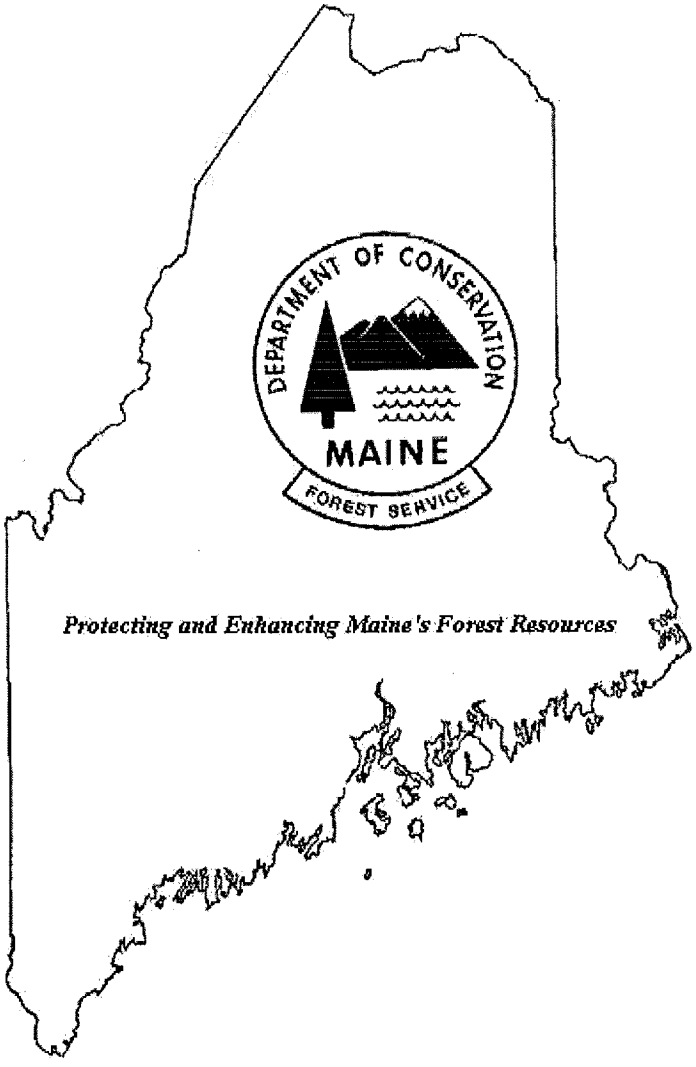
Forest & Shade Tree Insect & Disease Conditions for Maine

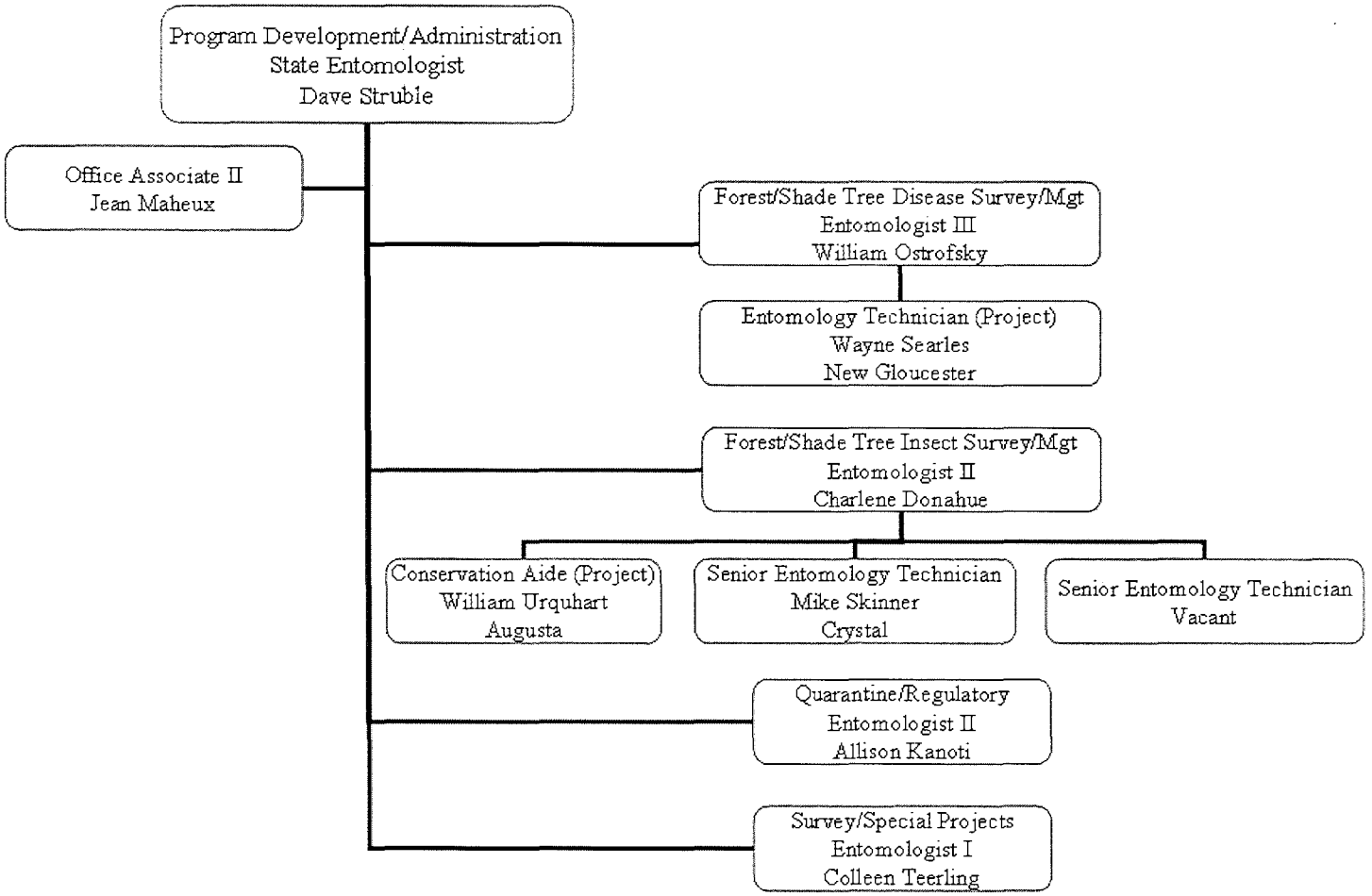
A Summary of the 2010 Situation



Forest Health & Monitoring Division
Summary Report No. 22
March 2011

Maine Forest Service
MAINE DEPARTMENT OF CONSERVATION
Augusta, Maine

Forest Health and Monitoring Division—Insect and Disease Management Unit



Forest Insect & Disease—Advice and Technical Assistance

Maine Department of Conservation, 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://www.maine.gov/doc/mfs/idmhome.htm

The Maine Forest Service/Forest Health and Monitoring (FH&M) Division 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 Web site and on the following page) 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 50 Hospital Street Augusta, Maine 04333-0168 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 Bill Urquhart, Conservation Aide	David Struble 22 State House Station Augusta, Maine 04333-0022 Phone: (207) 287-2791 Fax: (207) 287-8422 dave.struble@maine.gov Jean Maheux, Office Associate II	Mike Skinner, Entomology Technician 185 Crystal Road Island Falls, Maine 04747 Phone: (207) 463-2328 Radio Call #F-181 * Can be contacted directly for homeowner assistance in his area of the state.

Forest & Shade Tree – Insect & Disease Conditions for Maine
Reports for the 2011 Season

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168 Statehouse Station
Augusta, Maine 04333-0168

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Acknowledgements

Individual cooperators and the staff from many groups and organizations have contributed information to complete this Annual Summary Report. Our appreciation is extended to the landowners, foresters, and members of the general public who have provided us with insect and disease samples that were processed through our lab. Providing identification of and management assistance for insects, diseases, and abiotic damage to trees and forests has been, we sincerely hope, beneficial to our clients. In addition, the information we collect from submissions on pest occurrence, location, and severity provides us with a much more complete understanding of the forest conditions across the state.

Volunteers are invaluable resource, and much of what we do could not be fully carried out without their assistance. Volunteers form an integral part of three major survey efforts: Asian longhorned beetle, hemlock woolly adelgid (Take-A-Stand), and emerald ash borer (WaspWatchers). We thank the many people involved for their contributions. In addition, we thank Dave Bourque and Dana Michaud for the many hours they have spent sorting, cataloguing and identifying insects in the state insect collection.

Special recognition must be given to the three Maine State Government summer interns who were so critical to our project efforts this past year. Helen Birk, Rachael Mack, and Amanda Sawyer are bright, energetic and hard-working. Their enthusiasm and diligence throughout the summer was exemplary. We thank them all for their contributions to our mission, and for making even the sometimes tedious chores a real pleasure.

Maine Forest staff beyond the Insect & Disease Laboratory have augmented our efforts. Mike Devine, Melanie Duffy, Greg Bjork, Aron Bishop, Jeff Harriman and Jamie Dow have extended our reach across by servicing traps, delivering supplies, fitting some survey work into their schedule in far flung regions of the state. Our thanks are also extended to Greg Lord, Greg Miller, and Ken Laustsen, for providing valuable assistance with mapping, data retrieval, and data management. Their support and advice on so many technical issues is extremely valuable to us, and their expertise is always greatly appreciated.

As always, we also received much assistance and encouragement from many other administrative and field staff members of the Maine Department of Conservation, the Maine Department of Agriculture, the USDA-APHIS, and from our many contacts in the USDA Forest Service Northeastern Area – Forest Health Protection. Our contacts and cooperators in the other New England States and Maritime Provinces of Canada are also kindly acknowledged.

This report was assembled by the staff of the Maine Forest Service, Forest Health and Monitoring Division: Charlene Donahue, Allison Kanoti, William Ostrofsky, David Struble, and Colleen Teerling. As in the past, a substantial amount of the data and forest condition observations has been also provided by the Entomology Laboratory field staff: Wayne Searles, Mike Skinner, Grayln Smith, and William Urquhart. Their work simply remains essential to our mission.

Thank you all for the generous support.

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Printed under appropriation numbers 010-04A-5221-522 and 013-04A-2120-522 FHM7

Issued 03/11
Initial printing of 250

FOREST & SHADE TREE INSECT & DISEASE CONDITIONS FOR MAINE – A SUMMARY OF THE 2010 SITUATION

State Entomologist's Comments

Insect Conditions

Insects: Softwood Pests

Balsam Gall Midge
Paradiplosis tumifex
Hosts: Balsam Fir, Fraser Fir (*Abies balsamea, A. fraseri*)

Populations of balsam gall midge are at moderate to high levels especially in Downeast Maine. Christmas tree growers and wreath tippers are noticing the problem as it causes current year needles to drop off in the fall. This is a minor forest problem and does not affect tree health long term. Populations should drop in the next year or two now that they have been high for a couple of years.

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

Balsam woolly adelgid populations continued at low levels in 2010 and fir trees are recovering from past BWA infestations. This is a pest that will be back causing deformed growth and mortality.

Eastern Larch Beetle
Dendroctonus simplex
Host: Eastern Larch (*Larix laricina*)

Pockets of dead and dying larch infested with this species have been common since the mid 1970's and continue to be a common sight throughout the range of larch in Maine. Stands of larch in southern, central and Downeast regions of the state exhibit the highest mortality. Most tree mortality is generally in association with other stress factors, particularly extremes in water availability. Areas around beaver flowages, ponds and streams have been particularly affected.

Elongate Hemlock Scale
Fiorinia externa
Hosts: 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 (Figure 1). In 2010 it was found on planted hemlocks in Cape Elizabeth (Cumberland County) and Old Orchard Beach (York County). In two of these instances, spread to adjacent trees has been detected. At all four locations it appears the hemlocks arrived in Maine prior to the 2001 tightening of the hemlock woolly adelgid quarantine. Containment measures are planned at these sites.

The first forest infestation of elongate hemlock scale in Maine, likely representing natural spread of the insect, was detected while sampling for hemlock woolly adelgid predator beetles in Kittery Point (York County) in 2010. Samples were being taken from mid-canopy locations using a pole-pruner mounted basket. Light scale populations were found on all trees at this site sampled with the pole-pruner.

If you have planted hemlock check it for signs of this insect, especially stock that arrived in Maine prior to 2001. Additionally, planted fir and spruce originating in states south and west of Maine should be checked for this pest. Most other conifer species are generally only infested when adjacent to heavily infested hemlock, fir or spruce hosts. Hemlocks in areas infested by hemlock woolly adelgid should also be closely monitored for elongate hemlock scale. In late winter dropped hemlock branchlets that have accumulated on the snow pack can be examined. This allows you to check foliage that that would otherwise be inaccessible.

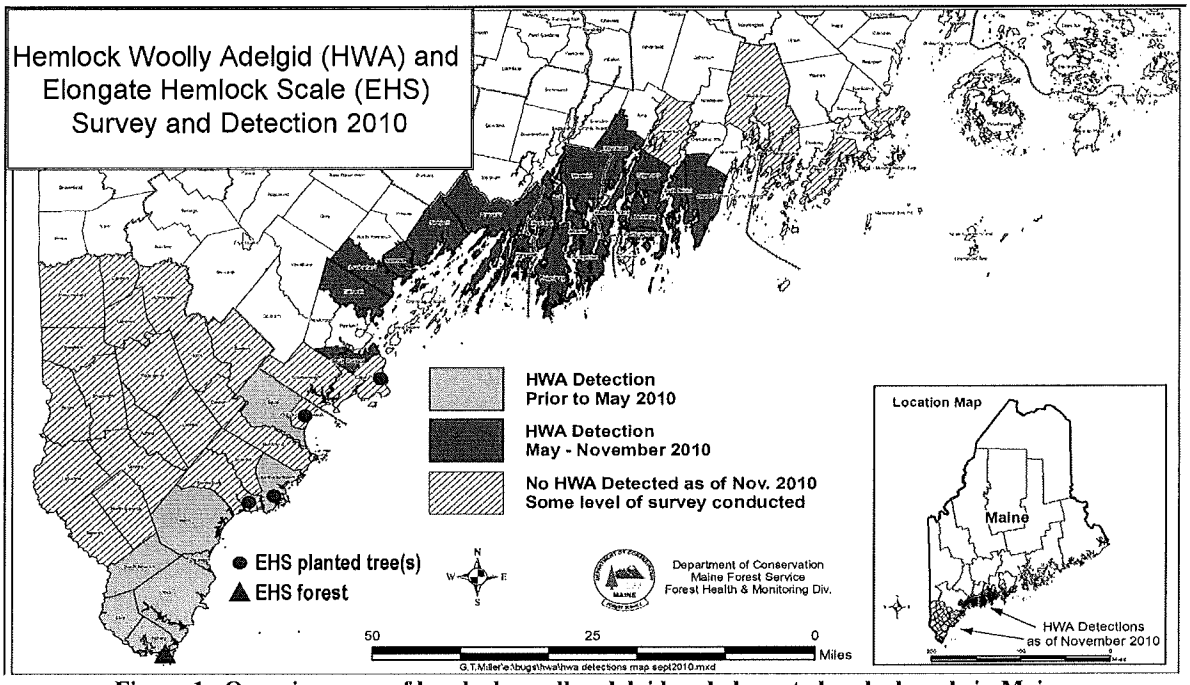


Figure 1. Overview map of hemlock woolly adelgid and elongate hemlock scale in Maine.

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

2010 was a year of dramatic changes in our knowledge of distribution of hemlock woolly adelgid in Maine (Figure 1). In May a landowner in Harpswell (Cumberland County) reported hemlock woolly adelgid in the forest on her property. Following confirmation of that detection resources were directed to survey the coastal areas of southern Maine. Wayne Searles and Amanda Sawyer did the lion's share of the survey and were successful in finding numerous additional infestations over a vast area. Arborists, homeowners, and a visitor from New Hampshire augmented MFS finds with additional reports.

Surveys in coastal and border towns continue at the time of the publication. No new infested towns have been detected since September. To date, infestations of naturalized hemlock woolly adelgid have been found in the following Maine towns:

- **Cumberland County**: Brunswick, Cumberland, Falmouth, Freeport, Harpswell, South Portland, Yarmouth, and Great Diamond Island (Island in Casco Bay, part of City of Portland)
- **Lincoln County**: Boothbay, Boothbay Harbor, Bristol, Edgecomb, South Bristol, Westport Island, Wiscasset
- **Sagadahoc County**: Arrowsic, Bath, Georgetown, Phippsburg, West Bath, Woolwich
- **York County**: Eliot, Kennebunkport, Kittery, Ogunquit, Saco, South Berwick, Wells and York

Delimiting surveys have not yet been conducted in most of the new locations. However, it is clear that there is a range of conditions at the sites: in some of the newly detected locations hemlock woolly adelgid is well established, in others, the detections may be isolated spots.

