); and the brown spruce longhorned beetle (*Tetropium fuscum*), which is a devastating pest of spruce in nearby Canada.

The pine beauty moth may be introduced into the United States through nursery stock. Eggs are laid on pine needles and may be able to survive international trade as they usually take around 14 days to mature before hatch. Pupae may also move through international trade if soil is present on host plants, although this is unlikely as movement of soil is restricted in trade to the United States.

The establishment of pine tree lappet in the United States could have adverse impacts on domestic and international trade and would likely result in domestic and/or international quarantines or requirements for additional treatment of potentially infested host materials. The pine tree lappet has a moderate host range, feeding primarily on needles of coniferous hosts.

The Siberian silk moth is the most important defoliator of coniferous trees (*Pinus, Larix, Abies and Picea*) in Russia and Kazakhstan and one of the most important defoliators of *Larix* in China. Outbreaks occur over enormous areas (many thousands of hectares) and often lead to the death of entire forests.

The brown spruce longhorned beetle (BSLB)is an introduced wood boring pest, is native to north and central Europe and Japan, where it uses stressed and dying conifers as hosts, most notably the Norway spruce (*Picea abies*). In 1999, the beetle was detected in Point Pleasant Park, Halifax, NS, and subsequent investigations confirmed that beetles collected in the park as early as 1990 were, in fact, *T. fuscum*. Studies conducted by the Canadian Forest Service since 1999 indicate that the woodboring beetle is killing healthy spruce trees by feeding on the cambium and phloem and eventually girdling the tree. BSLB is considered to be a quarantine pest in North America.

Traps were deployed in twenty high risk (or priority) sites for each pest. Traps were serviced every two weeks and screened for target species and scanned for non-target exotic pests as well.

- **Priority sites** such as sawmills and pulpmills, as well as other sites such as truck stops, firewood depots, etc... that are receiving or have received softwood logs from Nova Scotia should be selected. Traps should be set in predominately forested areas in close proximity to log holding areas (inventory yard) at these sites, generally within 1.25 mi.
- Consider placing some traps in stands that are in or are in close in proximity to **campgrounds,** truckstops, etc...
- General forested areas.
- Areas planted with nursery stock and trees are now mature.

Pine Beauty Moth (*Panolis flammea*)
Hosts: Scots Pine (*Pinus sylvestris*), pine (*Pinus* spp.)
Trapping: mid-April – mid-May, 4 weeks

- Lure: Rubber septum
- Trap: One uni-trap
- Placement: 1 to 2 m (3.28 to 6.56 feet). traps should not be obstructed by vegetation
- Spacing: When trapping for more than one species of moth, separate traps for different moth species by at least 20 meters (65 feet).

Pine-tree Lappet (*Dendrolimus pini*)
Hosts: pine (*Pinus* spp.); Scots Pine (*P. sylvestris*), White Pine (*P. strobus*), Mountain Pine (*P. mugo*), Norway Spruce (*Picea abies*), Fir (*Abies* spp.), Common Juniper (*Juniperus communis)*
Trapping: mid-June – August, 12 weeks

- Lure: Rubber septum, replace lure monthly (2 replacements)
- Trap: One modified milk carton trap with insert and enlarged holes

Siberian Silk Moth (*Dendrolimus sibiricus*)
Hosts: *Larix* spp., *Pinus* spp. *Abies* spp.
Note: Same trap/lure as Pine-tree lappet moth (one trap for both moths)

Brown Spruce Longhorned Beetle (*Tetropium fuscum)*
Hosts: White Spruce, (*Picea glauca*), Red Spruce, (*P. rubens*), Norway Spruce, (*P. abies*), and Black Spruce, (*P. mariana*).
Trapping: mid-May – August, 16 weeks.

- Lures: one UHR BSLB lure, one UHR ethanol lure, and one BSLB pheromone lure to trap.
- Trap: One panel trap
  - Hang trap from a seven foot rebar pole/conduit; <u>not</u> in a tree.
- Spacing: Set traps at least 3 feet from the live spruce and at least 100 feet away from other traps.

<u>No target insects or other invasive insets have been found to date.</u>

Sites for 2013 invasive conifer insects survey

Trap	Town	County		Latitude	Longitude	Up	Down	Duration
T. fuscum	Brownfield	Oxford	Campground	43.96	-70.89	5/14	9/12	118
T. fuscum	Brunswick	Cumberland	camper staging	43.91	-69.92	5/14	9/10	116
T. fuscum	Damariscotta	Lincoln	Campground	44.03	-69.46	5/16	9/8	112
T. fuscum	Dixfield	Oxford	Mill	44.53	-70.45	5/14	9/12	118
T. fuscum	Farmington	Franklin	Logyard	44.69	-70.18	5/15	9/9	114
T. fuscum	Freeport	Cumberland	Forest	43.86	-70.11	5/14	9/10	116
T. fuscum	Houlton	Aroostook	rest stop	46.14	-67.83	5/15	9/3	108
T. fuscum	Masardis	Aroostook	Mill	46.53	-68.36	5/16	9/3	107
T. fuscum	Newry	Oxford	Resort	44.47	-70.83	5/17	9/12	115
T. fuscum	Crystal	Aroostook	Mill	46.70	-68.01	5/18	9/3	105
T. fuscum	Presque Isle	Aroostook	Boxstore	46.00	-68.41	5/19	9/3	104
T. fuscum	Rangeley	Franklin	camper staging	44.96	-70.64	5/15	9/9	114
T. fuscum	Scarborough	Cumberland	camper staging	43.60	-70.37	5/14	9/10	116
T. fuscum	Skowhegan	Somerset	Mill	44.71	-69.65	5/15	9/9	114
T. fuscum	Solon	Somerset	Mill	44.94	-69.86	5/15	9/9	114
T. fuscum	South Portland	Cumberland	Boxstore	43.63	-70.32	5/14	9/10	116
T. fuscum	Standish	Cumberland	Campground	43.82	-70.63	5/14	9/12	118
T. fuscum	Stratton	Franklin	Mill	45.14	-70.43	5/15	9/9	114
T. fuscum	Trout Brook	Piscataquis	Campground	46.16	-68.85	5/13	9/5	112
T. fuscum	Weld	Franklin	Campground	44.68	-70.44	5/15	9/12	117
Trap	Town	County		Latitude	Longitude	Up	Down	Duration
P. flammea	Brownfield	Oxford	Campground	43.96	-70.89	4/10	5/29	49
P. flammea	Brunswick	Cumberland	camper staging	43.90	-69.92	4/10	5/28	48
P. flammea	Damariscotta	Lincoln	Campground	44.03	-69.46	4/11	5/31	50
P. flammea	Dixfield	Oxford	Mill	44.53	-70.45	4/10	5/29	49
P. flammea	Farmington	Franklin	Logyard	44.69	-70.18	4/11	5/29	48
P. flammea	Freeport	Cumberland	Forest	43.86	-70.11	4/9	5/28	49
P. flammea	Newry	Oxford	Resort	44.47	-70.83	4/10	5/29	49
P. flammea	Rangeley	Franklin	camper staging	44.96	-70.64	4/11	5/30	49
P. flammea	Scarborough	Cumberland	camper staging	43.60	-70.37	4/9	5/28	49
P. flammea	Skowhegan	Somerset	Mill	44.71	-69.65	4/11	5/31	50
P. flammea	Solon	Somerset	Mill	44.94	-69.86	4/11	5/31	50
P. flammea	South Portland	Cumberland	Boxstore	43.63	-70.32	4/9	5/28	49
P. flammea	Steep Falls	Cumberland	Campground	43.81	-70.64	4/10	5/28	48
P. flammea	Stratton	Franklin	Mill	45.14	-70.43	4/11	5/30	49
P. flammea	Weld	Franklin	Campground	44.68	-70.45	4/14	5/29	45
P. flammea	Ashland	Aroostook	Mill	46.62	-68.41	4/13	6/10	57
P. flammea	Easton	Aroostook	Mill	46.63	-67.87	4/13	6/10	57
P. flammea	Fort Fairfield	Aroostook	Forest	46.75	-67.87	4/13	6/10	57
P. flammea	Moro Plantation	Aroostook	Forest	46.21	-68.33	4/13	6/10	57
P. flammea	Washburn	Aroostook	Forest	46.83	-68.10	4/13	6/10	57
Trap	Town	County		Latitude	Longitude	Up	Down	Duration
Dendrolimus spp.	Brownfield	Oxford	Campground	43.96	-70.88	6/13	9/12	89
Dendrolimus spp.	Brunswick	Cumberland	camper staging	43.90	-69.92	6/14	9/10	86
Dendrolimus spp.	Damariscotta	Lincoln	Campground	44.03	-69.46	6/14	9/8	84
Dendrolimus spp.	Dixfield	Oxford	Mill	44.53	-70.45	6/13	9/12	89

