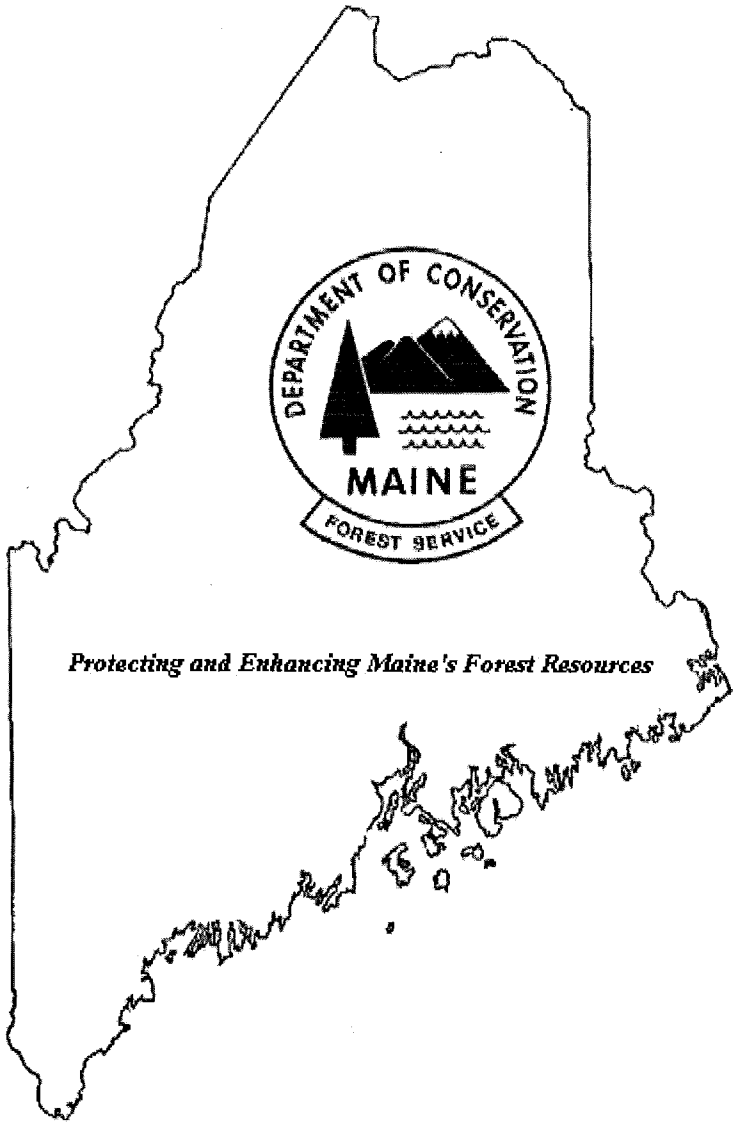
Forest & Shade Tree Insect & Disease Conditions for Maine