Infestations tend to be scattered and range from heavy to light. Tree damage has been noted on some adelgid-infested sites including some of the newly found locations in Cumberland, Lincoln and Sagadahoc Counties. Damage takes the form of increased crown transparency, seedling/sapling mortality and overstory mortality and is especially severe in areas prone to drought such as those with exposed ledge.

Biological control establishment efforts continue in Maine (Table 1). In 2010, through a $21,450 grant from the USDA-APHIS-PPQ, 9000 *Sasajiscymnus tsugae* beetles were purchased and released in Maine. Releases were

conducted at three prior *Laricobius nigrinus* release sites in York (York County), a prior *L. nigrinus* release site in Saco (York County), and the newly detected HWA infestation in Harpswell (Cumberland County). As planned in 2009, *S. tsugae* recovered from a release site in Kittery in (York County) in November 2010 were transferred to a prior *L. nigrinus* release site in York. Forty-seven beetles recovered in one sampling period were released in this manner. Additionally, In March 2010 we received 500 *L. nigrinus* beetles because weather at their intended destination to the south was not suitable for release. They were liberated in York as an augmentative release at a site established in November 2009.

Table 1. Hemlock woolly adelgid biological control releases 2004-2010.

Species (Strain)	Town	Total Number Released	Number/ Release	Site	Date
Sasajiscymnus tsugae		**32,781**			
	Harpswell	2,500			
			2,500	***HPWL1***	***13 May 2010***
	Kittery	17,734			
			7,500	GI1	May-June 2004
			2,602	GI2	April 2005
			2,553	GI3	April 2005
			2,548	GI4	April 2005
			2,531	GI5	April 2005
	Saco	2,750			
			2,750	***FBSP2***	***5 & 6 May 2010***
	York	9,797			
			6,000	YWD1	April 2007, June 2008
			500	***YWD4***	***7 May 2010***
			1,750	***YWD3***	***28 & 30 April 2010***
(recovered from GI1 vicinity in Kittery)			***47***	***YWD3***	***2 November 2010***
***Laricobius nigrinus* (Pacific Northwest)**		**5,172**			
	Kittery	800			
			300	GI6	October 2006
			500	KLT1	October - November 2007
	Saco	500			
			500	FBSP1	October 2008
	York	3,872			
			400	MTA1	October - November 2007
			500	YWD1	October - November 2007
			622	YWD2	October 2008
			1,500	YWD3	October, December 2008, November 2009
			100	YWD4	October 2008
			250	YWD5	December 2009
			500	***YWD5***	***2 March 2010***
***Laricobius nigrinus* (Intermountain)**		**100**			
	Kittery	100			
			100	KIT1	April 2008
Total Number Released 2004-2010:		**38,053**			

Maine, New Hampshire and Vermont have similar challenges and advantages in managing HWA. In July of 2009 the three states were awarded a US Forest Service Redesign Grant to develop a coordinated program to slow the spread of hemlock woolly adelgid in northern New England. Since the notice of grant award, the states have developed unified survey and reporting standards and have taken steps towards aligning quarantines, developing impact assessment plots, and creating a geo-referenced database of information about adelgid presence and management. We will work with researchers outside our organizations to look into new management strategies—our existing partnership will help facilitate outside research and sharing of ideas. Work done with this grant will demonstrate a replicable region-wide approach to forest protection by adapting available tools to northern conditions and can serve as a model for other regions which may soon face HWA.

Larch Casebearer
Coleophora laricella
Host: Larch (*Larix* spp.)

The early season browning caused by the larch casebearer was spotty in 2010. More locations were noted than in the past two years but still very low overall.

Pine Shoot Beetle
Tomicus piniperda
Host: 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. The Maine Forest Service and USDA-APHIS-PPQ trap to monitor for the spread of pine shoot beetle in unregulated counties. Neither organization caught pine shoot beetle in Aroostook or Washington counties. The Maine Forest Service also had traps within the regulated area, which did not yield pine shoot beetle.

No pine shoot beetles were recovered in 2010.

Table 2. 2010 pine shoot beetle trap sites (*Italics* indicate traps within the quarantine area).

Town	County	Type
Ashland - Boralex	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
Avon	*Franklin*	*Red Pine Plantation*
Strong	*Franklin*	*Red Pine Plantation*
Dixfield	*Oxford*	*Red Pine Plantation*
Deblois	Washington	Biomass Plant

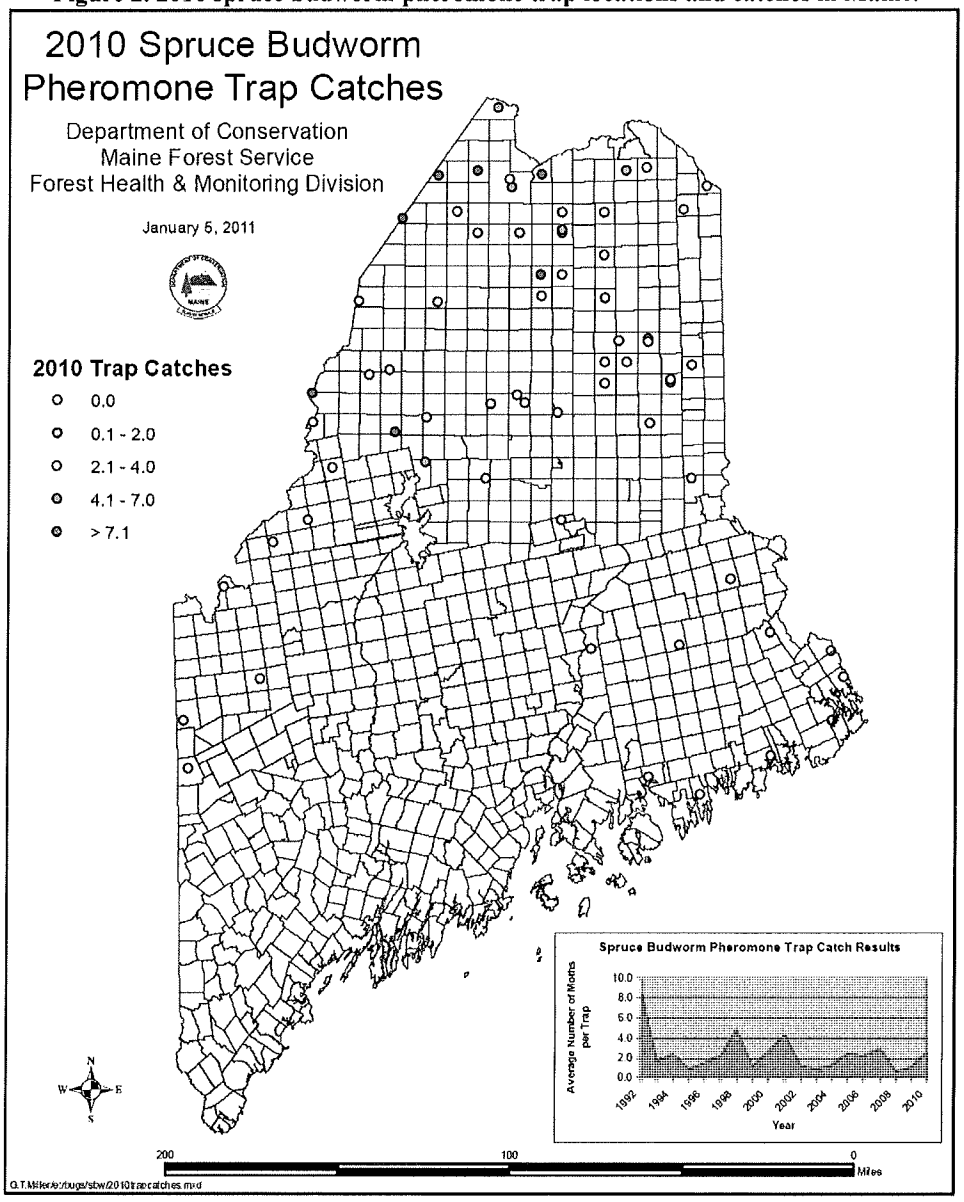
Spruce Beetle
Dendroctonus rufipennis
Hosts: White Spruce, Red Spruce (*Picea glauca, P. rubens)*

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.

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

Spruce budworm populations are still very low in 2010. Pheromone trap catches averaged 2.6 moths per trap (Figure 2). Sites in northwestern Maine had higher catches than other locations. The percentage of pheromone traps catching moths increased to 85%. In 2008 and 2009 fewer than 60% of traps caught moths. Light traps in Ste. Pamphile, Shirley, Norway, and Mount Desert each caught 1-3 spruce budworm moths during the season. This is on par with what light traps usually pick up with the catch scattered across the state. No larval activity or defoliation was observed during field surveys. We are keeping close track of this pest as Quebec had 1,892,176 acres defoliated north of the St. Lawrence Seaway in 2010. New Brunswick is reporting trap catches similar to Maine and has not found larvae in the field. Vermont also reported low spruce budworm catches.

Figure 2. 2010 spruce budworm pheromone trap locations and catches in Maine.



Insects: Hardwood Pests

Ash Spider Mites
Tetranychus homorus
Host: Ash (*Fraxinus* spp.)

An unusual call came in from Strong this summer via photos sent to Cooperative Extension and then forwarded to the Insect & Disease Laboratory. An ash tree trunk was covered in a continuous sheet of webbing from the ground up to about 12 feet including branches; it looked like the tree was wrapped in cellophane. The leaves were not covered but silk tubes ran from one branch to another with red frass or insects under some of the webbing. A visit to the site revealed that it was mites that had made the webbing. Mites do well in dry hot weather so this summer was good one for high mite populations to develop. The mites feed on the leaves during the summer apparently doing little damage and then move to the trunk to overwinter. This webbing is not a common sight anywhere although the mites are reported to live throughout the United States. Cooler summers and rain may keep the phenomenon from occurring most years.

***Birch Leafminer**
Messa nana
Host: Birches (*Betula* spp.)

The foliage on birch trees across the state was damaged by birch leafminers this year. The sawflies were primarily the species *Messa nana* that reportedly has only one generation a year. Adults emerge from the soil in late May – probably earlier this year – and lay their eggs on the margins of the leaves. The larvae hatch and feed between the layers of the leaf with some leaves having multiple mines per leaf. (You can see them inside the leaf by holding it up to the light.) Once the larvae have finished feeding they drop to the ground and pupate.

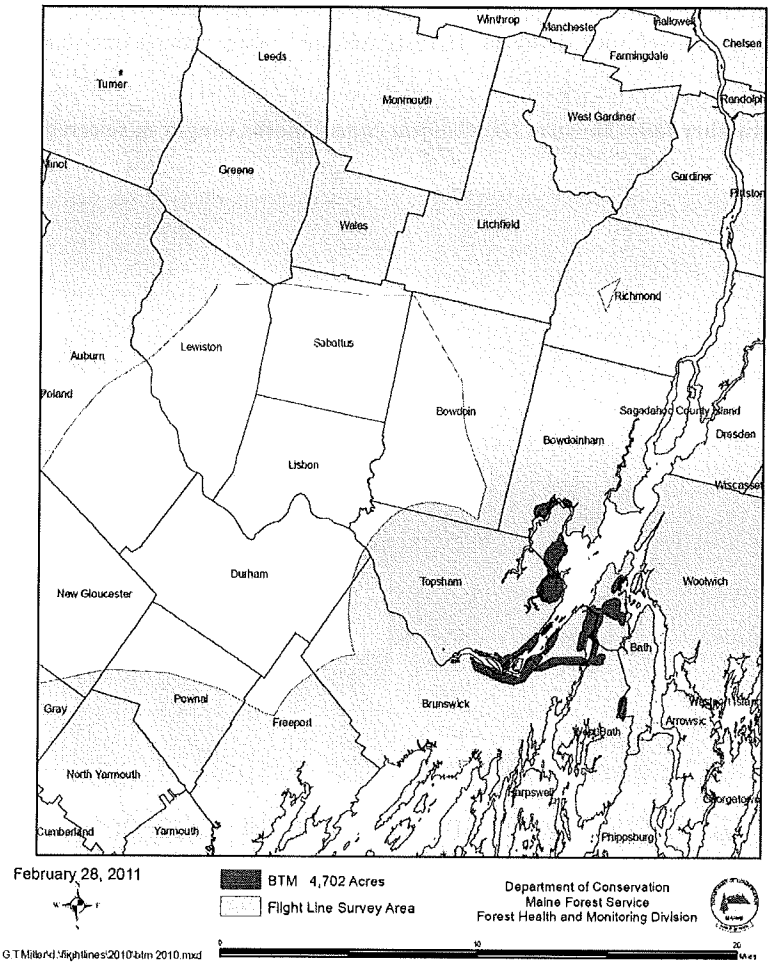
Browntail Moth
Euproctis chrysorrhoea
Host: Red Oak (*Quercus rubra*)

Browntail moth defoliation continues to be heavy in Bath, West Bath, Brunswick, Topsham and Bowdoinham (Cumberland and Lincoln Counties) at the southern terminus of Merry Meeting Bay in midcoast Maine (Figure 3). Isolated infestations are present in other locations as well including; Turner, Lewiston, Falmouth, Augusta and Kennebunkport. Total defoliation covered 4,700 acres which is significant increase over the 758 acres of defoliation in 2009. One multi-year infestation on Bustins Island, Freeport did crash this year with little defoliation or rash problems reported.

Last year's weather appears to have been perfect conditions for browntail moth. A dry May and cool June in 2009 led to a moth population explosion - although browntail moth has been a problem for the area for a number of years. Then a mild winter and very warm, early spring caused the larvae to emerge early when there still was not much foliage on trees to eat so they outstripped their food source and defoliated the trees. At this point the larvae 'ballooned' off looking for more food. That meant they were crawling up people's houses, on their decks, across the lawn and on every shrub and bush in the area. Instead of being concentrated on trees they were everywhere. I was hoping this would mean that the population would subside but apparently enough of them found new hosts that they survived. The infestation has intensified and expanded slightly.

The browntail moths are primarily in red oaks in this area and chemical control is the only viable option in most cases. Treatment needs to be done by a licensed pesticide applicator to effectively control this pest.

Figure 3. Browntail moth defoliation in 2010



Winter surveys conducted to monitor the population indicate that the 2011 population will be even larger than 2010. The browntail moths have moved back into Freeport, Woolwich and Falmouth expanding their range.

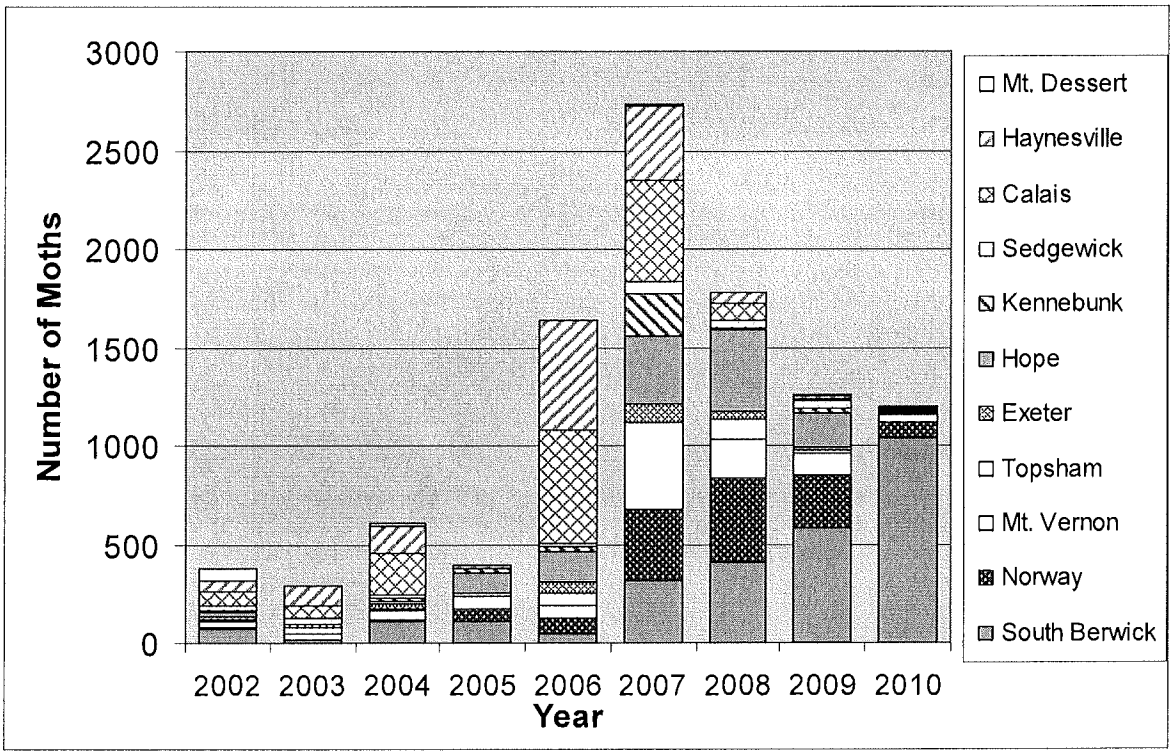
***Chyrsomela* Beetle**
***Chyrsomela* sp.**
Host: *Populus balsamifera*

Balsam poplars in Aroostook County were lightly defoliated by a leaf beetle this year. The species is yet to be confirmed. Balsam poplar does not usually have very many pests attacking it so this is a bit unusual. Many of the larval samples brought back to the lab contained parasitoid wasps so the population may decrease dramatically next year.