Dendrolimus spp.	Farmington	Franklin	Logyard	44.69	-70.18	6/13	9/9	86
Dendrolimus spp.	Freeport	Cumberland	Forest	43.86	-70.11	6/14	9/10	86
Dendrolimus spp.	Newry	Oxford	Resort	44.47	-70.83	6/13	9/12	89
Dendrolimus spp.	Rangeley	Franklin	camper staging	44.96	-70.64	6/18	9/9	81
Dendrolimus spp.	Scarborough	Cumberland	camper staging	43.60	-70.37	6/11	9/10	89
Dendrolimus spp.	Skowhegan	Somerset	Mill	44.71	-68.35	7/17	9/9	52
Dendrolimus spp.	Solon	Somerset	Mill	44.94	-69.86	6/18	9/9	81
Dendrolimus spp.	South Portland	Cumberland	Boxstore	43.63	-70.32	6/11	9/10	89
Dendrolimus spp.	Standish	Cumberland	Campground	43.81	-70.64	6/11	9/12	91
Dendrolimus spp.	Stratton	Franklin	Mill	45.14	-70.43	6/18	9/9	81
Dendrolimus spp.	Weld	Franklin	Campground	44.68	-70.46	6/18	9/12	84
Dendrolimus spp.	Ashland	Aroostook	Mill	46.62	-68.40	6/17	9/3	76
Dendrolimus spp.	Easton	Aroostook	Mill	46.63	-67.87	6/17	9/3	76
Dendrolimus spp.	Fort Fairfield	Aroostook	Forest	46.75	-67.87	6/17	9/3	76
Dendrolimus spp.	Moro Plantation	Aroostook	Forest	46.20	-68.33	6/17	9/4	77
Dendrolimus spp.	Washburn	Aroostook	Forest	46.83	-68.10	6/17	9/5	78

Appendix C
Monitoring for Emerald Ash Borer (*Agrilus planipennis*): Purple Prism Traps, Trap Trees, and Biosurveillance with *Cerceris fumipennis*

Colleen Teerling
Forest Entomologist
Maine Forest Service
168 State House Station, Augusta, Maine 04333-0168

Introduction: Emerald ash borer (EAB) is a serious invasive pest of ash trees (*Fraxinus* spp.). This insect is native to Asia and attacks all species of ash in North America. Ash trees on this continent have no defenses against the EAB and usually die within a few years of attack. Emerald ash borer was first found in Michigan in 2002, and since then has spread rapidly throughout the eastern part of the continent. EAB has killed millions of trees in the last several years, and has the potential to destroy ash in North America in the same way that Dutch elm disease decimated the elm.

In the spring of 2013, EAB was discovered in Concord, New Hampshire, within about 50 miles of Maine's border. In November 2013, it was found in North Andover, MA, within about 30 miles of Kittery, ME. This has increased the urgency for multi-tiered monitoring for EAB in Maine. If EAB is not already in Maine, undetected, we suspect it will arrive soon.

A very large proportion of new EAB infestations are caused by people unknowingly moving infested firewood. Often new EAB infestations are not found for several years, during which time the insects can be unwittingly spread further in firewood from those new areas. People can help slow the spread of EAB and protect the forests they care about by leaving their firewood at home when they travel. As of August 2010, it is unlawful to bring firewood from out of state into Maine. Maine Forest Service has an active "Leave Your Firewood At Home" campaign which is directed toward people from out-of-state, as well as Maine residents.

The Maine Forest Service investigates reports of possible EAB infestations. Maine also monitors for EAB using three methods: purple prism traps, girdled trap trees, and biosurveillance

Purple Trap Survey: In 2013, the Maine Forest Service (MFS) coordinated Maine's participation in the second national EAB survey with sticky purple panel traps baited with manuca oil and hexanol. Approximately 856 traps (picture on right) were hung in ash trees throughout the state in pre-determined locations. In addition, we hung traps in 11 locations (previous concentration yards and mill sites) where ash had been accepted in the past 4-6 years from possibly infested areas of CT, NH, and MA. Within the MFS, the Insect and Disease Lab partnered with FHM's Forest Inventory Unit as well as the Forest Protection Division. Additional partners were USDA-APHIS, the Animal and Plant Health Unit within the Maine Bureau of Agriculture, and the Penobscot Indian Nation. All traps were checked for EAB mid-season, and when taken down in the autumn. All were negative for EAB.

Girdled Trap Tree Survey: For the past two years, the Maine Forest Service has worked with volunteers from the Small Woodland Owners Association of Maine to create girdled trap trees for EAB. In May, ash trees are girdled which make them more attractive to EAB. After standing all summer and fall, the trees are felled in the winter and the bark peeled off the boles to look for any signs of EAB galleries. In the spring of 2012, eight volunteers girdled ash trees on their property, and in March and April of 2013, we had two log-peeling workshops where volunteers and personnel from the Department of Agriculture, Conservation and Forestry as well as the university worked together to peel the logs. Sixty 3-foot bolts from 8 trees were peeled and no EAB was detected.

In 2013-14, we expanded the trap tree network, including trees in more high-risk areas. Thirty-four trap trees were girdled in May 2013 and will be felled and peeled in early 2014:

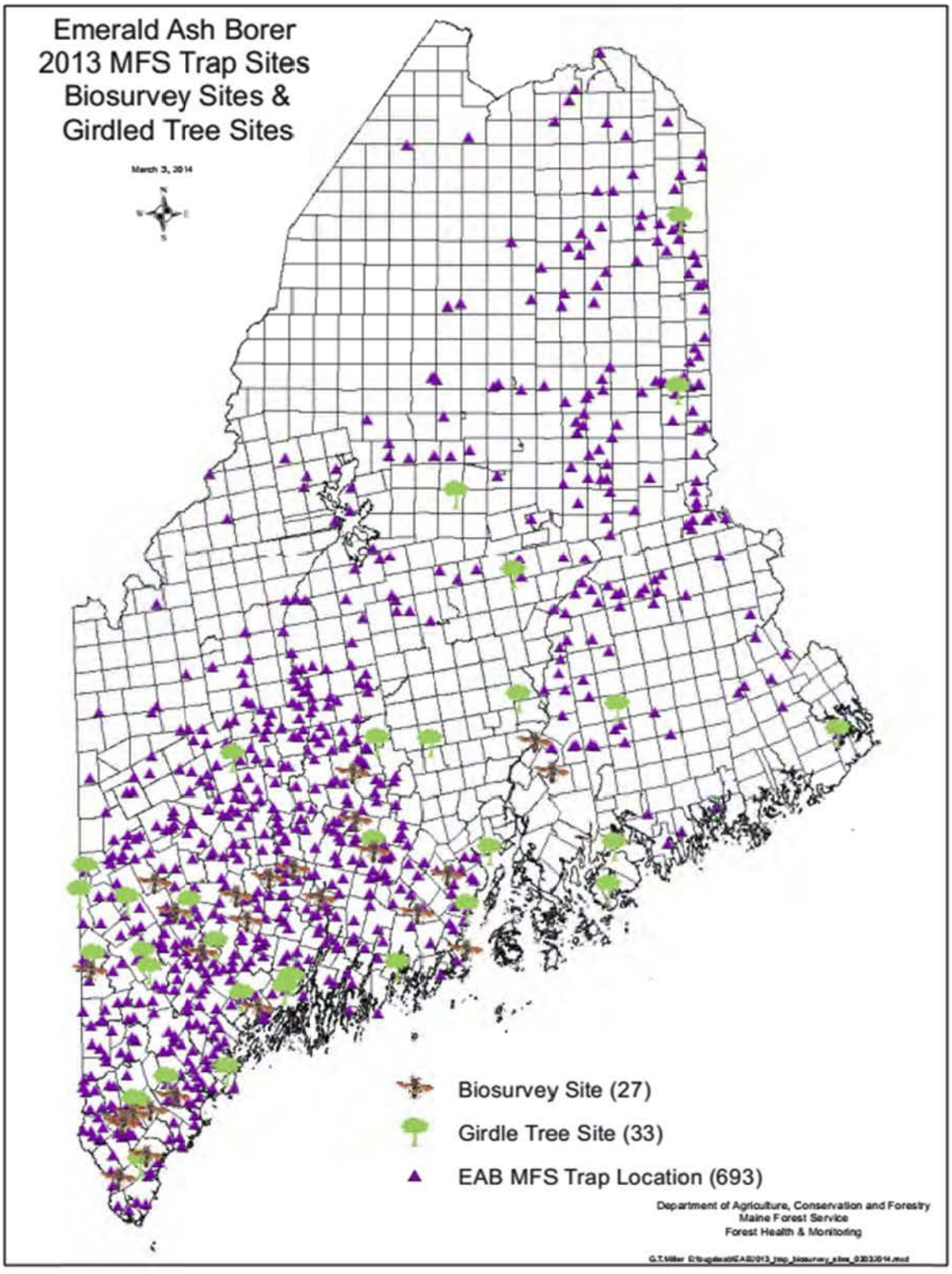
- MFS district foresters girded 12 trees throughout the state, primarily in private campgrounds.