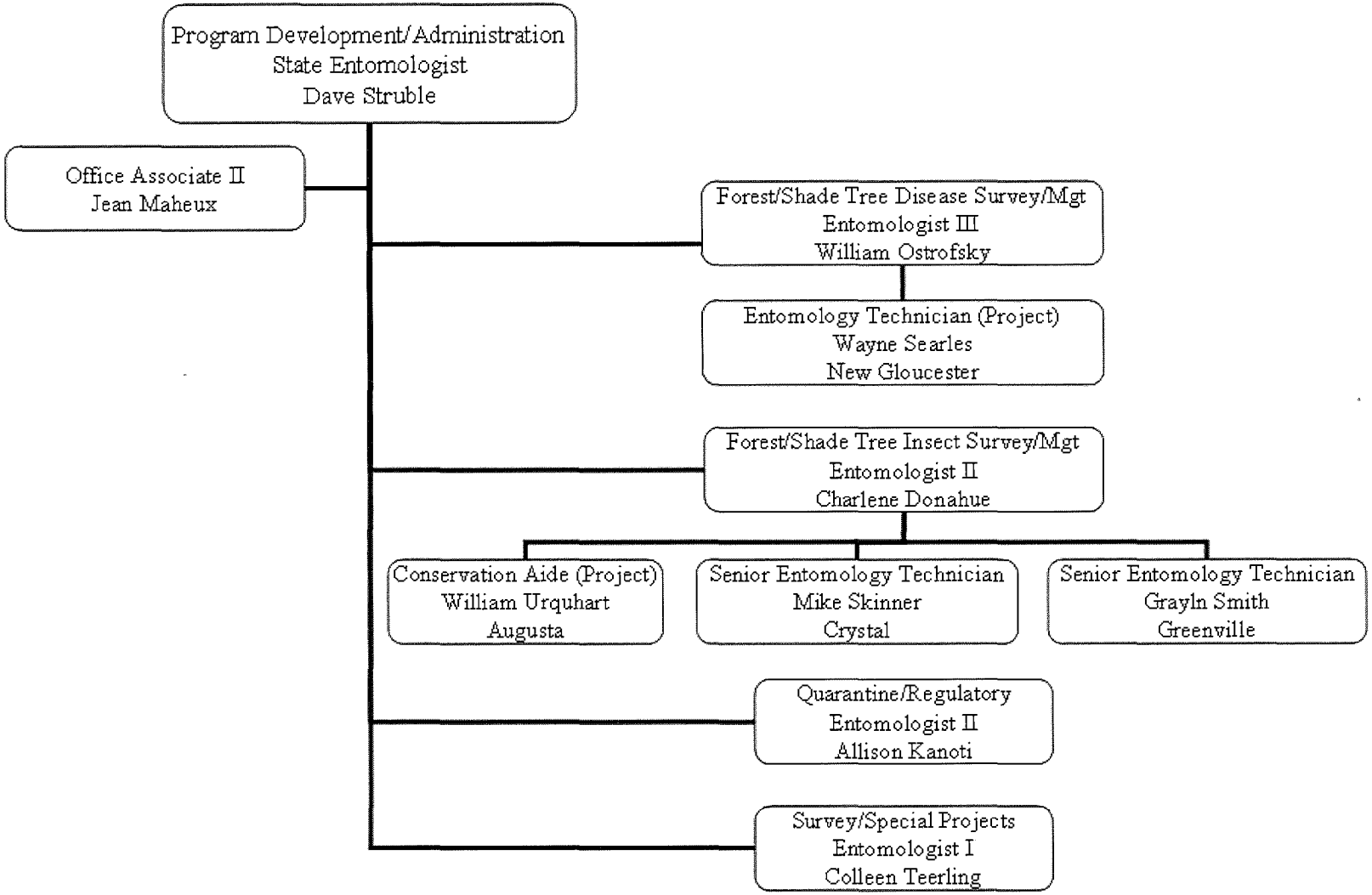
A Summary of the 2009 Situation



Health & Monitoring Division
ıry Report No. 21
2010

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
ph. (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. 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 William 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	Mike Skinner, Entomology Technician 185 Crystal Road Island Falls, Maine 04747 Phone: (207) 463-2328 Radio Call #F-181 Grayln Smith, Entomology Technician Box 128 Greenville, Maine 04441 Phone: (207) 695-2452 Radio Call #F-182 * Field staff can be contacted directly for homeowner assistance in their area of the state.

Forest & Shade Tree – Insect & Disease Conditions for Maine
Reports for the 2010 Season

Sign Up/Renewal Form

Please take a moment to consider whether or not you wish to continue to receive our conditions reports and alerts. You may elect to receive a hard copy of the information or an electronic version. If you prefer not to subscribe, you can check our website now and then for updates. Our website will be especially useful for special alerts and quarantine information. The I&DM Lab will still maintain information sheets on a variety of pest problems, available also on our website, and will continue with diagnostic services as time and manpower permit.