Fall Webworm
Hyphantria cunea
Hosts: Ashes, Apple, Cherries, Oaks, Birches, other hardwoods (*Fraxinus* spp., *Malus* spp., *Prunus* spp, *Quercus* spp., *Betula* spp.)

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. After years of high fall webworm numbers the population dropped significantly in most areas across the state (Figure 4). Numbers remained relatively high in the south. Expect the population to continue to decline as parasites, predators and disease populations catch up with the fall webworm numbers. The fall webworm rarely damage trees but are unsightly.

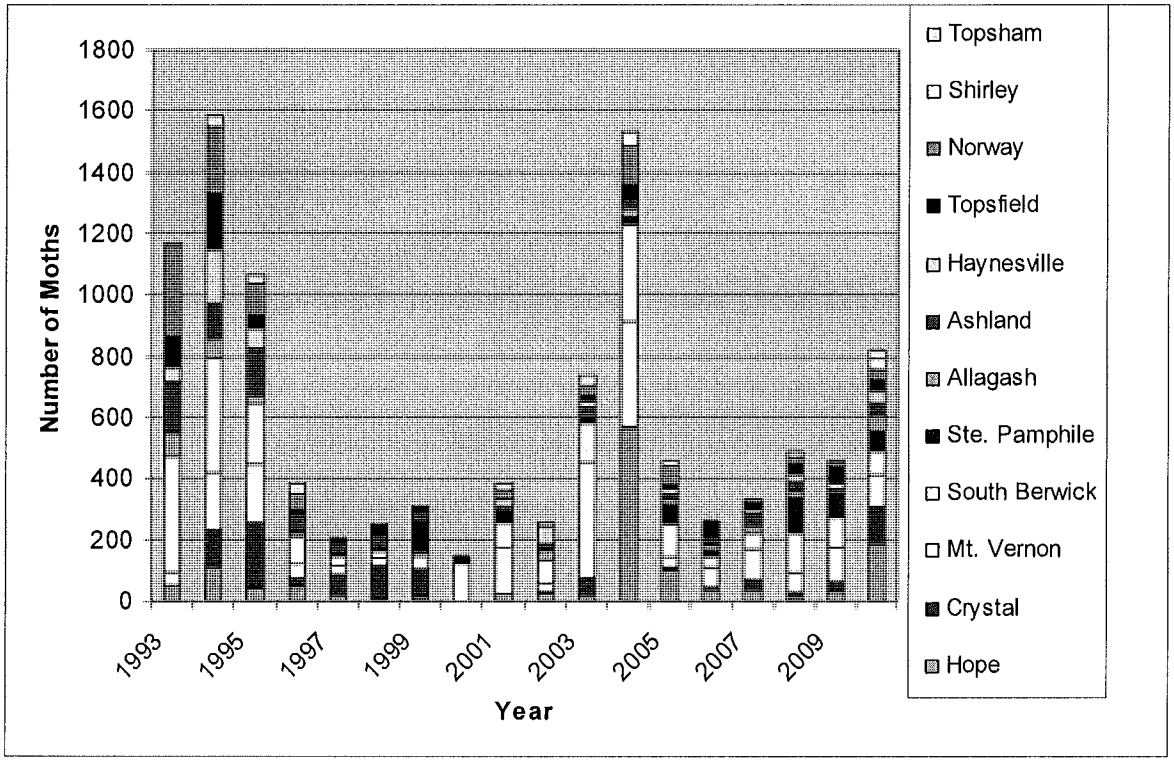
Figure 4. Total number fall webworm (*Hyphantria cunea*) moths caught in selected light traps



Forest Tent Caterpillar
Malacosoma disstria
Hosts: Aspen (*Populus* spp.) and other hardwoods

Forest tent caterpillar numbers remained low in 2010 with no defoliation of forest trees from this leaf feeding insect. The catches in light traps across the state are showing an increase in numbers (Figure 5) again. Forest tent caterpillars feed on hardwood foliage in the spring, especially maple. Although they are called tent caterpillars they do not form webs like their relatives The larvae do not form webs and Maine has missed the forest tent outbreaks in recent years that affected surrounding states. We need to keep an eye on this one.

Figure 5. Total number of forest tent caterpillar (*Malacosoma disstria*) moths caught in selected light traps



Gypsy Moth
Lymantria dispar
Hosts: Various (300+ trees and shrubs)

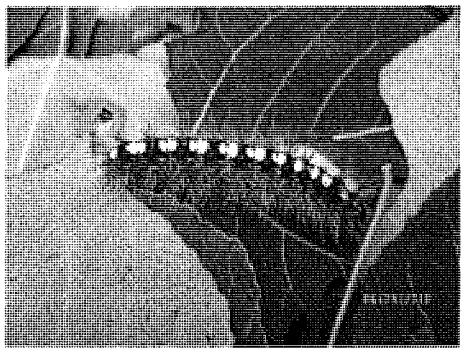
No defoliation of hardwoods resulting from gypsy moth larval feeding was recorded in 2010. The fall egg mass survey indicated populations are likely to remain low in 2011. Two hundred sixty-six (266) pheromone baited milk carton traps were set and retrieved in towns adjacent to the gypsy moth quarantine zone (transition zone) and these traps captured approximately 3300 male moths. Eighty-four percent of the traps in the transition zone had fewer than 10 male moths (n=244). Egg mass surveys in towns with high male moth counts were negative.

State rules were changed in 2010 to make the parallel state and federal gypsy moth quarantine more explicit. In early 2011 federal register was corrected and amended to bring the register in line with the state quarantine boundaries.

Large Aspen Tortrix
Choristoneura conflictana
Host: Aspens (*Populus* spp.)

This early season defoliator stripped scattered stands of quaking aspen in the Island Falls area of Aroostook County. Over 1,000 acres were affected. The large aspen tortrix has been defoliating trees in Quebec for the past four years and we have been seeing the moths in our light traps. This is the first time we have found defoliation on our side of the border though. This insect overwinters as a larva at the base of the tree and feeds as soon as the foliage is out. It rolls and ties leaves together for protection and pupates in the leaves. Surprisingly very few tortrix moths were found in the light traps despite one of the traps being just down the road from defoliated trees.

Satin Moth
Leucoma salicis
Hosts: Aspen (*Populus* spp.)



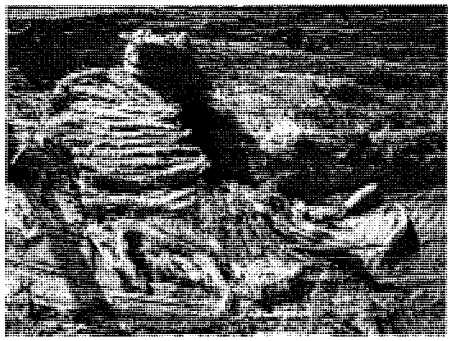
Poplar yard trees from Houlton to Fort Fairfield were attacked by satin moth caterpillars this year. They have been mostly absent in the past few years. Light trap catches were up in Allagash and New Sweden in Aroostook County. This is a pest to watch.

Winter moth
Operophtera brumata
Hosts: Oaks, Maples, Ashes, Cherries, Apple, Spruce (*Quercus* spp., *Acer* spp., *Fraxinus* spp., *Prunus* spp, *Malus* spp., *Picea* spp.)

Males of this species have been trapped in recent years in Maine but no larvae, damage or female moths were found. This European pest is currently a problem in Massachusetts. It is also found in Nova Scotia where populations are reduced by two parasitoids; *Cyzenis albicans* and *Agrypon flaveolatum* also introduced from Europe. We have been monitoring for it for years and this year a suspect female moth was found in Kennebunk this past fall thanks to an observant young entomologist. We will follow up in the spring to see whether there is a population of winter moth starting in Maine. Winter moth feed on many deciduous plants including oak, maple, cherry, crabapple, apple and blueberry.

Insects: Miscellaneous

Bee Moth
Aphomia sp.



An unusual specimen was sent in to the lab from Wilton this winter (February 2011); it was dozens cocoons inside a piece of yellow birch firewood. The cocoons were long (2" x 1/8"), fibrous and very tough. Dissecting a couple of cocoons revealed yellow caterpillars inside less than half the length of the cocoons. They are a species of bee moths, *Aphomia* sp., whose caterpillars are found most often in wasp and bumblebee nests. The caterpillars feed on stored food, wasp/bee larvae and wastes in the nest. They do not destroy the nest nor do the wasps/bees kill the caterpillars.

Some of the time the entire life cycle occurs in the wasp/bee nest but sometimes the caterpillars move away and communally build cocoons in wood. The cocoons have been found in wood piles, lumber piles, boards on houses and even in books. They apparently like the association with trees in some form whether it is wood or paper. The caterpillars gouge the wood to attach their cocoons then spend the winter as caterpillars, pupate in the spring and emerge as adults.

There are three species of *Aphomia* moths recorded from Maine. The most common one is *Aphomia sociella* a European species. In North America the only recorded hosts have been paper wasps but that is because little has been written about them here. In Europe they are found in wasp and bumblebee nests (but rarely underground where most bumblebees live) and also in mouse and bird nests.

The caterpillars are being held in hopes they will emerge this spring and a species determination can be made.

Wood Gnat
Sylvicola fenestralis

Wood gnat larvae on algae mat on logs

Wood gnats are usually benign insects living in damp places in the forest. The larvae normally live in damp/wet organic matter often near the edge of standing water. Unfortunately they sometimes breed in large numbers when humans provide proper conditions for them. The flying adults become a nuisance making outdoors activities unpleasant as the gnats fly around people in large numbers. They do not bite, they are just really annoying. This happened in one town where a lumber mill sits close to a residential area.

The mill has a large log pile in the yard and the wood gnat larvae are living in the algal/fungal mat growing on the log pile. Alga often grows on log piles that are sprayed to protect them from beetles and blue-stain fungi (brought into the wood by the beetles). The algal/fungal mat is a very rich source of nutrients and is a very attractive environment for other life forms. There are a number of species of flies living on the logs but the ones that are annoying the neighbors are the wood gnats.

The company is working on a solution to reduce the problem to an acceptable level for neighbors while still protecting the logs.

Diseases and Injuries

Diseases: Native

Anthracnose of Hardwoods
Hosts: Ashes (*Fraxinus* spp.), Birches (*Betula* spp.), Maples (*Acer* spp.), Oaks (*Quercus* spp.)

Anthracnose diseases occurred at significantly lower levels in 2010 than in 2009. Although trees with trace infection levels were found in several counties, there were no reported cases of significant leaf damage anywhere in the state. A low level of damage was reported on red oaks in one coastal town (Deer Isle, Hancock County), and on maples in China (Kennebec County), Owls Head (Knox County), Solon (Somerset County), and Wells (York County).

***Armillaria* Root Rot**
Armillaria mellea and other species
Hosts: Hardwoods and Conifers

Several cases of *Armillaria* root rot were found affecting Arborvitae, balsam fir, and paper birch, red oak, and sugar maple. In most cases infected trees had received mechanical injuries, and damage was restricted to one or a few trees in the stand. A few Christmas tree plantations, especially those on heavier-textured soils, are still affected by some mortality from *Armillaria* root rot. The overall damage appears to be lower than that of the past three years. The widespread damage so prevalent last year to Arborvitae (*Thuja occidentalis*) and attributed to *Armillaria* root rot and winter stresses was not prevalent. Only one report of this was received from Augusta (Kennebec County) in 2010.

Ash Leaf and Twig Rust
Puccinia sparganioides
Hosts: White Ash (*Fraxinus Americana*); Green Ash (*F. pennsylvanica*)

Only trace levels of ash leaf rust were found. The disease was found in a few coastal locations, but noticeable defoliation was reported only from Old Orchard Beach (York County) and Thomaston (Knox County).

Balsam Fir Tip Blight
Delphinella balsameae
Hosts: Balsam Fir (*Abies balsamea*); Concolor Fir (*Abies concolor*)

Balsam fir tip blight was identified from several infected trees in Frenchville (Aroostook County). The disease first became apparent in early to mid-June, and appeared as browning and shriveling of the current-season growth at the branch tips. Shortly thereafter, similar damage was identified in Dover-Foxcroft (Piscataquis County). In both cases, the disease was affecting sapling-sized to small pole-sized trees in the 4 to 8 in. diameter range.

Black Knot of Cherry
***Dibotryon morbosum* (=*Apiosporina morbosa*)**
Host: Cherry (*Prunus* spp.)

Black knot galls commonly occur on native and introduced cherry species throughout the state. Disease clinic samples were received from Portland (Cumberland County) in 2010.

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

Caliciopsis canker was most recently reported from Canaan (Somerset County), and Sangerville (Piscataquis County).The disease likely occurs statewide, but is most prevalent in central and southern Maine. Dense, overstocked stands of eastern white pine are susceptible this disease. Typical symptoms include pitching and

slightly depressed bark cankers in the inter-nodal sections of infected stems. Elongate, blackened, shallow bark cankers often develop, with visible bark cracks appearing. The excessive pitching is sometimes confused with white pine blister rust, but blister rust cankers nearly always originate at the branch whorl region. *C. pinea* is considered to be only a weak pathogen, affecting trees of low vigor. It is most damaging in overstocked stands growing on sandy, well-drained soils. The recommended practice for the management of *Caliciopsis* canker in white pine stands is to reduce stand density through thinning, and to maintain good tree vigor.

***Cytospora* Canker of Concolor Fir**
Cytospora abietis
Host: Concolor Fir (*Abies concolor*)

Several occurrences of *Cytospora* canker on ornamental Concolor firs have been observed over the summer. *Cytospora* is generally a weak parasite, and becomes established on trees that have been stressed from drought, suboptimal site or soil conditions, or mechanical injuries. Symptoms are similar to the *Cytospora* disease of spruces (caused by *C. kunzei*) and appear as branch dieback starting from the lower areas of the crown, and slowly spreading upwards. Affected branches exude pitch, which is seen as white streaks along the branches and sometimes the main stem. Pitch of older infections often darkens to black. Splits, lesions, and seams along the branch axis may also be evident. *Cytospora* canker on ornamental Concolor fir was reported from Brunswick and Portland (Cumberland County) and Phippsburg (Sagadahoc County).

Eastern Dwarf Mistletoe
Arceuthobium pusillum
Hosts: Spruces (*Picea* spp.)

Eastern dwarf mistletoe is a native flowering plant that is parasitic on black, white, and red spruces. Chronically affected stands, especially those in coastal Maine areas, can exhibit stand decline and considerable mortality of spruces. Reports of damage from dwarf mistletoe were received from the towns of Bath (Sagadahoc County) and Camden (Knox County). It is well known that the disease occurs in spruces on islands along the coast, as well.

Fir Needle Casts
Lirula nervata, Lirula mirabilis, Isthmiella faullii, Rhizosphaera pini
Hosts: Balsam Fir (*Abies balsamea*); Fraser Fir (*Abies fraseri*)

Several needle cast diseases of balsam fir were common in forest areas and in Christmas tree plantations throughout the state. *Lirula* species (most commonly *L. nervata*) and *Rhizosphaera pini* were identified and often could be found on individual or small groups of trees wherever balsam fir was growing. Damage this year was judged to be very low with the exception of one plantation in Amherst (Hancock County) and one in Belgrade (Kennebec County), where damage was considered light to moderate.

Ozone Damage Monitoring
Suscepts: All woody and herbaceous vegetation

A total of 18 towns were surveyed in 2010 for ozone damage to a variety of woody and herbaceous indicator plants. The survey is part of the USDA Forest Service National Ozone Biomonitoring Program, conducted annually since 1994. Ozone damage was confirmed on white ash (*Fraxinus americana*) and milkweed (*Asclepias syriaca*) obtained from each of two sites (Swanville, Waldo County; Bowdoinham, Sagadahoc County), and on milkweed from Canton (Oxford County).