- Bureau of Public Lands foresters girdled 3 trees in high-use wilderness campgrounds frequented by out-of-state campers.
- Two trees were girdled at campgrounds in the White Mountains National Forest.
- Four trees were girdled at campgrounds in State Parks.
- One street tree was girdled with the cooperation of the city of South Portland.
- One tree was girdled on private land in a high-risk area where symptoms of EAB had been seen.
- Eleven trees were girdled by volunteer landowners.

Biosurveillance: Seven new colonies of *Cerceris fumipennis* (photo right with native buprestid prey) were found in 2013, ranging in size from 1 to approximately 400 nests. In addition, 53 colonies which had been found in previous years were revisited and evaluated; some of these had not been visited in 2-3 years. Biosurveillance was carried out and buprestids were collected at 28 sites. A total of 207 beetles were collected. No EAB were collected.

Towns where new colonies of *Cerceris fumipennis* were found: Belfast, Madison, Readfield, Searsmont, Searsport, Wayne
Towns where biosurveillance was conducted: Alfred, China, Dedham, Farmingdale, Freeport Fryeburg, Greene, Harrison, Lyman, Norway, Owlshead, Poland, Saco, Sanford, Searsmont, Skowhegan, South Berwick, Turner, Union, Veazie, Wayne, Wells, Winslow, York

Emerald Ash Borer Monitoring Sites



Appendix D
Forestry Related Quarantines in Maine – 2013

The five forestry related state quarantines currently in effect in Maine are: White Pine Blister Rust, Gypsy Moth, European Larch Canker, Hemlock Woolly Adelgid and Pine Shoot Beetle. With the exception of the White Pine Blister Rust Quarantine, the regulated material designated in the rules and regulations may be moved freely within the quarantine area. Movement from the quarantine area to unregulated areas is restricted.

The Maine Forest Service maintains compliance agreements with facilities outside the quarantine areas which allow some movement of regulated materials outside the quarantine zones. Questions about forestry related quarantines and moving regulated material and requests for compliance agreements can be directed to Allison Kanoti, e-mail: allison m kanoti@maine.gov; phone: (207)-287-2431; Maine Forest Service Insect and Disease Lab, 168 State House Station, Augusta, ME 04333-0168. More details are available on our Website: http://maine.gov/dacf/mfs/forest_health/quarantine_information html.

The following is only a partial summary of the rules. Refer to the cited statutory authority and related rules for complete quarantine regulations. Information about regulated areas can be found at the end of this section.

I. White Pine Blister Rust

a. Rules and Regulation

i. Title 12 MRSA 1988, Subchapter III, §803:8305 Shipment Prohibited.
ii. Department of Conservation, Bureau of Forestry Rules Chapter One.

b. Summary: *Ribes* spp. (currants and gooseberries) are alternate hosts for the non-native white pine blister rust fungus (*Cronartium ribicola*). This disease causes mortality and severely reduces the commercial value of eastern white pine (*Pinus strobus*). Planting or possession of European black currant, *Ribes nigrum*, or its varieties or hybrids anywhere within the boundaries of the State of Maine is prohibited. The sale, transportation, further planting or possession of plants of other species in the genus *Ribes* (commonly known as currants and gooseberries) including cultivated wild, or ornamental sorts) is prohibited in all or part of the following counties: York, Cumberland, Androscoggin, Kennebec, Sagadahoc, Lincoln, Knox, Waldo, Hancock, and parts of Oxford, Franklin, Somerset, Piscataquis, Penobscot, Aroostook, and Washington (see map and list of towns at the end of this section).

This quarantine is administered by the Forest Health & Monitoring Division of the Maine Forest Service, phone: (207) 287-2431 or (207) 287-2791.

c. **New in 2013:** See *White Pine Blister Rust* in the *Diseases: Non-native* section of the Annual Summary Report for a discussion of European black currant news from 2013.

Gypsy Moth

d. Rules and Regulation:

i. 7 CFR Part 301.45, United States Department of Agriculture, Animal & Plant Health Inspection Service, Plant Protection and Quarantine as printed in the Federal Register.
ii. Title 12 MRSA, §8305 of the Laws of the State of Maine.

e. Summary: The infested area in Maine is quarantined for the movement of regulated articles, which includes wood of any species such as logs, pulpwood, trees, shrubs, firewood, Christmas trees, and chips, and requires the inspection and certification of such material if movement is *from the infested area* of the state *to non-infested states and foreign countries*. This is administered by the USDA-APHIS, PPQ in Hermon, Maine, phone: (207) 848-5199.

Since **Maine is not completely infested and quarantined**, wood or regulated articles moving *from the infested area* of the state *to the non-infested area* of the state must be accompanied by a certificate or go to a facility under state compliance agreement which allows the reception of such articles. Regulated articles moving *from the non-infested* area of the state *to other non-infested states or non-infested parts of Canada* must be accompanied by a state permit stating that the regulated article originated outside of the infested

area of the state. This is managed by the Forest Health & Monitoring Division of the Maine Forest Service, phone (207) 287-2431 or (207)287-2791.

f. **New in 2013:** The regulated area for the gypsy moth quarantine is due for expansion. See *gypsy moth* in the Annual Summary Report for a list of new towns with egg mass detections.

II. European Larch Canker

a. Rules and Regulation:

i. 7 CFR Part 301.91 of the United States Department of Agriculture, Animal & Plant Health Inspection Service, as published in the Federal Register

ii. Title 12 MRSA, §8305 of the Laws of the State of Maine.

b. **Summary:** All parts of larch (*Larix* spp.) including but not limited to logs, pulpwood, branches, twigs, etc., are regulated. Parts of Hancock, Knox, Lincoln, Waldo, and Washington counties are designated as the quarantined area from which their movement is restricted. This is managed by the USDA-APHIS, PPQ in Hermon, Maine, phone: (207) 848-5199; and the Forest Health & Monitoring Division of the Maine Forest Service, phone (207) 287-2431 or (207) 287-2791.

c. **New in 2013:** Eradication efforts continue in Brunswick (Cumberland County). See *European larch canker* in this Annual Summary Report for more details.

III. Hemlock Woolly Adelgid

a. Rules and Regulations:

i. 7 MRSA, Chapter 409, §2301-2303 of the Laws of the State of Maine.

ii. Department of Agriculture, Food & Rural Resources, Division of Plant Industry Rules Chapter 266.

b. Summary: Hemlock Woolly Adelgid is quarantined to prevent its artificial spread in the State, in order to protect Maine's forest, timber and wildlife resources from this destructive pest. Rooted hemlock plants, hemlock branches and/or needles, hemlock chips with top material (branches and/or needles) and uncomposted bark with top material (branches and/or needles) are regulated. The area currently under quarantine includes all of York, Lincoln and Sagadahoc Counties and parts of Androscoggin, Cumberland, and Kennebec Counties in Maine; portions of the northeastern United States to our south and west; the States of Alaska, California, Oregon and Washington in the western United States; and the Province of British Columbia in Canada.