You must complete and return this form if you wish to remain/be on our mailing list. All addresses must begin with individual's names, not corporations or position titles. Please take a moment to fill this out.

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Comments:_____

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Return Your Completed Form To: **Insect & Disease Laboratory**
168 State House Station
Augusta, Maine 04333-0168

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Acknowledgements

The information presented in this Annual Summary is compiled from a variety of sources, and reflects the work of many cooperating individuals and organizations. The report was assembled and edited for printing by the staff of the Maine Forest Service, Forest Health and Monitoring Division: Charlene Donahue, Allison Kanoti, William Ostrofsky, David Struble, and Colleen Teerling. These individuals have the primary responsibility for conducting and administering the forest insect and disease projects and activities within the Maine Forest Service. A substantial amount of the data and forest conditions observations have also come from the work of our Entomology Laboratory field staff: Wayne Searles, Mike Skinner, Grayln Smith, and William Urquhart. Office Assistant Jean Maheux has also provided some much-needed office support.

Maine State Government Interns Adam Douin, Jonathan Dumont and Caroline Gallant provided valuable assistance during some of our busiest months. Their enthusiasm, work ethic and ability to perform independently and as a team exceeded our expectations.

We extend our appreciation to those landowners, arborists, foresters and other individuals in the public, business, and industry sectors who came to us over the year with tree and forest health insights, questions, comments or problems for diagnosis. Our gratitude is also extended to landowners who cooperate in allowing research and management projects to be conducted on their properties; with special acknowledgement to an early cooperator in the hemlock woolly adelgid biological control program who has forgone chemical treatment of the hemlocks in his yard, even in the face of severe tree decline, and whose trees continue to yield high numbers of introduced predators.

Special thanks are extended to Greg Miller, MFS, for constructing maps for this and other reports on short notice; to Greg Lord, MFS, for his assistance in retrieving data; to Peter Lammert, MFS, for his enthusiasm in finding and delivering a multitude of insect and disease "finds" to the Entomology Lab; to Jeanne Curran, DOC, for her help with outreach; and to the many groups and individual volunteers who have assisted with the *Cerceris* biosurveillance project over the past year.

Our appreciation and sincere thanks are also extended to many other administrative and field staff in the Maine Department of Conservation, and to our many contacts in the USDA Forest Service Northeastern Area - Forest Health Protection, USDA-APHIS, Maine Department of Agriculture, and to other cooperators in the New England States and Maritime Provinces of Canada.

Thank you all for the generous support.

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FOREST & SHADE TREE INSECT & DISEASE CONDITIONS

FOR MAINE – A SUMMARY OF THE 2009 SITUATION

State Entomologist's Comments

It is again the time of year when I share my reflections for the past year, and I frequently end such reflections with a statement regarding our dependence on, and appreciation of, the contribution of our client/cooperators. In reflecting back on this year, I think it most appropriate to start there.

You, our client cooperators, represent a crucial resource. You provide an early detection and information dispensing network far beyond what we could otherwise accomplish; we could not do what we do without your assistance. The past year shows this in spades.

Following the discovery of Asian longhorn beetle (ALB) in Worcester, Massachusetts last year, we focused our internal resources on addressing the increased threat; both of incipient spread or, even worse, introduction that might have already occurred but which we had not yet detected. The emerald ash borer (EAB) situation near Montreal posed a distressingly similar situation.

In both instances, we solicited your assistance. And you stepped forward.

- The biomass burning industry worked with us to craft compliance agreements to increase safeguards for use of the material generated as part of the federal ALB eradication program in Worcester. Although the federal regulations required no constraints on the chipped wood, and the industry didn't have to alert us to the fact that they were being approached to use the Worcester material, they did. And working together, our Maine-specific measures added another layer of safety, limiting importation and use of such chips to the months when any beetles present would be hibernating. This effort assured that there were legal markets for the material generated as part of the federal eradication program, and allowed us to monitor the situation. All trapping at those sites found no evidence of ALB.