***Phomopsis* Branch and Stem Galls on Oaks**
***(Phomopsis* spp.)**
Hosts: *Quercus* spp.

Branch galls on oaks (primarily on red oaks, *Quercus rubra*) were reported from several towns in 2010 including Paris (Oxford County), Sydney (Kennebec County), Waldoboro (Lincoln County), and Castine (Hancock County). Some individuals in the oak stand in Paris had multiple and severe branch infections, with branch mortality very evident. Some previous tree mortality resulting from extensive branch damage was reported by the landowner.

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

The disease is widespread throughout Maine, and damage has remained high for the past several years. Mortality in ornamental and roadside plantings is scattered but not uncommon.

Red Flag of Balsam Fir
Fusicoccum abietinum
Hosts: Balsam fir (*Abies balsamea*)

Flagging (reddening of the needles and branch tip death) of the distal portions of balsam fir branches is sometimes caused by the canker fungus *Fusicoccum abietinum*. Most commonly, only a few branch tips per tree are affected. Symptoms are most often noticed in mid-summer. These same symptoms can also be caused by hail damage or by twig-feeding injury from adults of the pine sawyer beetle. However, damage from these causes can be easily distinguished from the twig cankering caused by the pathogen.
The disease has never appeared to cause significant damage to tree health, and the management recommendation (primarily for aesthetics) continues to be simply clipping the affected tips. The disease was noted from Augusta (Kennebec County) and Brunswick (Cumberland County) in 2010.

Red Pine Root Rot
Heterobasidion irregulare (= annosum)
Hosts: Red Pine (*Pinus resinosa*); occasionally White Pine (*Pinus strobus*)

Root and butt rot of red pine (and other conifers) caused by *Heterobasidion irregulare* continues to threaten the long-term productivity of many plantation stands recently thinned or in need of thinning. No new locations or sites in Maine were identified as being infected with *H. irregulare* this year.

***Sirococcus* Tip Blight**
Sirococcus conigenus, Sirococcus tsugae
Hosts: Red Pine (*P. resinosa*); Eastern Hemlock (*Tsuga canadensis*)

Sirococcus conigenus on Red Pine:
Infection of red pines with the *Sirococcus* shoot blight pathogen continues be a concern, particularly in the northeastern and Downeast regions of Maine, where a significant acreage of plantations has been established. One report from a land manager of a large ownership has indicated that infections levels in eastern Washington County appeared to be less severe than in the past two years. Industrial forest ownerships appear to be most at risk, and most forest managers have increased their efforts to monitor and assess for this disease.

Sirococcus tsugae on Eastern Hemlock:
The tip blight of Eastern hemlocks, recently attributed to *Sirococcus tsugae* has continued to cause damage. Damage is particularly evident in understory regeneration, but the disease has been found in upper-canopy hemlocks, as well. Heavy damage, possibly resulting in some mortality of hemlock regeneration was observed in Berwick, North Berwick, (York County), and Scarborough (Cumberland County). The disease has been found throughout southern, south-central, and western Maine. Efforts are underway by the USDA Forest Service and the Maine Forest Service to establish long-term monitoring plots in 2011 to assess future disease development and to measure disease impacts.

Spring Frost
Suscepts: All woody and herbaceous vegetation

Many species of woody plants were damaged after the hard frosts that occurred during the period from May 10 – 12, 2010. The long period of warm spring weather that occurred prior to early May contributed to the injury as it resulted in tender young growth to be exposed earlier than usual. Plant species as diverse as apples (*Malus* spp.), Andromeda (*Pieris* spp.), Japanese knotweed (*Fallopia* spp.), American beech (*Fagus grandifolia*) ashes (*Fraxinus*

spp.), balsam fir (*Abies balsamea*), oaks (*Quercus* spp.) and maples (*Acer* spp.) were damaged in widely scattered locations throughout north-central, central, and southern Maine. Damage to beech and maple was observed in Andover North Surplus (Oxford County) and Pownal (Cumberland County). Damage to oaks was observed in Kennebec County, and also in the Skowhegan and Norridgewock (Somerset County) areas. Damage to *Pieris* was observed in Augusta, and damage to Japanese knotweed was seen in several locations in southern Maine and as far north as Sidney (Kennebec County). Injury to newly-flushed shoots on conifers also occurred, and some damage to evergreen ornamentals and Christmas tree plantations was observed.

Recovery from damage was fairly rapid. Refoliation occurred quickly on trees which only had the leaf tissue alone frosted. In some individual cases, it was observed that if the succulent, new shoot growth (in addition to the leaves) was frosted, a slower recovery occurred. In these cases, new buds had to first develop before the refoliation could begin. Some branch dieback on these trees may occur, but damage will be minor. Tree seed production (acorns on oaks, for example) may have been reduced in localized areas or on individual trees.

Spruce Needle Cast
Rhizosphaera kalkhoffii
Hosts: White and Colorado Blue Spruce (*Picea glauca*; *Picea pungens*)

Spruce needle cast is widespread and locally severe, and was the second-most reported tree disease occurring in Maine this year. Although reports of the disease were fewer than those from recent years, it is estimated that the damage actually has increased as a result of the exceptionally wet spring and summer of 2009. Spruce needle cast has taken a heavy toll in ornamental trees, with arborists reporting many removals over the past several years. The disease occurs statewide. Disease clinic samples were received from the following counties in 2010: Cumberland, Hancock, Kennebec, Lincoln, Sagadahoc, Somerset, and York

Tar Leaf Spot of Maples
Rhytisma acerinum
Host: Norway Maple (*Acer platanoides*)

Tar leaf spot of Norway maples caused only localized and minor damage in 2010. This trend was similar to that of other hardwood anthracnose diseases. No reports were received this year of branch tip dieback resulting from widespread and heavy infections of 2009

Diseases: Non-Native

Beech Bark Disease
Cryptococcus fagisuga* and *Neonectria faginata
Host: American Beech (*Fagus grandifolia*)

Beech bark disease is a significant and chronic forest disease that continues to cause losses in stand productivity and timber values statewide. Beech bark disease also negatively affects beech nut production, an important wildlife food for a wide variety of birds and small and large mammals. A two-year study was initiated in 2010 to compare beech scale population levels in several biogeoclimatic zones where beech stands comprise a significant component of the forest resource.

One hundred American beeches were surveyed in each of two stands in each of five townships per biophysical region (Figure 6). Five biophysical regions were surveyed across the central portion of the state. The biophysical regions selected were a subset of those defined by McMahon (1990) and later modified by Bailey (*Krohn et al.: 1999, Northeastern Naturalist 6:2:139-164*). A total of 5000 trees were assessed for beech scale population levels and other disease characteristics.

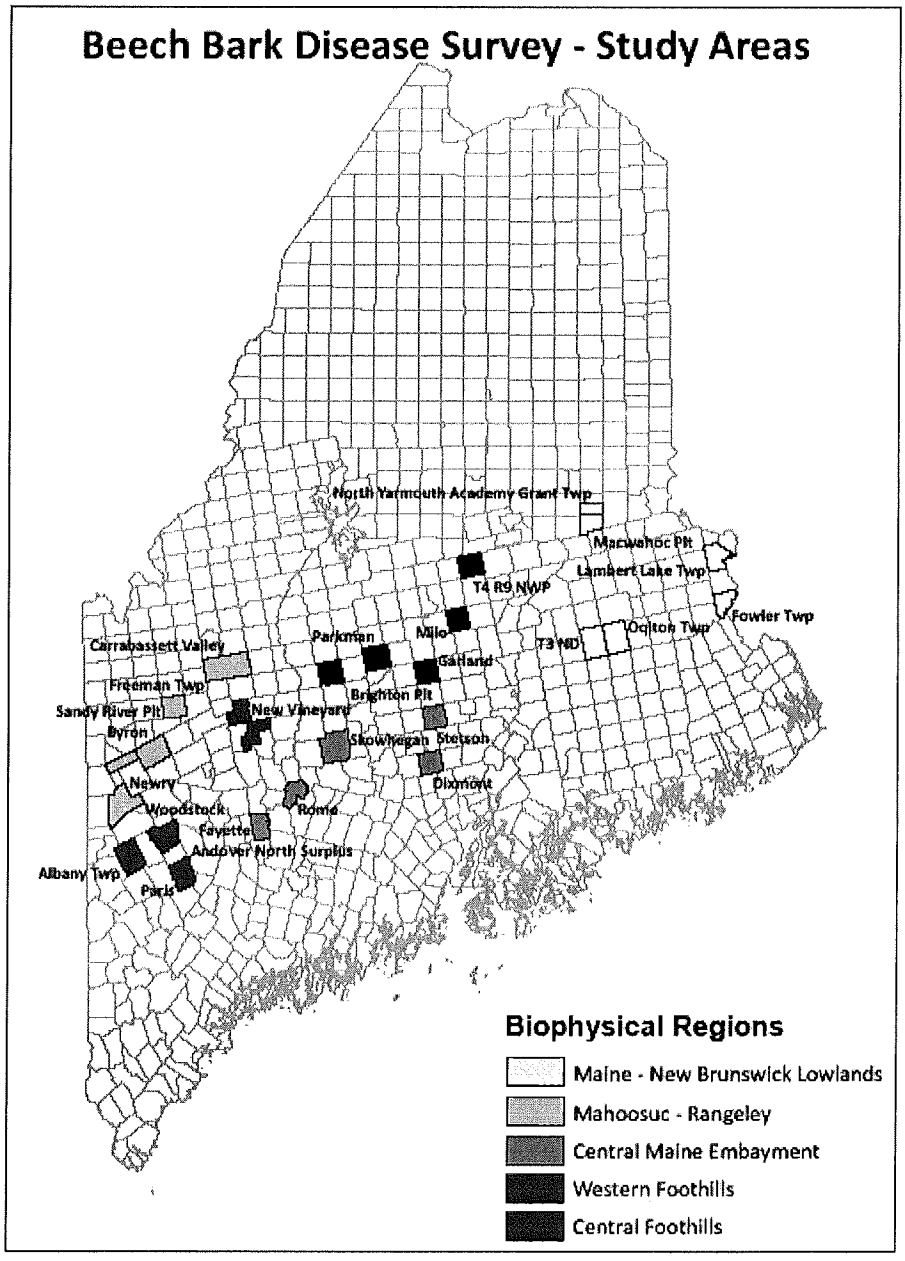


Figure 6. Townships surveyed for beech scale populations in 2010.

Formal data analysis is preliminary, but some interesting trends have appeared when examining summary tables. In comparing beech scale populations between the Western Foothills Region (the western-most area) and the Maine-New Brunswick Lowlands Region (the eastern-most area), scale populations were found to be generally higher in the eastern region of Maine, specifically in the Central Foothills biophysical region (Figure 7, 8). However, contrary to expectations, beech scale populations appear to be lower as stem diameter increases.

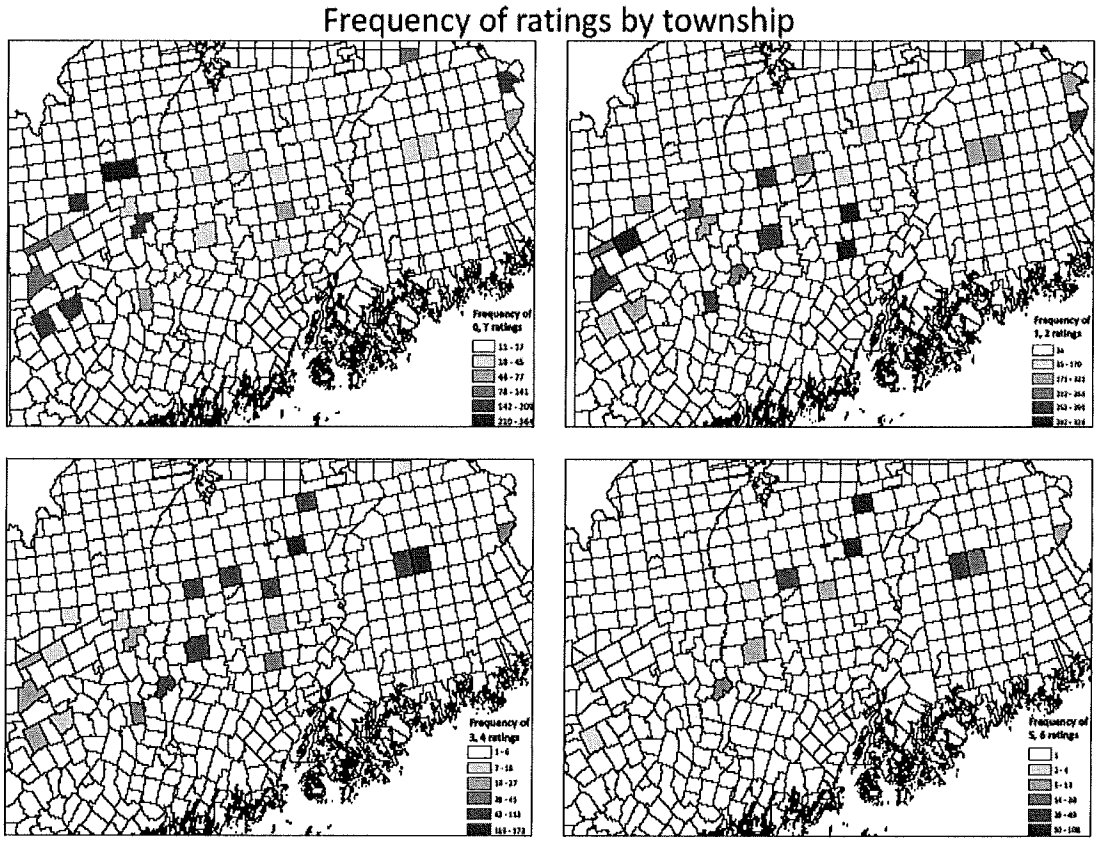


Figure 7. Frequency of ratings of beech scale population levels. Rating classes: 0 (no scale), T (trace), 1 (low scattered), 2 (low uniform), 3 (moderate scattered), 4 (moderate uniform), 5 (high scattered), 6 (high uniform).

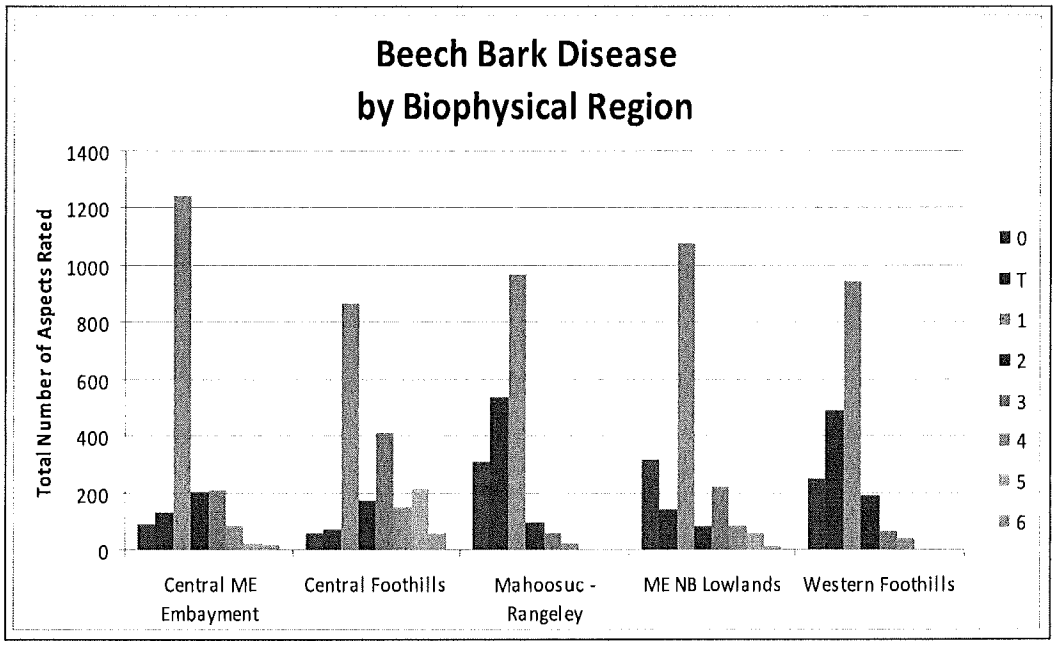


Figure 8. Beech scale rating frequency by biophysical region. Rating classes: 0 (no scale), T (trace), 1 (low scattered), 2 (low uniform), 3 (moderate scattered), 4 (moderate uniform), 5 (high scattered), 6 (high uniform).

This trend was found for both the western and eastern regions. It is not yet known how this relationship will be shown in other the regions, or in the composite analysis of all regions.