Questions about importing hemlock seedlings and nursery stock should be directed to Animal and Plant Health, 28 State House Station, Augusta, ME 04333; Tel. (207) 287-3891. Questions about movement of chips, bark and top material should be directed to the Insect and Disease Laboratory, 168 state House Station, Augusta, ME 04333; phone: (207) 287-3147.

c. **New in 2013:** The revision of the Hemlock Woolly Adelgid Quarantine Rule has been finalized and is in effect as of 9/25/2013. This final rule modifies the existing HWA quarantine by adding 81 towns in Maine and additional counties in other states that have been found to be infested with this pest to the area under quarantine. It also removes roundwood from the list of regulated articles and simplifies some of the reporting requirements imposed on State Regulatory Officials in states that are free of this pest.

Receivers of roundwood material from the quarantine area no longer need compliance agreements. Those processors who receive chipped material with branches that may contain hemlock from the regulated area will need to set up compliance agreements with the Maine Forest Service.

Operators who plan to move hemlock top material from the regulated area would be handling a regulated product, and should familiarize themselves with the quarantine.

IV. Pine Shoot Beetle

a. Rules and Regulations:

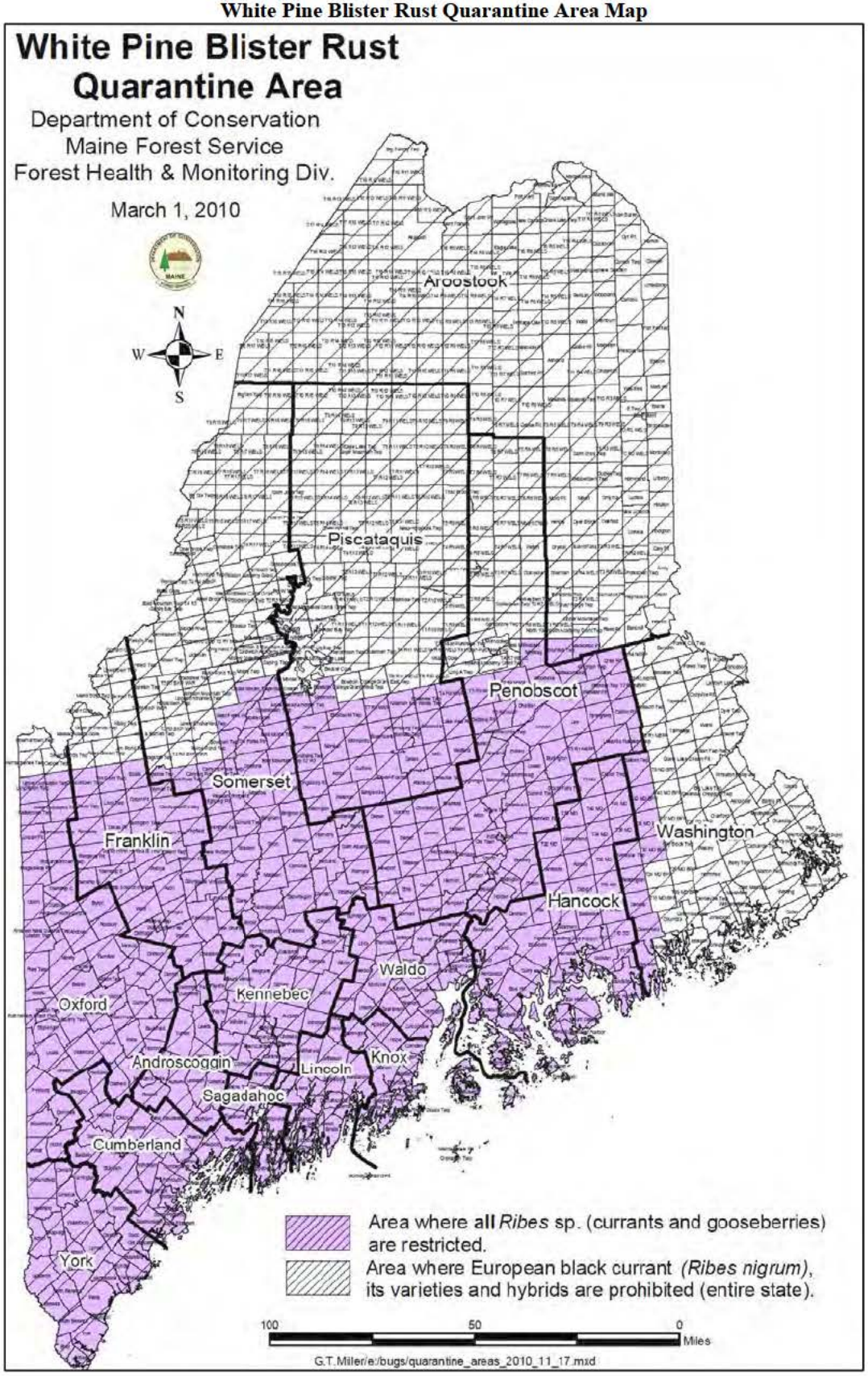
i. 7 CFR Part 301.5, United States Department of Agriculture, Animal & Plant Health Inspection Service, Plant Protection and Quarantine as printed in the Federal Register

ii. 7 MRSA, Chapter 409, Section 2301 of the Laws of the State of Maine.
iii. Department of Agriculture, Food & Rural Resources, Division of Plant Industry Rules Chapter 268.

b. Summary: This quarantine designates regulated areas in the United States of America including the following areas in Maine: all counties except Aroostook and Washington Counties. Regulated articles are pine products with bark including entire plants, or plant parts such as Christmas trees, nursery stock, branches, boughs and stumps, pine logs and lumber with bark attached and bark mulch, nuggets or wood chips with bark attached. This is managed by the USDA-APHIS, PPQ in Hermon, Maine, phone: (207) 848-5199; and the Forest Health & Monitoring Division of the Maine Forest Service, phone (207) 287-2431 or (207) 287-2791.

NOTE: A summary of forestry related quarantines and links to maps and Federal and State laws and rules can be found on our web-site: http://maine.gov/dacf/mfs/forest_health/quarantine_information.html**.**

White Pine Blister Rust Quarantine Area Map



Towns Regulated by Maine's White Pine Blister Rust Quarantine*

Note:** ***Ribes nigrum, **European black currant and its varieties or hybrids are prohibited statewide.**

Androscoggin County: The entire County.

Aroostook County: Macwahoc Plt, Molunkus Twp

Cumberland County: The entire County.

Franklin County: Avon, Carrabassett Valley, Carthage, Chesterville, Coplin Plt, Dallas Plt, Davis Twp, Eustis, Farmington, Freeman Twp, Industry, Jay, Kingfield, Lang Twp, Madrid Twp, Mount Abram Twp, New Sharon, New Vineyard, Perkins Twp, Phillips, Rangeley, Rangeley Plt, Redington Twp, Salem Twp, Sandy River Plt, Stetsontown Twp, Strong, Temple, Tim Pond Twp, Township 6 North of Weld, Township D, Township E, Washington Twp, Weld, Wilton, Wyman Twp

Hancock County: The entire County.

Kennebec County: The entire County.

Knox County: The entire County.

Lincoln County: The entire County.