- As we have come to recognize the extent of the threat for introducing these and similar exotic pests through casual movement of firewood, we have taken the story to the public. In response, a broad coalition of cooperators, from arborists and tree wardens in towns to foresters and campground owners, sought ALB and EAB detection training and carried the message of the threat to their clientele. The maple sugar producers showcased this issue during Maine Maple Sunday last year, and are already preparing for a similar effort this year. The Maine Indian Basketmakers Alliance is spearheading similar efforts with their clientele. The Maine Campground Owners Association is working to get the message out through their network of members.

- As I am writing this, a bill authorizing the Maine Forest Service to ban import of out-of-state firewood to anywhere in Maine is working its way through the Maine Legislature. This legislation, which is in response to the threat posed by ALB and EAB in firewood, was strongly supported by a broad coalition of organizations; demonstrating public support for our mission and efforts.

- As we have developed new ways of monitoring for these pests, we have had citizens (both groups and individuals) volunteering to assist in the monitoring efforts: hosting and participating in "train the trainer" sessions and "adopting" local *Cerceris* colonies to provide local EAB biosurveillance monitoring.

- And the support extends well beyond just the threat of ALB and EAB. Since the first detection of hemlock woolly adelgid in Maine on nursery stock in 1999, it has been the public and industry that have provided many of the initial reports as this pest spread into new areas. This pattern was again demonstrated this year when vigilant citizens noticed something wrong with their hemlocks. They called it in, and in so doing provided us the initial detection of elongate hemlock scale (EHS) in Maine.

- EHS is a non-native pest that, when intermixed with hemlock woolly adelgid, greatly accelerates tree mortality. This detection, before we had a larger area of infestation, provided us the opportunity to treat the site and suppress the population. We can't say that the situation is eradicated but we have greatly reduced the population and its potential for spreading to new areas. This is a direct result of a concerned and vigilant public.

- We also have volunteers helping with curating the reference collection and processing samples. The list goes on and on. And all of it expands our capacity to respond in a timely and effective manner.

I will close as I started: You, our client cooperators, are critical to the success of our mission to protect Maine's forest resources. Although we will continue to target what we think are high risk areas and issues, we can not with our internal capacity begin to investigate all the areas that should be addressed. The help you have provided has been crucial in the past; it will continue to be. I cannot overstate the extent of our reliance on your help or our appreciation for your contribution.

Thank you.

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 heavy levels especially in Downeast Maine. Christmas tree growers and wreath tippers are noticing the problem as it causes current year growth to turn brown and fall off in the fall. This is a minor forest problem and does not affect tree health long term. Populations are expected to remain high next year.

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

Balsam woolly adelgid populations continued at low levels in 2009. While mortality from past years is striking, the consistent rainfall of 2004 through 2008 coupled with low population levels of the adelgid allowed a number of the light to moderately damaged trees to recover. Mortality of heavily damaged fir continues to occur but it becomes less obvious as old stands are salvaged or fall to the ground. Two to ten acre patches of dead fir will remain a common sight in eastern Maine for several more years. No change from 2008.

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. No change from 2008.

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

In late August of 2009 elongate hemlock scale (EHS) was detected by a homeowner in a planted hedge in Kennebunkport. Subsequently, a homeowner in Kennebunk noticed EHS, also on planted hemlocks (Figure 1). At both sites the planted trees were brought into the state prior to the tightening of the quarantine on hemlock woolly adelgid on nursery stock in 2001. Scale populations were extremely high at both sites and in Kennebunk scale was detectable on native hemlock and fir near the planted trees. Infested and adjacent host trees were treated with the systemic insecticide dinotefuron to contain the infestations. These are the first detections of established EHS in Maine. Check planted hemlock 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.