Individual stem condition was found to be highly variable. The stem cankering which occurs is of the "delimited canker" type almost exclusively, as opposed to the "diffuse canker" type typical of killing front regions of the beech bark disease (*Ostrofsky: 1982, USDA Gen. Tech. Rept. WO-37*). In most stands, highly cankered trees can be found with both high and low populations of beech scale. In addition, cankering intensity is highly variable from tree to tree, and in part determines scale populations both positively (providing habitat in areas surrounding deep cankers) and negatively (dead bark tissues no longer supporting beech scale populations).

The survey to date has identified 27 trees that are likely immune (or highly resistant) to beech scale infestation, an occurrence of 0.675 percent. Nineteen of the 27 trees were encountered in the Maine-New Brunswick Lowland Region, two in the Central Maine Embayment Region, and three each in the Western Foothills and in the Mahoosuc/Rangely Regions. Of the nineteen trees found in the Maine-New Brunswick Lowland Region, two groups of four resistant trees, and one group of three resistant trees were noted. A "group" was determined as having consecutive tally numbers. All other resistant trees that were located appeared to be occurring as single or at least widely spaced individuals.

Collected sample tree information includes, in addition to the beech scale population rating, information on presence or absence (on an individual tree basis) of *Xylococculus betulae*, an associated scale insect in the beech bark disease complex. To date, *X. betulae* has been found in all stands, but appears to be highly variable in abundance.

In the spring of 2011, a quality-check on sampling is planned, where one stand in each of the five biophysical regions will be re-evaluated for beech scale population levels. Formal data analysis will continue through 2011.

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

Dutch elm disease appears static at moderate levels throughout the state. Noteworthy is the loss of a large elm in Yarmouth, Maine this year due to the disease. The elm, which was 217 years old, was recorded as the largest in New England, and its removal created significant media attention at the local, state, and national level. A major effort was conducted by the town of Yarmouth to reclaim all the usable wood from the tree for artisans, artists, and other crafters to fashion high-valued products and other memorabilia from the tree.

European Larch Canker
Lachnellula willkommii
Hosts: Eastern Larch, European Larch, Japanese Larch (*Larix laricina; L. decidua; L. leptolepis*)

No new locations were found or reported in 2010 for this disease. A re-inspection of the Brunswick (Cumberland County) site at which a small eradication effort was completed in 2008 revealed an additional infected tree, which was treated by removal of the branch bearing the canker. Re-inspections of the site will continue for at least another three years, to be sure the eradication effort was successful.

Assistance was again provided for the larch canker intensification project in Washington County being conducted by Dr. David Houston (Retired, USDA Forest Service). The project entered its final phase, as sample trees in three of the study stands were harvested for detailed analysis. A final report of findings will be available after analyses have been completed.

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

There continues to be many requests annually regarding planting of "resistant" varieties of *Ribes* species in the quarantine zone established for white pine blister rust control. The requests for information usually come in the early spring, when homeowners are examining seed catalogs, and become interested in planting *Ribes* species for backyard fruit production. The quarantine regulations that Maine has developed remain in effect, and the public and commercial nurseries are reminded frequently of this law. It remains the position of the Maine Forest Service that "resistant" or "immune" species of *Ribes* still pose a significant threat to white pine because of the potential for inadvertent crosses with wild populations of *Ribes*. Many of the "resistant" and "immune" varieties may carry genetic traits of the highly susceptible European black currents.

Diseases: Unknown Origin

Ash Decline
***Candidatus* Phytoplasma fraxini**
Hosts: Ash, Lilac (*Fraxinus* spp. , *Syringa* spp.)

Symptoms of ash decline were reported occurring in a natural stand of white ash in Baldwin (Cumberland County). Symptoms of the decline have also been reported in other ash stands in the town in recent years.

Butternut Canker
Sirococcus clavigignenti-juglandacearum
Host: Butternut (*Juglans cinerea*)

This canker disease is a highly debilitating disease of butternut. Such a high level of butternut mortality has occurred from this disease in the United States over the past two decades that species survival is now seriously threatened. According to a survey completed in 2010 by Dr. Dale Bergdahl, a leading research scientist on this disease, approximately 40 percent of the living butternut surveyed in Maine have cankers, and are likely very short-lived. An additional 3.5 % were classed as standing dead. The survey report also indicates that nut production throughout the New England region was absent in 2007 and 2008, and very minimal in 2009. There is nearly no seedling regeneration in the majority of butternut areas surveyed, and where regeneration does occur, the majority of seedlings are also cankered. Research work by the USDA Forest Service to find or develop disease resistant stock continues. The disease has been found from all counties in Maine except Washington County The most recent (2010) butternut canker diagnosis was made from trees in Yarmouth (Cumberland County).

White Pine Needlecasts
Canavirgella banfieldii and ***Mycosphaerella dearnessii***
Host: White Pine (Pinus strobus)

The majority (over 18%) of public assistance requests for tree disease concerns in 2010 was due to the yellowing, browning, and premature needle loss of white pines. The condition has been observed throughout the state, but was most severe in western and southern counties. The occurrence of needle diseases and needle browning on white pine was reported from throughout New England. There are two diseases of particular importance, and trees in Maine may be affected by either or both. The first is called *Canavirgella* needle cast (*Canavirgella banfieldii*), the second is called "brown spot" (*Mycosphaerella dearnessii*). High levels of *Canavirgella* have been recorded in the past four or five years, and it is suspected that this was the result of the very wet springs and summers. In addition to the fungi, some observers feel that the late spring frosts may have played a role in the development of the yellowing symptoms of one-year-old needles.

To date, there has been no documented tree mortality from these diseases, but some trees do appear to be very thin in the crown. Younger, regenerated trees in the understory are also affected, and may be more at risk of succumbing than the mature overstory trees. A few affected white pines still retain an off-brown color to the lower crown, but the majority of the needles infected last year (and browned this year) by these two needlecast pathogens have now been shed. Observations from around western, central, and southern Maine in late summer indicate that some trees have lost an occasional lower branch or two. The needle casts have been reported from as far north as Township 7 Range 12.

Some browning of current-season needles (those produced in 2010) was recently observed through the Livermore (Androscoggin County) and Dixfield (Oxford County) region. As a result of the reduced foliage, crowns still appear quite thin, so the effects of this years' needle loss will likely affect tree vigor for some time. Forest management activities, including stand thinning and other practices that result in significant stand disturbance, are discouraged in stands that have had extensive needle loss, or where the crowns appear especially thin. Reports of current-season needle browning notwithstanding, the expectation now is that infection levels on the current-season foliage has been lower this year, so trees should begin to recover their full complement of foliage by the end of the next growing season (2011). Changing stand conditions will require regular monitoring for at least an additional year to better assess management risks.

Division Activities

Aerial Survey

Aerial survey flights were flown in June 2011 to delineate browntail moth and large aspen tortrix infestations. Additionally early season surveys provided information on what parts of the state were affected by frost, pine needlecasts and cedar decline. General overflights later in season were for detecting potential damage and stress situations. 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. Balsam fir along the coast is recovering or has died and is no longer visable from past balsam woolly adelgid infestations. 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. Most of the survey flights are made in a Cessna 180 float plane although a Bell Jet Ranger helicopter which allows us more flexibility is sometimes used. 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.

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 second year, the Maine Forest Service partnered with the Maine Department of Agriculture 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.

Research has shown that Sebago Lake State Park is one of the state parks most heavily used by out-of-state campers and that many of the campers come from Massachusetts, where ALB is of serious concern. Therefore in conjunction with the Maine Department of Agriculture, we conducted a large public awareness event and invasive insect survey at Sebago Lake State Park during the summer. The day included games and events for children and adults, displays, information, beetle costumes, and a survey of campground trees for invasive insects by both volunteers and professionals. The event was covered by both print and television media. A second, smaller survey was held in Lewiston.

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, and has been extended into 2011. Two out-of-state firewood exchanges were held 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 were handed out over the past year. Materials for outreach were supplied by the USDA Forest Service, and USDA Animal Plant Health Inspection Service (APHIS). We designed a "*Leave your Firewood at Home*" bumper sticker which proved to be very popular. We had a "*Pack Marshmallows, Not Firewood*" poster designed, which is being used widely throughout the state.

As much 'face time' as possible was put into the effort this year as that has a greater impact on people than passive displays. 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. 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. We also held multiple training sessions for various arborist groups.

Personal contact was made with campground owners to remind them of the new legislation and impress on them the importance of campers not moving firewood. Campground presentations were made during the summer to communicate directly with campers. Games and beetle costumes were made and used as outreach tools at campgrounds. The costumes proved very effective at catching people's attention at many venues, which is often the hardest part of getting a message out. 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. These notices were also mailed to property owners in the unorganized territories of Maine.

The Maine Forest Service Public Service Announcement (PSA) has continued to be broadcast on television stations and the internet across the State and beyond. News releases covering invasive insects and firewood movement started in early spring and continued throughout the year as events warranted. Both the MFS and Maine Department of Agriculture have websites on firewood and/or invasive insects. The MFS firewood web pages had 32,450 hits in 2010 and the invasive insects pages had 68,461 visits. 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.

Year two of a survey of second homes owned by out of state owners from quarantined areas was conducted. Records from towns with large numbers of second homes were secured and locations where firewood could have potentially come in to the state were mapped. Host trees in these areas were surveyed for ALB and/or EAB. To date no sign of infestations have been found.

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.

Light Trap Survey

The Maine Forest Service has been monitoring forest insect pest populations with an array of light traps across the State for 68 years. Traps are 150W light bulbs inside a protective casing with an entry for moths. The moths fall down a funnel into a can where they die. Trap operators collect the catch on a daily basis and send the catch in weekly to be processed. The timeframe for trap operation in 2010 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. Twenty-five traps were run in 2010 in locations from South Berwick to Allagash to Topsfield (Table 6). 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.

Table 6. 2010 light trap locations.

Trap Location	Start Date	End Date	No. Nights
Allagash	July 3, 2010	July 30, 2010	30
Ashland	July 3, 2010	July 30, 2010	30
Bowerbank	June 17, 2010	July 30, 2010	45
Calais	June 17, 2010	July 30, 2010	45
Crystal	July 3, 2010	July 30, 2010	30
Exeter	June 17, 2010	July 30, 2010	45
Frost Pond - T3 R11 WELS	June 17, 2010	July 30, 2010	45
Haynesville	June 17, 2010	July 30, 2010	45
Hope	June 17, 2010	July 30, 2010	45
Jackman	July 3, 2010	July 30, 2010	30
Kennebunk	June 17, 2010	July 30, 2010	45
Kingfield	July 3, 2010	July 30, 2010	30

Millinocket	June 17, 2010	July 30, 2010	45
Mount Desert	June 17, 2010	July 30, 2010	45
Mount Vernon	June 17, 2010	July 30, 2010	45
New Sweden	July 3, 2010	July 30, 2010	30
Norway	June 17, 2010	July 30, 2010	45
Rangeley	June 17, 2010	July 30, 2010	45
Sedgwick	June 17, 2010	July 30, 2010	45
Shirley	June 17, 2010	July 30, 2010	45
South Berwick	June 17, 2010	July 30, 2010	45
Ste. Aurelie -Big Six Twp	July 3, 2010	July 30, 2010	30
Ste.Pamphile-T15 R15 WELS	July 3, 2010	July 30, 2010	30
Topsfield	June 17, 2010	July 30, 2010	45
Topsham	June 17, 2010	July 30, 2010	45

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. This year we also cooperated in a nationwide study of two tussock moths *Lophocampa maculata* and *L. caryae*. Specimens of these two species were retained and sent to the researcher at Lewis and Clark College in Portland, Oregon along with the associated trap location and date information.

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 this unit takes many forms. We speak at workshops and field days to a broad range of audiences, we 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.

Subscription to our own publications, the *Annual Summary* and monthly *Conditions Reports* remains stable, with 533 electronic and paper subscriptions in 2010. Six *Conditions Reports* and one *Annual Summary Report* were produced in 2010. In addition, staff prepared articles for magazines such as Independent Sawmill & Woodlot Management and Northern Woodlands and newsletters such as the SWOAM newsletter, collaborated with Jeanne Curran (DOC) on press releases, and responded to press inquiries.

Division staff prepared and gave more than 60 presentations, with more than 2000 people in attendance. Audiences included arborists, foresters, landowners, garden clubs, land trusts, road crews, and school children. Invasive insects and firewood were frequent topics.

More than 1000 calls were recorded in our pest log database in 2010. This does not account for all calls coming in, as some are inevitably left unrecorded. Invasive insects such as hemlock woolly adelgid, Asian longhorned beetle and emerald ash borer accounted for the most calls. Needlecast diseases, including needlecast on spruce and white pine, also were high on the list. Frost injury caused a lot of concern and generated many inquiries.

A subset of the division's Web pages received over 422,400 hits in 2010 (Table 3). Some highlights include: over 10,400 hits on the homepage, over 12,200 hits on invasive threats pages, more than 32,000 hits on firewood pages, more than 10,000 hits on hemlock woolly adelgid pages, more than 26,000 hits on quarantine pages, and a combined 160,000 hits distributed among insect and disease factsheets.

Table 3. Summary of Web page hits on of a subset of Forest Health and Monitoring pages in 2010.

Category	Sum

All		*422,452*
	Factsheets	**160,021**
	Browntail Moth	*18,284*
	Mosquitoes	*10,677*
	Invasive Insects	**68,461**
	Hemlock Woolly Adelgid	*10,677*
	Elongate Hemlock Scale	*6,096*
	Firewood	**32,450**
	Quarantines	**26,252**
	Cerceris	**13,086**

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. More information on the quarantines is contained in the section: **Forestry Related Quarantines in Maine – 2010**.

Forestry Related Quarantines in Maine – 2010

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 material outside the quarantine zone.

The following is only a partial summary of the rules. Refer to the cited statutory authority and related rules for complete quarantine regulations. Maps of the regulated areas and lists of regulated towns can be found at the end of this section. 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: www.maineforestservice.gov/idmquar.htm.

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.

II. Gypsy Moth

a. 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.

b. 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.

c. New in 2010: Updated quarantine rules went through the rule-making process. The new rules do not change processes related to the quarantines, but formalize the parallel State and Federal quarantines on gypsy moth and European larch canker.

III. **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 2010:** Updated quarantine rules went through the rule-making process. The new rules do not change processes related to the quarantines, but formalize the parallel State and Federal quarantines on gypsy moth and European larch canker.

IV. **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 spread in the State, in order to protect Maine's forest, timber and wildlife resources from this destructive pest. Any hemlock articles with attached bark, including but not limited to hemlock seedlings and nursery stock, logs, lumber with bark, chips with bark, and uncomposted shipments of bark are regulated. The area under quarantine includes the towns of Eliot, Kittery, Ogunquit, South Berwick, Wells and York in York county Maine, portions of the northeastern United States to our south and west and the States of Alaska, California, Oregon and Washington in the western United States.

   Arrangements or requests for importing hemlock seedlings and nursery stock must be handled through the Plant Industry Division, 28 State House Station, Augusta, ME 04333; Tel. (207) 287-7548. Arrangements or requests for importing hemlock logs, lumber with bark, chips with attached bark, or uncomposted bark must be handled through the Insect and Disease Laboratory, 50 Hospital Street, Augusta, ME 04330; phone: (207) 287-2431.

c. **New in 2010:** Hemlock woolly adelgid is also a quarantine pest in OH, MI, NH, VT, WI and Canada. Many of those areas use the federal list of infested counties to set the quarantine zones. For those areas hemlock from Cumberland, Lincoln and Sagadahoc counties in Maine were added to the quarantine in February 2011. For our in-state quarantine the formal rule-making process needs to be followed to add new areas. That process is on hold, but informal discussions are underway.