Oxford County: Adamstown Twp, Albany Twp, Andover, Andover North Surplus, Andover West Surplus Twp, Batchelders Grant Twp, Bethel, Brownfield, Buckfield, Byron, C Surplus, Canton, Denmark, Dixfield, Fryeburg, Gilead, Grafton Twp, Greenwood, Hanover, Hartford, Hebron, Hiram, Lincoln Plt, Lovell, Lower Cupsuptic Twp, Lynchtown Twp, Magalloway Plt, Mason Twp, Mexico, Milton Twp, Newry, Norway, Otisfield, Oxford, Paris, Parkertown Twp, Peru, Porter, Richardsontown Twp, Riley Twp, Roxbury, Rumford, Stoneham, Stow, Sumner, Sweden, Township C, Upper Cupsuptic Twp, Upton, Waterford, West Paris, Woodstock

Penobscot County: Alton, Argyle Twp, Bangor, Bradford, Bradley, Brewer, Burlington, Carmel, Carroll Plt, Charleston, Chester, Clifton, Corinna, Corinth, Dexter, Dixmont, Drew Plt, Eddington, Edinburg, Enfield, Etna, Exeter, Garland, Glenburn, Grand Falls Twp, Greenbush, Greenfield Twp, Hampden, Hermon, Holden, Howland, Hudson, Indian Island, Kenduskeag, Kingman Twp, Lagrange, Lakeville, Lee, Levant, Lincoln, Lowell, Mattamiscontis Twp, Mattawamkeag, Maxfield, Medway, Milford, Newburgh, Newport, Old Town, Orono, Orrington, Passadumkeag, Plymouth, Prentiss Twp T7 R3 NBPP, Pukakon Twp, Seboeis Plt, Springfield, Stetson, Summit Twp, T2 R8 NWP, T2 R9 NWP, T3 R1 NBPP, T3 R9 NWP, Veazie, Webster Plt, Winn, Woodville,

Piscataquis County: Abbot, Atkinson, Barnard Twp, Blanchard Twp, Bowerbank, Brownville, Dover-Foxcroft, , Ebeemee Twp, Elliottsville Twp, Greenville, Guilford, Katahdin Iron Works Twp, Kingsbury Plt, Lake View Plt, Medford, Milo, Monson, Moosehead Junction Twp, Orneville Twp, Parkman, Sangerville, Sebec, Shirley, T4 R9 NWP, T7 R9 NWP, Wellington, Williamsburg Twp, Willimantic

Sagadahoc County: The entire County.

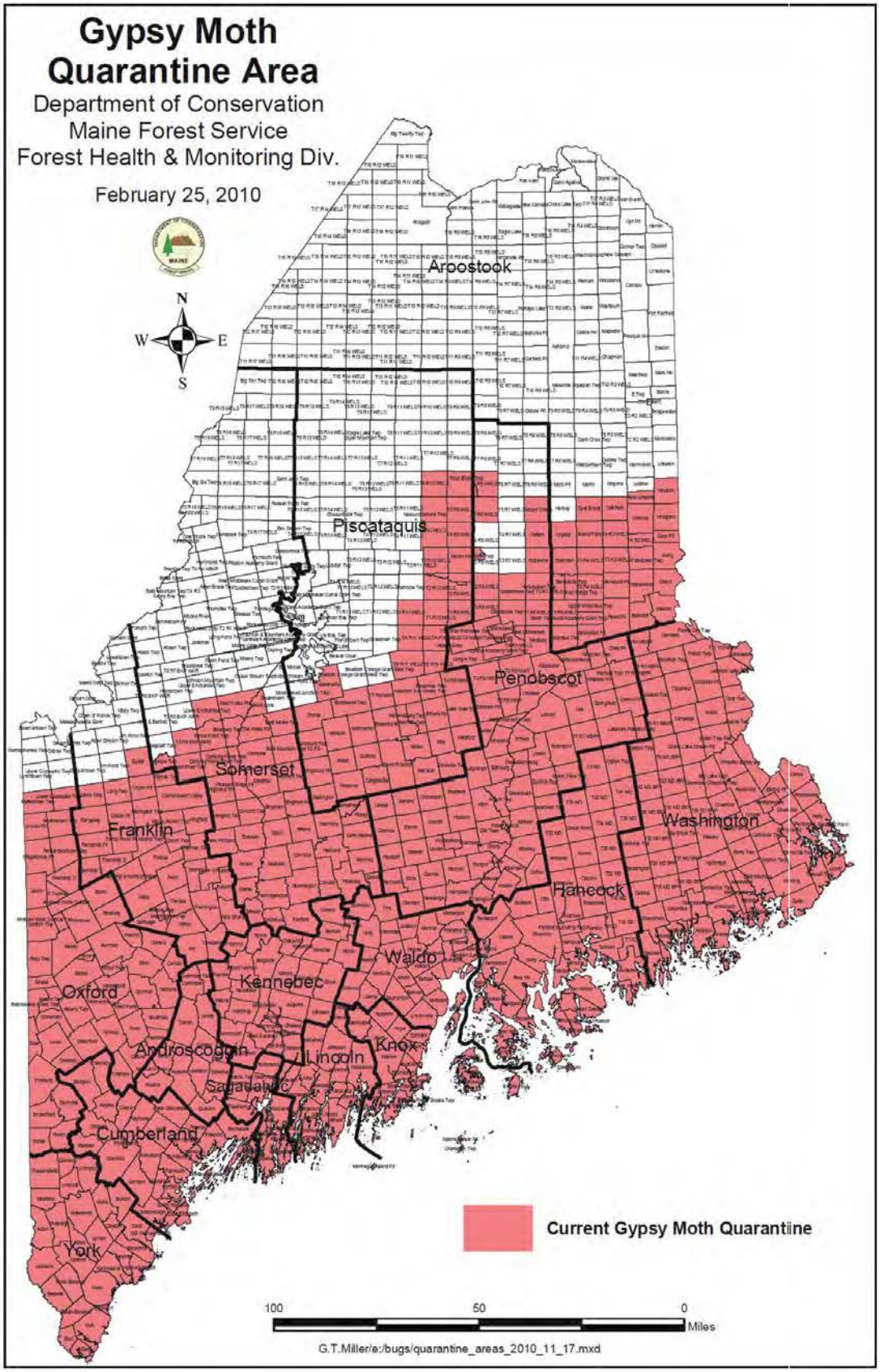
Somerset County: Anson, Athens, Bald Mountain Twp T2 R3, Bigelow Twp, Bingham, Bowtown Twp, Brighton Plt, Cambridge, Canaan, Caratunk, Carrying Place Town Twp, Carrying Place Twp, Chase Stream Twp, Concord Twp, Cornville, Dead River Twp, Detroit, East Moxie Twp, Embden, Fairfield, Harmony, Hartland, Highland Plt, Indian Stream Twp, Lexington Twp, Madison, Mayfield Twp, Mercer, Moscow, Moxie Gore, New Portland, Norridgewock, Palmyra, Pittsfield, Pleasant Ridge Plt, Ripley, Saint Albans, Skowhegan, Smithfield, Solon, Squaretown Twp, Starks, The Forks Plt, West Forks Plt

Waldo County: The entire County.

Washington County: Beddington, Cherryfield, Deblois, Devereaux Twp, Sakom Twp, Steuben, T30 MD BPP, T36 MD BPP, T42 MD BPP

York County: The entire County.

Gypsy Moth Quarantine Area Map



Areas Regulated by Maine's Gypsy Moth Quarantine

Baxter State Park –The entire park (entire townships of: Mount Katahdin Twp, Nesourdnahunk Twp, T3 R10 WELS, T4 R9 WELS, T5 R9 WELS, T6 R10 WELS, Trout Brook Twp and portions of: T2 R10 WELS, T2 R9 WELS, T3 R8 WELS, T4 R10 WELS, T6 R8 WELS)

Androscoggin County- The entire County.

Aroostook County- Amity, Bancroft, Benedicta Twp, Cary Plt, Crystal, Dyer Brook, Forkstown Twp, Glenwood Plt, Haynesville, Hodgdon, Houlton, Island Falls, Linneus, Macwahoc Plt, Molunkus Twp, North Yarmouth Academy Grant Twp, New Limerick, Oakfield, Orient, Reed Plt, Sherman, Silver Ridge Twp, T1 R5 WELS, T2 R4 WELS, T3 R3 WELS, T3 R4 WELS, T4 R3 WELS, TA R2 WELS, Upper Molunkus Twp, Weston

Cumberland County- The entire County.

Franklin County- Avon, Carrabassett Valley, Carthage, Chesterville, Coplin Plt, Dallas Plt, Davis Twp, Eustis, Farmington, Freeman Twp, Industry, Jay, Kingfield, Lang Twp, Madrid Twp, Mount Abram Twp, New Sharon, New Vineyard, Perkins Twp, Phillips, Rangeley, Rangeley Plt, Redington Twp, Salem Twp, Sandy River Plt, Strong, Temple, Township 6 North of Weld, Township D, Townthip E, Washington, Weld, Wilton, Wyman Twp

Hancock County- The entire County.