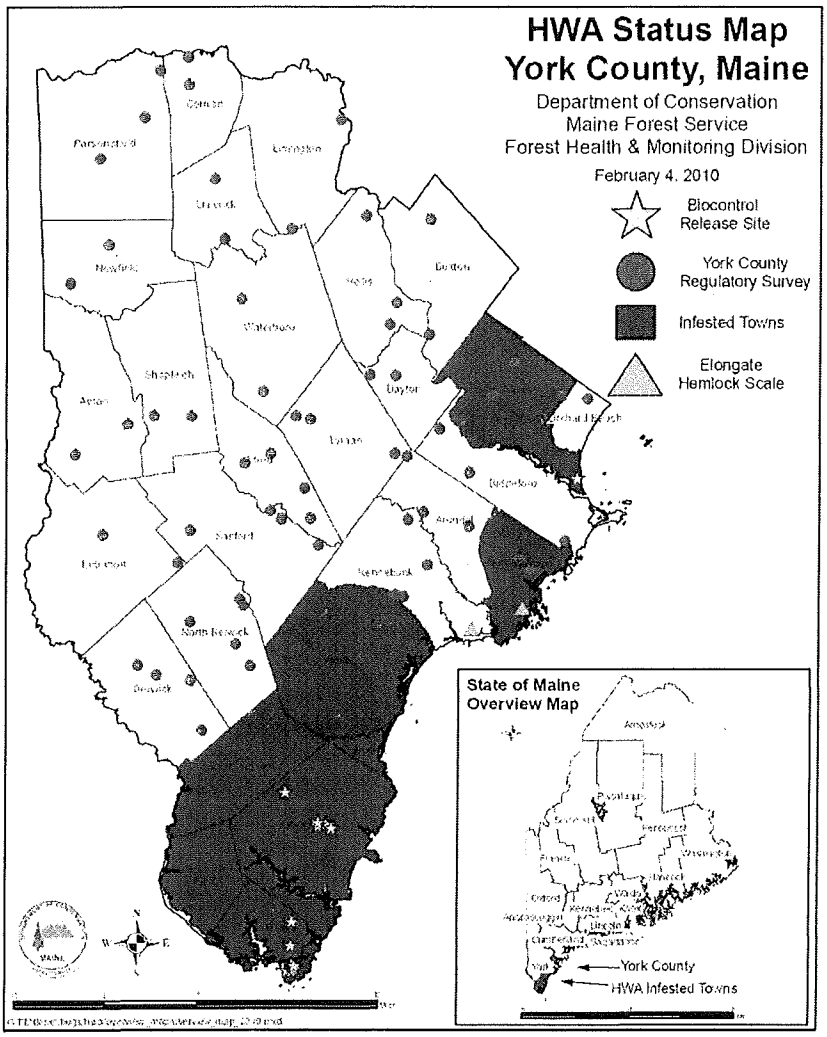


Figure 1. Overview map of hemlock woolly adelgid and elongate hemlock scale in Maine.

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

Hemlock woolly adelgid was first detected in Maine forests in 2003. Since then it has been found in scattered populations in the towns of Eliot, Kennebunkport, Kittery, Ogunquit, Saco, South Berwick, Wells and York all in York County (Figure 1, under **elongate hemlock scale**). The detection in Ogunquit is the most recent, discovered in January of 2010. Infestations tend to be scattered and range from heavy to light. Tree damage has been noted on some adelgid-infested sites. It 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. Hemlock woolly adelgid is one of several factors contributing to the declines on these sites.

A modified version of the detection survey methods published by the US Forest Service in *Standardizing Sampling for Detection and Monitoring of Hemlock Woolly Adelgid in Eastern Hemlock Forests* (Costa and Onken 2006) is conducted at two to five sites in each York County town not known to be infested with hemlock woolly adelgid (Table 1). The survey methods are followed, except more trees and branches are sampled at each site than the 100 tree 200 branch baseline. Sites are chosen based on their hemlock component and their risk for HWA introduction through artificial or natural spread. Five sites are surveyed in each town bordering (border) an infested town, and two sites are surveyed in other (buffer) towns within York County. The Cumberland County town of Scarborough

was added to the survey this year because of the infestations in Saco. One new town, Ogunquit, was found to be infested in January 2010 using this method.