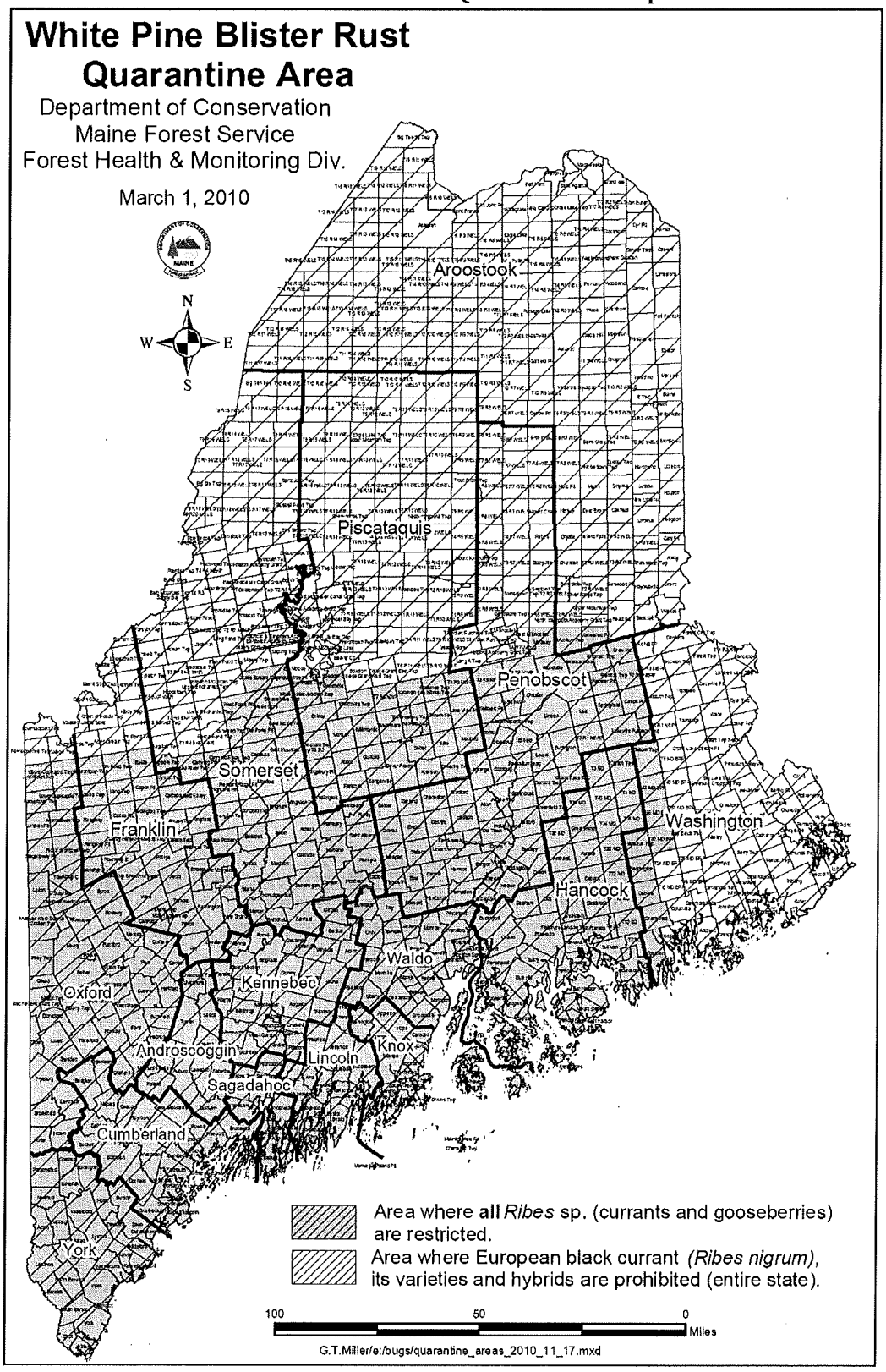
V. **Pine Shoot Beetle**

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: www.maineforestservice.org/idmquar.htm.

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, 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, T5 R9 NWP, T7 R9 NWP, Wellington, Williamsburg Twp, Willimantic

Sagadahoc County: The entire County.

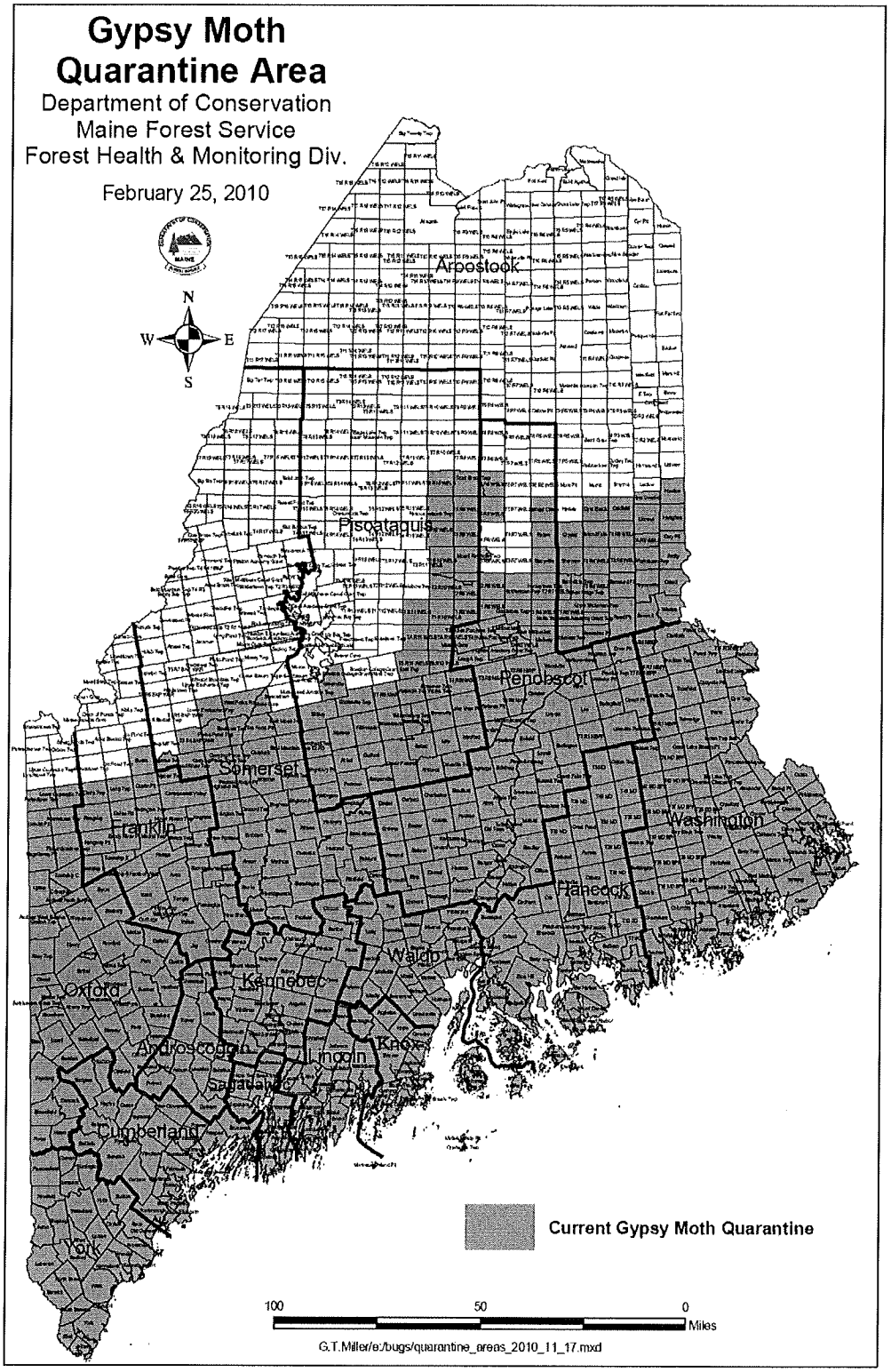
Somerset County: Anson, Athens, Bald Mountain Twp T2 R3, Bigelow Twp, Bingham, Bowtown Twp, Brighton Plt, Cambridge, Canaan, Caratunk, Carrying Place Town Twp, Carrying Place Twp, Chase Stream Twp, Concord Twp, Cornville, Dead River Twp, Detroit, East Moxie Twp, Embden, Fairfield, Harmony, Hartland, 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, Cary Plt, Crystal, Dyer Brook, Forkstown Twp, Glenwood Plantation, Haynesville, Hodgdon, Houlton, Island Falls, Linneus, Macwahoc Plantation, Molunkus, N. Yarmouth Acad.Grant, New Limerick, Oakfield, Orient, Reed Plantation, Sherman, Silver Ridge, T1 R5 WELS, T2 R4 WELS, T3 R3 WELS, T3 R4 WELS, T4 R3 WELS, TA R2 WELS, Upper Molunkus, Weston

Cumberland County- The entire county.

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

Hancock County- The entire county.

Kennebec County- The entire county.

Knox County- The entire county.

Lincoln County- The entire county.

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

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

Piscataquis County- Abbot, Atkinson, Barnard, Blanchard Plantation, Bowerbank, Brownville, Dover-Foxcroft, Eliotsville Twp., Greenville, Guilford, Katahdin Ironworks Twp., Kingsbury Plantation, Lakeview Plantation, Medford, Milo, Monson, Mount Katahdin Twp, Nesourdnahunk Twp, Orneville, 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, Willimantic and portions of T4 R10 WELS within the boundaries of Baxter State Park.

Sagadahoc County- The entire county.

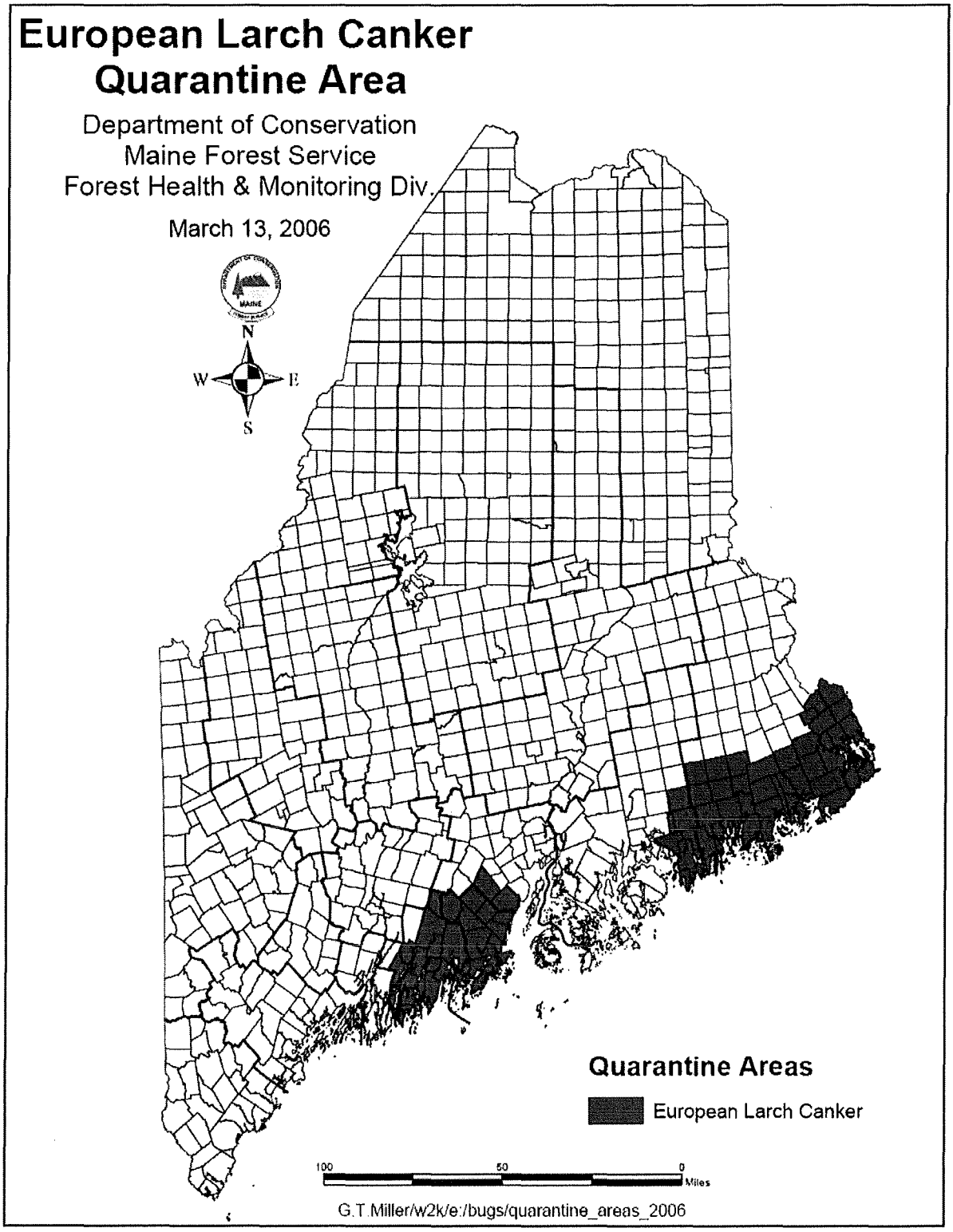
Somerset County- Anson, Athens, Bald Mountain, Bigelow Twp, Bingham, Bowtown, Brighton Plantation, Cambridge, Canaan, Caratunk, Carrying Place, Carrying Place Town, Concord Plantation, Cornville, Dead River, Detroit, East Moxie Twp, Embden, Fairfield, Harmony, Hartland, Highland Plantation, Lexington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

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

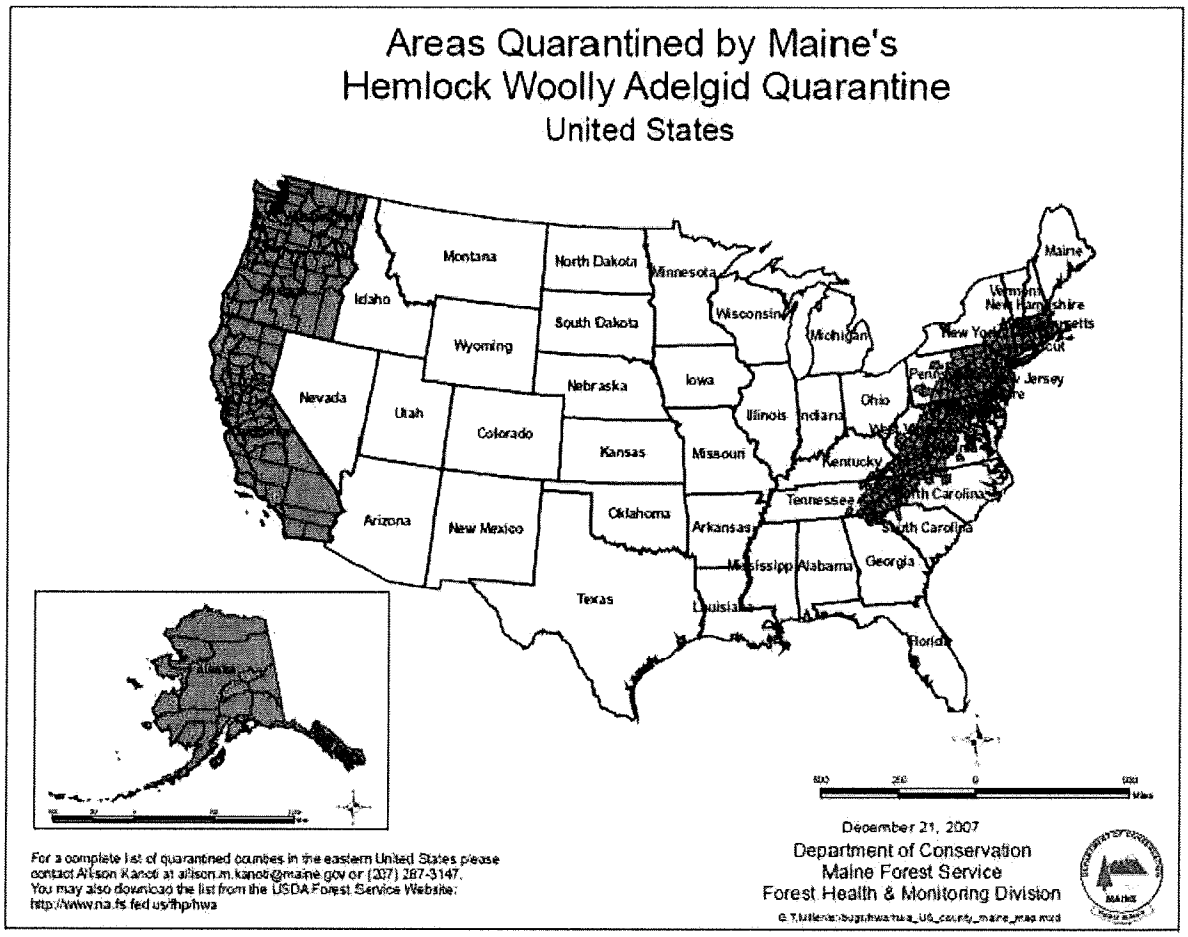
Knox County - Appleton, Camden, Cushing, Friendship, Hope, Owls Head, Rockland, Rockport, Saint George, South Thomaston, Thomaston, Union, Warren, and Washington

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

Hemlock Woolly Adelgid Quarantine Area Map—United States



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

Maine:
York County: Eliot, Kittery, Ogunquit, South Berwick, Wells, York

New Hampshire:
Cheshire, Hillsborough, Rockingham, and Strafford Counties

Vermont
Windham County

Eastern United States:
All or parts of: Connecticut, Delaware, Georgia, Kentucky, Maine, Massachusetts, Maryland, New Hampshire, New Jersey, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, South Carolina, Tennessee, Virginia, West Virginia