Kennebec County- The entire County.

Knox County- The entire County.

Lincoln County- The entire County.

Oxford County- Adamston Twp, Albany Twp, Andover, Andover North Surplus, Andover West Surplus Twp, Batchelders Grant Twp, Bethel, Brownfield, Buckfield, Byron, C Surplus, Canton, Denmark, Dixfield, Fryeburg, Gilead, Grafton Twp, Greenwood, Hanover, Hartford, Hebron, Hiram, Lincoln Plt, Lovell, Lower Cupsuptic Twp, Magalloway Plt, Mason Twp, Mexico, Milton Twp, Newry, Norway, Otisfield, Oxford, Paris, Parkertown Twp, Peru, Porter, Richardsontown Twp, Riley Twp, Roxbury, Rumford, Stoneham, Stow, Sumner, Sweden, Township C, Upton, Waterford, West Paris, Woodstock

Penobscot County- Alton, Argyle, Bangor, Bradford, Bradley, Brewer, Burlington, Carmel, Carroll Plt, Cedar Lake Twp, Charleston, Chester, Clifton, Corinna, Corinth, Dexter, Dixmont, Drew Plt, East Millinocket, Eddington, Edinburg, Enfield, Etna, Exeter, Garland, Glenburn, Grand Falls Twp, Greenbush, Greenfield Twp, Grindstone Twp, Hampden, Hermon, Herseytown Twp, Holden, Hopkins Academy Grant Twp, Howland, Hudson, Kenduskeag, Kingman Twp, Lagrange, Lakeville, Lee, Levant, Lincoln, Long A Twp, Lowell, Mattamiscontis Twp, Mattawamkeag, Maxfield, Medway, Milford, Millinocket, Mount Chase, Newburgh, Newport, Old Town, Orono, Orrington, Passadumkeag, Patten, Plymouth, Prentiss Twp T7 R3 NBPP, Pukakon Twp, Seboeis Plt, Soldiertown Twp T2 R7 WELS, Springfield, Stacyville, Stetson, Summit Twp, T1 R6 WELS, T1 R8 WELS, T2 R8 NWP, T2 R8 WELS, T2 R9 NWP, T3 R1 NBPP, T3 Indian Purchase Twp, T4 Indian Purchase Twp, T5 R8 WELS, T6 R8 WELS, TA R7, Veazie, Veazie Gore, Webster Plt, Winn, Woodville and portions of T3 R8 WELS within the boundaries of Baxter State Park.

Piscataquis County- Abbot, Atkinson, Barnard Twp, Blanchard Plt, Bowerbank, Brownville, Dover-Foxcroft, Ebemee Twp, Elliotsville Twp, Greenville, Guilford, Katahdin Iron Works Twp., Kingsbury Plt, Lake View Plt, Medford, Milo, Monson, Mount Katahdin Twp, Nesourdnahunk Twp, Orneville Twp, Parkman, Sangerville, Sebec, Shirley, T1 R10 WELS, T1 R11 WELS, T1 R9 WELS, T2 R10 WELS, T2 R9 WELS, T3 R10 WELS,T4 R9 NWP, T4 R9 WELS, T5 R9 NWP, T5 R9 WELS, T6 R10 WELS, T7 R9 NWP, TA R10 WELS, TA R11 WELS, TB R10 WELS, TB R11 WELS, Trout Brook Twp, Wellington, Williamsburg Twp, Willimantic and portions of T4 R10 WELS within the boundaries of Baxter State Park.

Sagadahoc County- The entire County.

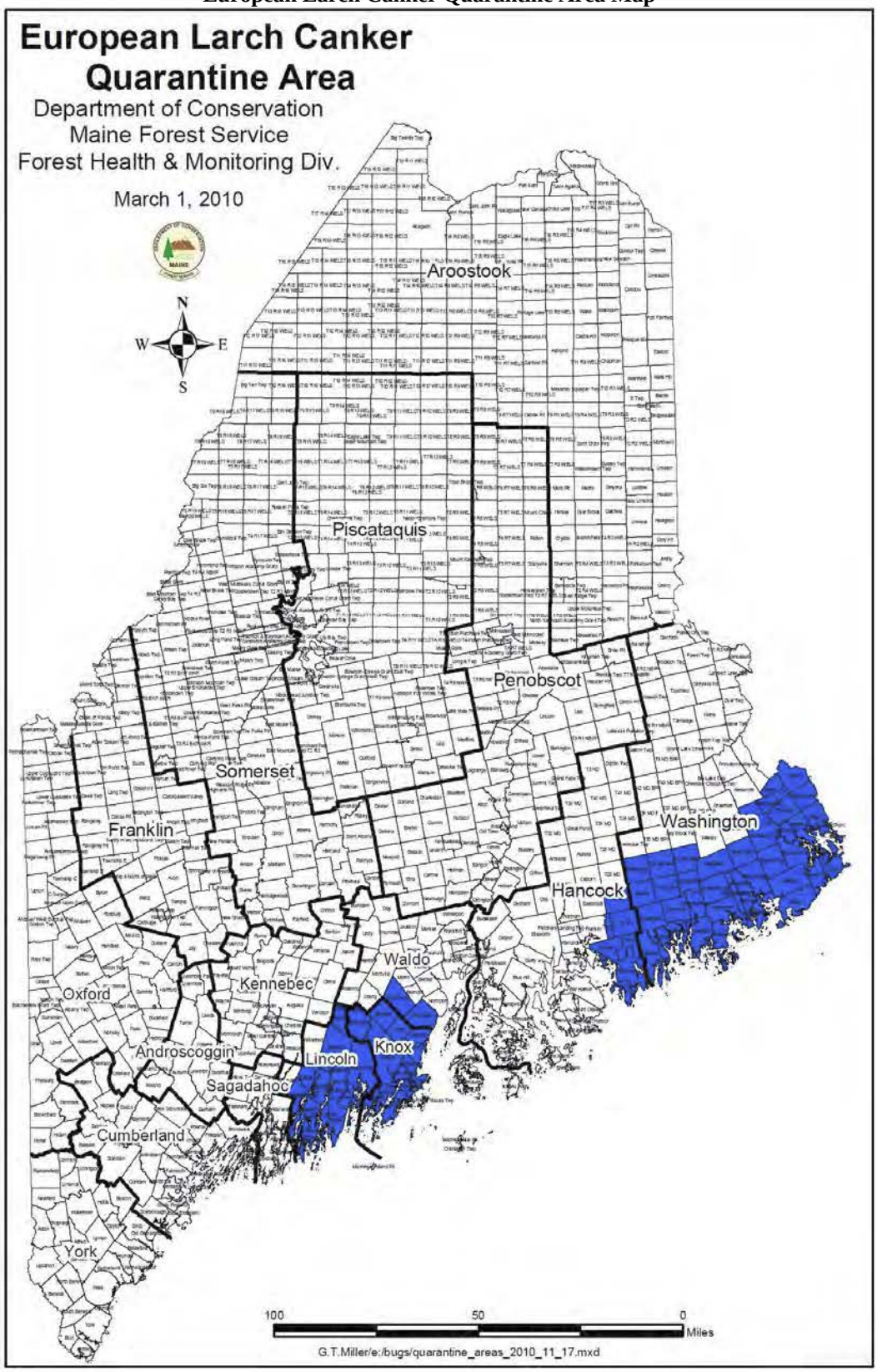
Somerset County- Anson, Athens, Bald Mountain Twp T2 R3, Bigelow Twp, Bingham, Bowtown Twp, Brighton Plt, Cambridge, Canaan, Caratunk, Carrying Place Twp, Carrying Place Town Twp, Concord Twp, Cornville, Dead River Twp, Detroit, East Moxie Twp, Embden, Fairfield, Harmony, Hartland, Highland Plt, Lexington Twp, Lower Enchanted Twp, Madison, Mayfield Twp, Mercer, Moscow, Moxie Gore, New Portland, Norridgewock, Palmyra, Pittsfield, Pierce Pond Twp, Pleasant Ridge Plt, Ripley, Skowhegan, Smithfield, Solon, Saint Albans, Starks, T3 R4 BKP WKR, The Forks Plt, West Forks Plt

Waldo County- The entire County.