Western United States:
Entire States of: Alaska, California, Oregon, Washington

Eastern US Counties Regulated by Maine's Hemlock Woolly Adelgid Quarantine
(italics are new listings in 2010)

Connecticut: Entire State

Delaware: Entire State

Georgia: *Banks,* Fannin, Habersham, *Hall,* Lumpkin, *Murray, Pickens,* Rabun, Stephens, Towns, Union, White

Kentucky: Bell, *Breathitt,* Clay, Floyd, Harlan, *Laurel,* Leslie, Letcher, *McCreary, Owsley,* Pike, Powell, Whitley, *Wolfe*

Massachusetts: Barnstable, Berkshire, Bristol, Dukes, Essex, Franklin, Hampden, Hampshire, Middlesex, Norfolk, Plymouth, Suffolk, Worcester

Maryland: Allegany, Anne Arundel, Baltimore, Calvert, Caroline, Carroll, Cecil, Frederick, Garrett, Harford, Howard, Kent, Montgomery, Prince George, Queen Anne's, Talbot, Washington

Maine: York (6 towns)

North Carolina: Alamance, Alexander, Alleghany, Ashe, Avery, Buncombe, Burke, Caldwell, Caswell, Catawba, Cherokee, Clay, Forsyth, Graham, Haywood, Henderson, *Iredell,* Jackson, Macon, Madison, McDowell, Mitchell, Orange, Polk, Rockingham, Rutherford, Stokes, Surry, Swain, Transylvania, Watauga, Wilkes, Yancey

New Hampshire: *Cheshire,* Hillsborough, Rockingham, Strafford

New Jersey: Entire State

New York: Albany, Bronx, *Broome, Chemung,* Columbia, Delaware, Dutchess, Greene, Kings, Monroe, Nassau, New York, Orange, Putnam, Queens, Rensselaer , Richmond, Rockland, Schuyler, Seneca, Suffolk, Sullivan, *Tioga,* Tompkins, Ulster, Westchester, Yates

Pennsylvania: Adams, Allegheny, Bedford, Berks, Blair, Bradford, Bucks, Cambria, Carbon, Centre, Chester, *Clearfield,* Clinton, Columbia, Cumberland, Dauphin, Delaware, Elk, Fayette, Franklin, Fulton, Huntingdon, Juniata, Lackawanna, Lancaster, Lebanon, Lehigh, Luzerne, Lycoming, Mifflin, Monroe, Montgomery, Montour, Northampton, Northumberland, Perry, Philadelphia, Pike, Potter, Schuylkill, Snyder, Somerset, Sullivan, Susquehanna, Tioga, Union, Wayne, Westmoreland, Wyoming, York

Rhode Island: Entire State

South Carolina: Greenville, Oconee, Pickens

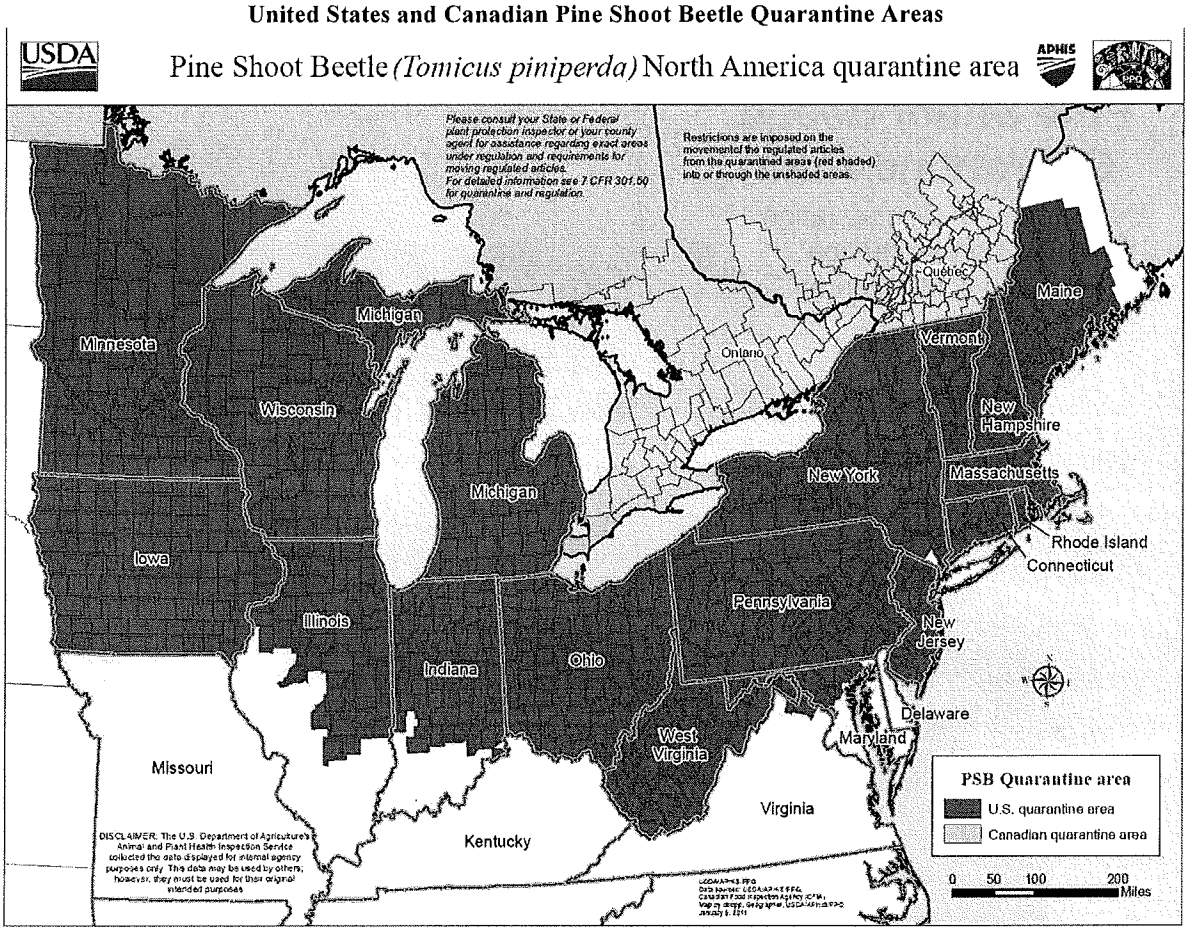
Tennessee: Blount, Campbell, Carter, Claiborne, Cocke, *Cumberland,* Grainger, Greene, Hamblen, Hamilton, Hancock, Hawkins, Jefferson, Johnson, Knox, Loudon, *McMinn,* Monroe, Morgan, Polk, Rhea, Sevier, Sullivan, Unicoi, Union, Washington

Vermont: Windham

Virginia: Albemarle, Alleghany, Amherst, Appomattox, Arlington, Augusta, Bath, Bedford, Bland, Botetourt, Buchanan, Buckingham, Campbell, Caroline, Carroll, Chesterfield, Clarke, Craig, Culpeper, Dickenson, Essex, Fairfax, Fauquier, Floyd, Fluvanna, Franklin, Frederick, Giles, Grayson, Greene, Hanover, Henrico, Henry, Highland, King William, Lee, Loudoun, Lunenburg, Madison, Montgomery, Nelson, Northumberland, Orange, Page, Patrick, Pittsylvania, Prince William, Pulaski, Rappahannock, Roanoke, Rockbridge, Rockingham, Russell, Shenandoah, Smyth, Spotsylvania, Tazewell, Warren, Washington, Wise, Wythe

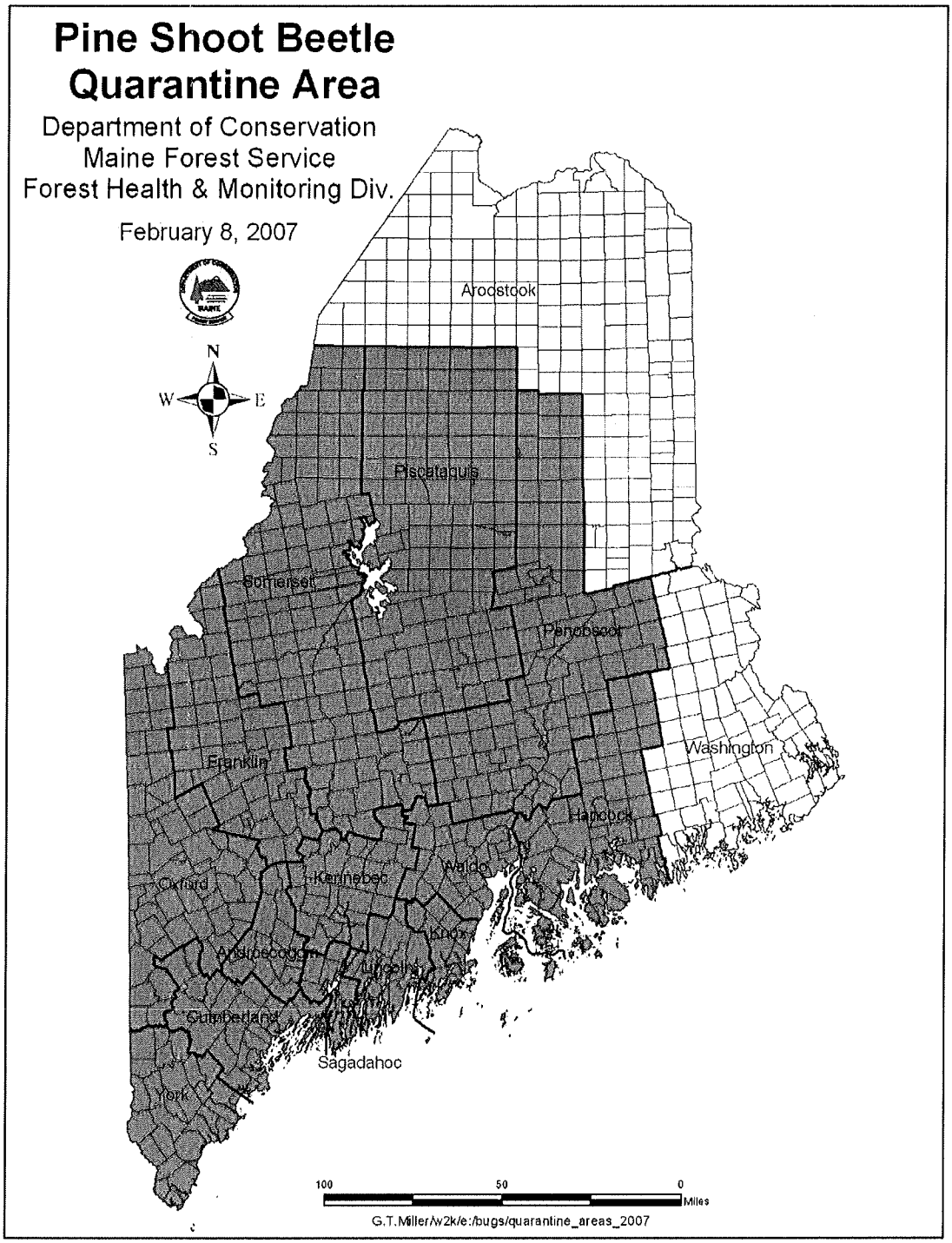
West Virginia: Barbour, Berkeley, Boone, Braxton, Cabell, Fayette, Grant, Greenbrier, Hampshire, Hardy, Jefferson, Kanawha, *Lewis,* Lincoln, Logan, Marion, McDowell, Mercer, Mineral, Mingo, Monongalia, Monroe, Morgan, Nicholas, Pendleton, Pocahontas, Preston, Raleigh, Randolph, Roane, Summers, Tucker, Upshur, Webster, *Wirt,* Wood, Wyoming

United States and Canadian Pine Shoot Beetle Quarantine Areas



Above map is available online at: http://www.aphis.usda.gov/plant_health/plant_pest_info/psb/.

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)

Maine Forest Service
DEPARTMENT OF CONSERVATION
INSECT & DISEASE MANAGEMENT DIVISION 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.
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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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27. Bradbury, R.L. An Economic Assessment of the White Pine Blister Rust Control Program in Maine. January, 1989. 17 pp.

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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.

32. Dearborn, R.G. and C.P. Donahue. The Forest Insect Survey of Maine - Order Coleoptera (Beetles). December, 1993. 101 pp.

33. Trial, Jr., H. and M.E. Devine. Forest Health Monitoring Evaluation: Brown Ash (*Fraxinus nigra*) in Maine - A Survey of Occurrence and Health. May 1994. 37 pp.

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35. Bradbury, R.L. Efficacy Trials of Foray 48B Against Early Larval Instars of the Browntail Moth, *Euproctis chrysorrhoea* (L.). May, 1995. 7 pp.

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37. Trial, Jr., H. and M.E. Devine. Forest Health Monitoring Evaluation: Brown Ash (*Fraxinus nigra*) in Maine - A 1995 Resurvey of Brown Ash Decline Plots Established in 1993. August 1996. 12 pp.

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.

42. Foss, K.A and R.G. Dearborn. Preliminary Faunistic Survey of Mosquito Species (Diptera: Culicidae) with a Focus on Population Densities and Potential Breeding sites in Greater Portland, Maine. November 2001. 35 pp.
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43. ____. Maine Mosquito Surveillance Program – Report of the 2001 Working Group (MeDOC/FH&M, MMCRI, Coop. Extension serv. PMO, DHS-HETL). November 2001. Revised 2004. 134 pp.

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MFS 03/11

Appendices

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

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Introduction: Emerald ash borer (EAB) is a serious invasive pest of ash trees. 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 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 Midwest, Atlantic states and Ontario and just south of Montreal, Quebec – less than 200 miles from the Maine Border. 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.

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 moved in firewood. 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 by using purple traps attractive to the adults. In addition, we have developed a 'biosurveillance' project, using a native wasp that hunts EAB, to monitor for its presence.

Purple prism trap survey: In the summer of 2010, the MFS participated in the third year of a national trapping trial for EAB. Traps (photo at right) were placed at 13 sites (mainly campgrounds and parks) throughout the southern and central part of the state (Table A1). At each site two large purple sticky prism traps, baited with a blend of manuca oil and synthetic phoebe oil, were hung in the canopies of ash trees at a height of 30-90 feet. Traps were set in the third week of June, were replaced in late July, and were removed the first week of September.

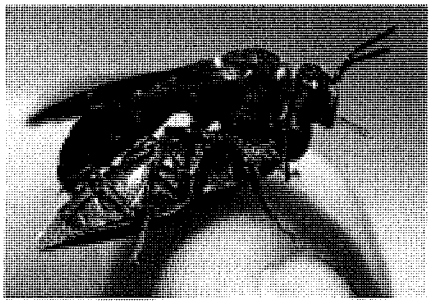
In order to make a small-scale comparison between purple traps and biosurveillance, pairs of purple traps were placed at five sites where *Cerceris fumipennis* were also being monitored for EAB. No buprestids were captured on these traps, and 85 native buprestids were collected from the corresponding *C. fumipennis* colonies.

No EAB was detected by this trapping method, and no buprestids of any species were captured on any purple sticky traps in 2010.

Table A1: Locations of purple prism traps.
(**Bold font** indicates sites where *Cerceris fumipennis* sites were also monitored)

Town	County	Latitude	Longitude
York (Cape Neddick)	York	43.21989	-070.61094
Kennebunkport	York	43.39119	-070.49281
Durham	Cumberland	43.92700	-070.15600
Freeport	Cumberland	43.82973	-070.07221
Damariscotta	Lincoln	44.02960	-069.45991
Camden	Knox	44.23057	-069.04738
Searsport	Waldo	44.44046	-068.93384
Greenville	Piscatiquis	45.49661	-069.58461
Biddeford	**York**	**43.54379**	**-070.51580**
Farmingdale	**Kennebec**	**44.26612**	**-069.80206**
Mechanic Falls	**Androscoggin**	**44.10528**	**-070.38736**
Washington	**Knox**	**44.30759**	**-069.39745**
Whitefield	**Lincoln**	**44.17035**	**-069.62178**

Biosurveillance for emerald ash borer: In 2008, the Maine Forest Service initiated a biosurveillance project for EAB. Biosurveillance is the use of one living organism to survey for another. *Cerceris fumipennis* (pictured on the right with native buprestid prey) is a native, non-stinging wasp which nests in hard-packed sandy ground and hunts buprestid beetles, including EAB when present. In Maine, it is very commonly found in hard-packed baseball diamonds. It is much more efficient at finding EAB than humans are, and has the potential to find a new infestation earlier. We are also using this wasp to monitor for other exotic buprestids.