Washington County- The entire County.

York County- The entire County.

European Larch Canker Quarantine Area Map



Towns Regulated by Maine's European Larch Canker Quarantine

Hancock County - Gouldsboro, Sorrento, Sullivan, T7 SD, T9 SD, T10 SD, and T16 MD, and Winter Harbor

Knox County - Appleton, Camden, Cushing, Friendship, Hope, Owls Head, Rockland, Rockport, Saint George, South Thomaston, Thomaston, Union, Warren, and Washington

Lincoln County - Alna, Boothbay, Boothbay Harbor, Bremen, Bristol, Damariscotta, Edgecomb, Jefferson, Newcastle, Nobleboro, Somerville, South Bristol, Southport, Waldoboro, Westport Island, and Wiscasset

Waldo County - Lincolnville and Searsmont

Washington County - Addison, Baring Plantation, Beals, Beddington, Berry Township, Calais, Cathance Township, Centerville Township, Charlotte, Cherryfield, Columbia, Columbia Falls, Cooper, Cutler, Deblois, Dennysville, East Machias, Eastport, Edmunds Township, Harrington, Jonesboro, Jonesport, Lubec, Machias, Machiasport, Marion Township, Marshfield, Meddybemps, Milbridge, Northfield, Pembroke, Perry, Robbinston, Roque Bluffs, Steuben, T18 MD BPP, T19 MD BPP, T24 MD BPP, T25 MD BPP, Trescott Township, Whiting, and Whitneyville

Areas in the United States Regulated by Maine's Hemlock Woolly Adelgid Quarantine

Quarantined Areas in Maine:

Androscoggin County: the towns of Auburn, Durham, Lewiston, Lisbon and Sabattus

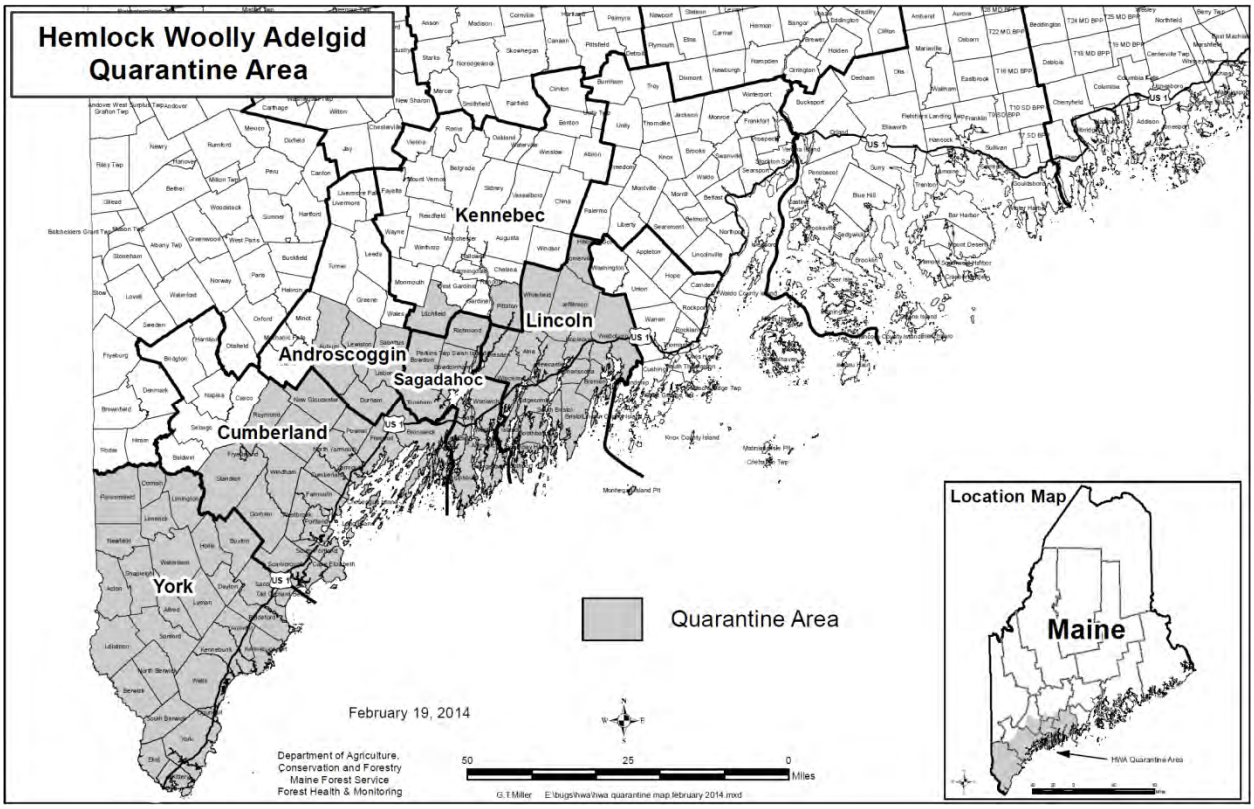
Cumberland County: the towns of Brunswick, Cape Elizabeth, Chebeague Island Cumberland, Falmouth, Freeport, Frye Island, Gray, Gorham, Harpswell, Long Island, New Gloucester, North Yarmouth, Portland, Pownal, Raymond, Scarborough, South Portland, Standish, Westbrook, Windham and Yarmouth

Kennebec County: the towns of Litchfield and Pittston

Lincoln County

Sagadahoc County

York County



Quarantined Counties in New Hampshire:

Belknap, Carroll, Cheshire, Hillsborough, Merrimack, Rockingham, Strafford

Quarantined Counties in Vermont: Bennington, Windham

Other Quarantined Areas:

Eastern United States: (see www.maine.gov/dacf/php/horticulture/HWAInfestedCounties.shtml)

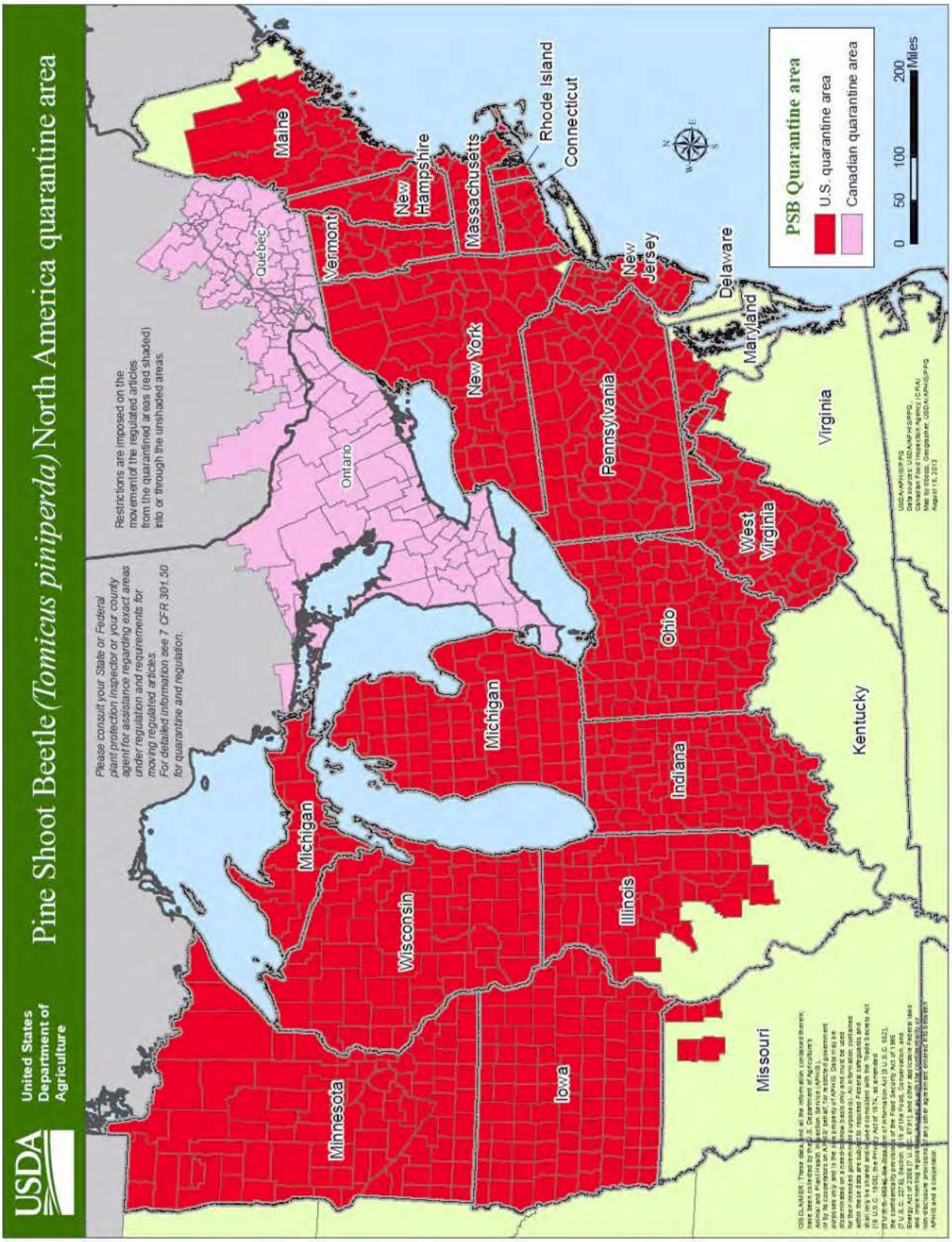
All or Parts of:
Connecticut (All)
Delaware (All)
Georgia (Parts)
Kentucky (Parts)
Massachusetts (All)
Maryland (Parts)
North Carolina (All)
New Jersey (All)
New York (Parts)
Pennsylvania (Parts)
Rhode Island (All)
South Carolina (Parts)
Tennessee (Parts)
Virginia (Parts)
West Virginia (Parts)