We had a warm spring, and Cerceris emerged a full month earlier this year in many sites than it did last year. The earliest colonies emerged around June 27, and at most sites, hunting activity was over by mid-August. As of the summer of 2010, we know of 63 active *C. fumipennis* colonies in Maine. Although the total number of known colonies increased this year, the number of colonies large enough to be used for biosurveillance is reduced from last year, likely due to the cold rainy summer of 2009. Nineteen colonies were large enough to support biosurveillance (Table A2), 34 are currently too small (Table A3), and 10 are too far from ash trees to be suitable for biosurveillance for EAB (Table A4). However, buprestids were collected from some of these sites to monitor for the presence of other exotic buprestids.

At least some level of biosurveillance was conducted at 18 locations throughout the state, and 254 buprestids were collected. Many of these were common *Dicerca sp* and were used in experiments on transplanting wasps and creating mobile colonies. The rest will be identified to species. No EAB was detected in Maine in 2010.

Twenty individuals or groups of volunteers 'adopted' local wasp colonies and took responsibility for conducting biosurveillance throughout the summer. The number of volunteers is higher than the number of biosurveillance sites, since at many sites last years cold rainy summer left the colonies too small to carry out biosurveillance this year. However volunteers at these sites did monitor wasp numbers and activity. Several additional volunteers also searched for, and some found, new wasp colonies. Volunteers included Girl Scouts, town arborists, Maine Entomological Society members, families, a town councilman, a high school teacher, and other interested individuals. They are an integral part of this program and we greatly appreciate their help in making it successful. Maine's biosurveillance program would not be possible without them.

Table A2: Cerceris fumipennis colonies large enough for biosurveillance ***(italics indicate site where biosurveillance occurred in 2010)***

County	Town	Location	# of Nests
Androscoggin	*Auburn*	*private yard*	*75-100*
Androscoggin	Greene	baseball diamond	27
Androscoggin	*Poland*	*baseball diamond*	*100*
Androscoggin	*Turner Center*	*baseball diamond*	*100+*
Cumberland	*Freeport*	*baseball diamond*	*25*
Cumberland	Windham	baseball diamond	100+
Hancock	*Dedham*	*baseball diamond*	*400*
Kennebec	*Augusta*	*baseball diamond*	*30*
Kennebec	*Farmingdale*	*baseball diamond*	*50*
Kennebec	Litchfield	gravel pit	15-20?
Knox	*Union*	*baseball diamond*	*100*
Knox	*Washington*	*private yard*	*15-30*
Lincoln	*Whitefield*	*gravel pit*	*100+*
Oxford	Fryeburg	dirt road	50
Oxford	*Norway*	*baseball diamond*	*50*
Somerset	Skowhegan	dirt road	95
Somerset	*Smithfield*	*gravel pit*	*32*
York	*Saco*	*parking lot*	*30*
York	*Sanford*	*baseball diamond*	*35*

Table A3: Cerceris fumipennis colonies too small for biosurveillance ***(italics indicate site where beetles were collected in 2010)***

County	Town	Location	# of Nests
Androscoggin	Greene	baseball diamond	2
Androscoggin	*Mechanic Falls*	*baseball diamond*	*15*
Cumberland	Casco	baseball diamond	6
Cumberland	Casco	baseball diamond	1
Cumberland	Cumberland	parking lot	6
Cumberland	Freeport	baseball diamond	1
Cumberland	Freeport	baseball diamond	11
Cumberland	Grey	cemetery	5-7
Cumberland	Harrison	baseball diamond	7
Cumberland	Harrison	baseball diamond	10
Cumberland	Naples	baseball diamond	3
Kennebec	China	baseball diamond	20
Kennebec	Winslow	baseball diamond	20
Lincoln	Wiscasset	baseball diamond	2
Oxford	Fryeburg	baseball diamond	8
Penobscot	Newport	baseball diamond	10
Piscataquis	Dover-Foxtrot	fairgrounds	3
Piscataquis	Guilford	baseball diamond	7
Sagadahoc	Bath	baseball diamond	2
Sagadahoc	Bath	baseball diamond	6-7
Sagadahoc	Bath	baseball diamond	3-5
Somerset	Norridgewock	baseball diamond	4
Somerset	Smithfield	gravel pit	1
Somerset	Smithfield	gravel pit	3
Waldo	Montville	gravel pit	12
York	Alfred	baseball diamond	8
York	Kennebunkport	baseball diamond	3
York	Lyman	baseball diamond	1
York	Sanford	baseball diamond	12
York	Sanford	baseball diamond	11
York	Wells	baseball diamond	10
York	York	baseball diamond	8
York	York	baseball diamond	1

Table A4: Cerceris fumipennis colonies with no ash trees nearby – unsuitable for biosurveillance ***(italics indicate site where beetles were collected in 2010)***

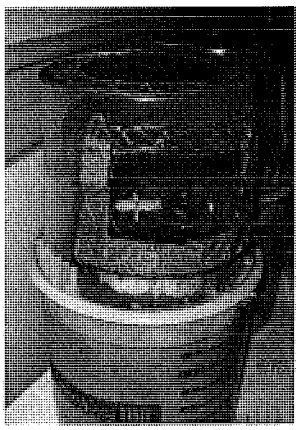
County	Town	location	# nests
Androscoggin	Auburn	baseball field	25
Cumberland	N. Windham	baseball field	15
Cumberland	N. Windham	baseball field	20
Franklin	Farmington	baseball field	5
Oxford	*Fryeburg*	*dirt road*	*50*
Oxford	*Fryeburg*	*airport*	*200+*
Somerset	Madison	baseball field	4
Somerset	Norridgewock	gravel pit	200-300
Somerset	*Smithfield*	*gravel pit*	*~200*
York	Wells	dirt road	3

Biosurveillance Research:

Transplanting Wasps: We experimented this year with transplanting adult wasps from an existing colony to a new location. Female wasps (almost certainly mated) were brought to the new site. Potential nest holes were initiated by driving a large-diameter nail into the ground. Well-ventilated translucent 1-gallon buckets were place upside-down over the nest holes and were driven into the ground to a depth of about 2 cm to prevent wasps from digging out. Food and water were provided by placing Q-tips dipped in honey-water and small dishes containing gravel and water under the buckets. Then 1-2 wasps were placed under each bucket. Shade covering was placed above the buckets to minimize heat exposure. Paralyzed beetles were placed 1-2 times daily adjacent to any nest which showed evidence of fresh excavation.

Four separate attempts, with 10-14 wasps each, were made. In the first, an unknown person removed the shade covering, and the wasps died of heat exposure. In the next three attempts, although a few wasps appeared to have escaped, most remained alive at the new sites, dug nest holes, and several accepted paralyzed beetles placed beside their nests. The wasps were maintained as captives for four days in the second trial, two days in the third, and overnight in the fourth. However, when the covers were removed, all females left their nests and were not seen again. It is likely that the soil at the new location was not acceptable to the wasps, but we were unable to gain permission to transplant wasps to a potentially more suitable site.

Mobile Colonies: We also experimented with creating mobile colonies. Since in many parts of Maine there appear to be no naturally-occurring *C. fumipennis* colonies, we feel it is important to create mobile colonies which can be taken to high-risk areas to monitor for EAB. One-gallon buckets were filled with firmly-packed sand from an existing colony. Food, water and nest holes were provided and buckets were covered (as above). The covered buckets were placed beside a bank of windows, but out of direct sunlight (see picture at right). Wasps were observed feeding on honey-water, drinking, and excavating nests. As above, paralyzed beetles were placed beside any hole which showed signs of fresh excavation. About 1/3 of the beetles offered were taken into the nests. After 5 days indoors, the covers were removed and the buckets taken out to a sunny area. When sufficiently warm, all wasps emerged from their nests, flew away from the buckets, and none returned.



We made three further attempts at creating mobile colonies. We dug a large hole about 50 cm deep, and lined the bottom with rocks taken from the hole. We then placed the same buckets from the first experiment in the hole and filled in the soil around them. The hope was that the wasps would take up residence in the buckets, which could then be dug up and moved as needed. Food, water, holes and shade were provided, and the buckets were covered as before. A thunderstorm during the first attempt showed that the nest buckets were seated too low in the ground and were prone to flooding. They were subsequently

dug up and raised to a higher level. The covers were maintained for two days in the first attempt and overnight in the second and third attempt. In the second attempt, one wasp returned after the covers were removed, and was seen the second morning. In the third attempt one wasp returned for two days before disappearing. It is likely that the buckets were not well-enough drained, and the soil was too moist for successful colonization.

We thank our Waspwatcher volunteers, the Walton and the Brown families, for their help in providing live paralyzed wasps for these experiments.

Degree-Day Modeling: Working in cooperation with Claire Rutledge (Connecticut Agricultural Experiment Station), Philip Careless (independent contractor in Ontario), and Melissa Fierke (State University of New York Environmental Science and Forestry), the Maine Forest Service began a two-year study to determine a soil degree-day (DD) model for the emergence of *Cerceris fumipennis*. Wasp emergence varies greatly with weather from year to year, and site to site. Being able to predict the timing of wasp emergence would allow both forest health professionals and volunteers to make more efficient use of *C. fumipennis* for biosurveillance.

Thirty-two temperature probes were buried eight inches below the soil surface in wasp colonies throughout the four states and provinces. Twelve were buried in Maine. These sites were then monitored closely by volunteers and entomologists to determine the date of adult wasp emergence. Due to mechanical failure, loss, and human causes, we obtained reliable data on both emergence and temperature at only 13 sites. Three of these sites were in Maine (Table A5). In Maine, most of the wasps emerged on the July 4 weekend, when many of the volunteers monitoring for emergence were away. Table A5.

Table A5: Data associated with monitored C. fumipennis colonies in Maine in 2010 (excerpt from Report for Cooperative Agreement 10-CA-027, Rutledge *et al*, 2010).

Location information						Base 7°C	
Location	Latitude	Longitude	Elevation (m)	Rain (cm)	Emergence Date	Air DD	Soil DD
Guilford	45.1684	69.3759	111.9	45	7-Jul	698.3	1067.7
Mechanic Falls	44.1046	70.3875	94.2	56.8	6-Jul	684	1024.5
Sanford	43.4342	70.7728	91.4	80.1	27-Jun	643.9	987

Using the methods of Drummond et al. (1986), the base temperature for degree-day accumulation for *C. fumipennis* was 7 °C. Over all the sites, the average soil degree-days needed for emergence was 989 °C base 7°C. The average air degree-day for emergence was 714°C base 7°C. Air DD and soil DD were correlated with borderline significance ($P = 0.069$; $R^2 = 0.329$). Cumulative rainfall was negatively correlated with soil DD needed for emergence ($P = 0.049$, $R^2 = 0.0366$); i.e., the more rain, the later the wasps emerged. To judge the usefulness of the average air DD, we looked at how many calendar days from the emergence date the average air DD was reached at each site. The difference between DD accumulation at the date at which wasps emerged at a site, and the date at which the average DD was accumulated was ± 4 days, with a median value of 0 days. This gives a fairly narrow window to monitor for emergence using the readily available source of air temperature data (Rutledge et al 2010). A second season of this work will be carried out. We thank the many Waspwatchers, as well as personnel at the Eastern Slopes Regional Airport in Fryeburg for their assistance with this research.

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Appendix B
Pinaceae Commodity Survey

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The Maine Forest Service surveyed for invasive pests that attack trees in the pine (*Pinaceae)* family (pines, fir, spruce, hemlock, cedar) for a second season. Pine forests are a national resource used for lumber, pulpwood, and increasingly as a potential biomass feedstock. Invasive pests continue to pose a serious threat to these pine resources of the U.S. This threat has resulted in actual or potential regulatory action for a number of species (*eg.*: pine shoot beetle; European woodwasp). Maine has over 1.7 million acres of pine and oak/pine forests, concentrated in the southern portion of the state. Overall, the state's forests contain over 2.5 billion cubic feet of pine timber. While this number comprises only 19 percent of the softwood volume, it represents 36 percent of Maine's softwood stumpage value. These forests provide the raw materials for a very significant pine milling industry and employment for the dependant communities. Pine milling byproducts are a important component in a growing soil amendment/bark mulch industry. There is considerable import and export of pine materials between Maine and its neighbors.

It is clear from our recent experience dealing with pine shoot beetle that even suspected presence of a pest of regulatory significance can create serious economic impacts and could critically disrupt the regional economy. Invasive woodborers and bark beetles continue to be among the most serious invasive pest threats to Maine's pine resource. Survey for these pests is funded through a grant from the United States Department of Agriculture – Animal and Plant Health Inspection Service and is consistent with Cooperative Agricultural Pest Survey (USDA-APHIS) objectives.

The following insects are considered significant threats to Maine's pine resource and were surveyed for in 2010:

Common Name	**Scientific Name**	**Hosts**
Bark beetle	*Hylurgops palliatus*	pine
Bark beetle	*Hylurgus ligniperda*	pine
Bark beetle	*Ips subelongatus*	larch, fir, spruce, pine
Bark beetle	*Orthotomicus erosus*	pine
Bark beetle	*Tomicus destruens*	pine
Brown Spruce Longhorned Beetle	*Tetropium fuscum*	spruce, fir, pine
Siberian silk moth	*Dendrolimus pini*	pine, spruce, fir
Siberian silk moth	*Dendrolimus superans*	spruce, fir, larch, pine
European woodwasp	*Sirex noctilio*	pine

Bark beetles were surveyed for at five sites around manufacturing sites/industrial parks/lumber mills/bark processors in high-risk counties in southern Maine. Three Lindgren traps were deployed at each site. Each trap was baited with lures appropriate for each pest (beta pinene + ethanol for *Hylurgops* and *Hylurgus*; racemic ipsenol for *Ips*; ipsdienol + alpha pinene for *Orthotomicus*). Traps were deployed in March before beetles started emerging from overwintering sites, checked every other week and retrieved in September.

Table B1. Locations and Results of Bark Beetle Traps in 2010

Town	**County**	*Hylurgops palliatus*	*Ips subelongatus*	*Orthotomicus erosus*	*Tomicus destruens*
Auburn	Androscoggin	0	0	0	0
Belgrade	Kennebec	0	0	0	0
Casco	Cumberland	0	0	0	0
Dixfield	Oxford	0	0	0	0
Sanford	York	0	0	0	0

The Siberian moths and European woodwasp traps were deployed at eleven sites in seven southern counties. These locations were chosen because they are considered at risk for infestation from invasive pests. Delta wing traps and milk carton traps baited with Siberian silk moth lure were deployed one each per site. One Lindgren trap baited with alpha + beta pinene was deployed at each site for the woodwasp. Traps were initially set in early June and retrieved in October to cover the flight season for these insects. Woodwasp traps were checked every other week and moth traps were checked after four weeks.

Table B2. Locations and Results of Siberian Moths and European Woodwasp Trapping 2010

Town	County	*Dendrolimus pini*	*Dendrolimus superans*	*Sirex noctilio*
Avon	Franklin	0	0	0
Burnham	Waldo	0	0	0
Fairfield	Somerset	0	0	0
Farmington	Franklin	0	0	0
Manchester	Kennebec	0	0	0
Poland	Androscoggin	0	0	0
Poland	Androscoggin	0	0	0
Readfield	Kennebec	0	0	0
Sanford	York	0	0	0
Strong	Franklin	0	0	0
Wiscasset	Lincoln	0	0	0

Brown spruce longhorned beetles were surveyed for at ten sites in eight southern Maine counties with half set in campgrounds and half at wood processing facilities. Lindgren funnel traps were baited with BSLB lure and deployed in mid-May. Traps were checked every other week until mid-September.

Table B3. Locations and Results of Brown Spruce Longhorned Beetle Trapping 2010

Town	County	Facility Type	*Tetropium fuscum*
Camden	Knox	campground	0
Damariscotta	Lincoln	campground	0
Dixfield	Oxford	lumber mill	0
Dover-Foxcroft	Piscataquis	lumber mill	0
Freeport	Cumberland	campground	0
Jackman	Somerset	lumber mill	0
Jay	Franklin	paper mill	0
Searsport	Waldo	campground	0
Skowhegan	Somerset	paper mill	0
Weld	Franklin	campground	0

No target pests were found at any of the locations. All traps were also checked for any other pests, native or invasive, that could be a threat to Maine's forests. Forty-four Cerambycidae woodborer species were identified adding up to 2,374 specimens. Buprestidae woodborer account for 18 species and 143 specimens. The Scolytinae bark beetles were the bulk of the collections as that is what the traps are designed to catch. Over 15,000 bark beetles were processed. All were identified to genus and most the species level. This is the first year out of seven years of trapping that no new woodborer or bark beetles species were found in Maine. For the third year we picked up *Xyleborus seriatus*, an exotic bark beetle that is known only from parts of Massachusetts and three locations in Maine; Auburn, Sanford and Livermore Falls. These locations are near an intermodal facility and two lumber mills.