Western United States:

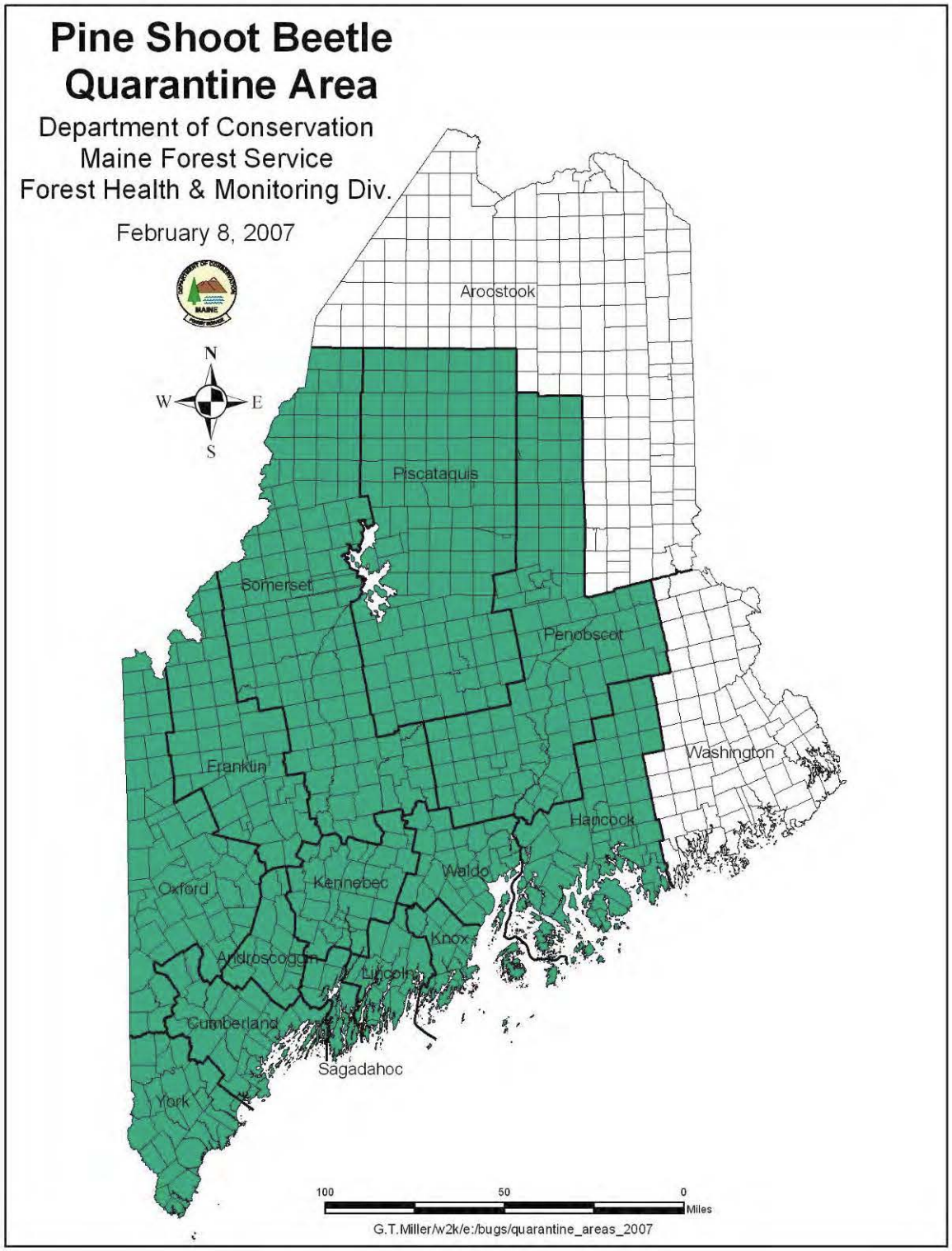
The Entire States of:
Alaska
California
Oregon
Washington

Western Canada
British Columbia

United States and Canadian Pine Shoot Beetle Quarantine Areas
www.aphis.usda.gov/plant_health/plant_pest_info/psb/downloads/psbquarantine.pdf



Maine Pine Shoot Beetle Quarantine Area Map



Maine Counties Regulated by the Pine Shoot Beetle Quarantine

Androscoggin, Cumberland, Franklin, Hancock, Kennebec, Knox, Lincoln, Oxford, Penobscot, Piscataquis, Sagadahoc, Somerset, Waldo and York Counties (All *except* Aroostook and Washington)

MFS Apr-12

Maine Forest Service - Forest Insect & Disease Diagnostic Request and Report Form

Sample provided - yes ☐ no ☐ Collection date _____

Please package disease samples in poly bags and insects in crush-proof containers.

Tree species affected _____

Township _____ County _____

Location in Township: (use area at right to construct map)

Property owner, address, and daytime phone number:

_____

_____

_____

_____

Location of affected plants:

- Forest or Woodlot ☐
- Yard or Landscape ☐
- Street or Driveway ☐
- Barnyard or Pasture ☐
- Tree Plantation ☐

Has the plant been recently transplanted? yes ☐ no ☐

Are there other plants of the same kind nearby? yes ☐ no ☐

Are they similarly affected? yes ☐ no ☐

Has the plant been recently fertilized? yes ☐ no ☐

Has the ground been disturbed? yes ☐ no ☐ when? _____

Have weed killers been used in the vicinity? yes ☐ no ☐ what? _____

Approximate size of trees: height _____ diameter _____ Number of trees checked _____

Damage Type: none _____ defoliation _____ wood borer _____ other _____

Damage Location: leaves _____ branches _____ trunk(s) _____ roots _____

Degree of damage: none _____ trace-light (<30%) _____ moderate (≥ 30-50%) _____ heavy-severe (>50%)

No. of trees affected: none _____ one _____ many _____ OR Number of acres _____

Describe problem and other additional information: _____

_____

_____

_____

Collector _____ Daytime Phone Number _____ email: _____

P.O. Address _____

If we need further information to diagnose this sample who should we contact? _____

Daytime Phone Number _____ email: _____

Send sample to: Insect & Disease Laboratory, 168 State House Station, Augusta, ME 04333-0168
(or deliver in person to 50 Hospital Street, Augusta Maine)
Tel. (207) 287-2431 Fax (207) 287-2432
e-mail: insects - charlene.donahue@maine.gov diseases - bill.ostrofsky@maine.gov

Please send diseased herbaceous material to: Dr. Bruce Watt, Pest Management Office, 491College Ave., Orono, ME 04473

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