Table 1. York County and Scarborough (Cumberland Co.) hemlock woolly adelgid detection survey sites in towns not known to be infested.

Town	Status	Number of Sites
Acton	buffer	2
Alfred	buffer	2
Arundel	border	5
Berwick	border	5
Biddeford	border	5
Buxton	border	5
Cornish	buffer	2
Dayton	border	5
Hollis	buffer	2
Kennebunk	border	5
Lebanon	buffer	2
Limerick	buffer	2
Limington	buffer	2
Lyman	buffer	2
Newfield	buffer	2
North Berwick	border	5
Old Orchard Beach	border	5
Parsonsfield	buffer	2
Sanford	border	5
Shapleigh	buffer	2
Waterboro	buffer	2
Scarborough	border	5

The same methods can be used as a monitoring tool to evaluate the percent of infested trees in a stand. This was done at several sites known to be infested with HWA to quantify the current infestation levels in the stands. Sampled stands ranged from 1 to 100 percent infested (Table 2) with a 75 percent confidence level. These surveys will be conducted periodically to track the infestations at the sites.

Table 2. Percent of trees in surveyed stands infested with hemlock woolly adelgid using survey methods in *Standardizing Sampling for Detection and Monitoring of Hemlock Woolly Adelgid in Eastern Hemlock Forests.*

Site ID(s)	Town	Locality	Date Surveyed	Percent Trees Infested
HWA 129	Kennebunkport	North of School Street	8/13/2009	50
GI1	Kittery	Gerrish Island	7/21/2009	100
HWA 103, HWA 109	Kittery	Boulter Pond	7/21/2009	4
KIT1	Kittery	Kittery Point	7/30/2009	100
KLT1	Kittery	Kittery Point	8/4/2009	45
FBSP1	Saco	State Park	7/8/2009	1 (heavy rain)
HWA 63	South Berwick	Near Jct. SR 91 and 236	8/5/2009	7
YWD1	York	North of Chases Pond	5/15/2009	20
YWD3	York	North of Chases Pond	7/19/2009	19

Biological control establishment efforts continue in Maine (Table 3). In 2009, 750 *Laricobius nigrinus* beetles were released in York. One *L. nigrinus* adult was recovered, also in York. This is the first recovery of *L. nigrinus* in Maine and is especially promising after the cold winter of 2008-2009. *Sasajiscymnus tsugae* continue to be recovered at a release site on Gerrish Island in Kittery. While sampling for *L. nigrinus* at the site, 29 adult *S. tsugae* were recovered from two trees. If populations hold up we hope to transfer recovered beetles to a site where we have released *L. nigrinus* but have not had *S. tsugae* available for release.

Table 3. Hemlock woolly adelgid biological control releases 2004-2009. St = *Sasajiscymnus tsugae*, Ln = *Laricobius nigrinus*, ***Bold italics*** = 2009 releases, **Bold** = species totals, Underline = town totals/species.

Species (Strain)	Town	Site	Date	Number	Total
St					**23734**
	Kittery				17734
		GI1	5/14/2004	2500	
		GI1	6/25/2004	5000	
		GI2	4/14/2005	2602	
		GI3	4/14/2005	2553	
		GI4	4/14/2005	2548	
		GI5	4/14/2005	2531	
	York				6000
		YWD1	4/10/2007	3000	
		YWD1	6/5/2008	3000	
Ln (Pacific Northwest)					**4672**
	Kittery				800
		GI6	10/31/2006	300	
		KLT1	11/21/2007	200	
		KLT1	10/30/2007	300	
	Saco				500
		FBSP1		500	
	York				3372
		MTA	11/21/2007	100	
		MTA1	10/30/2007	300	
		YWD1	10/30/2007	300	
		YWD1	11/21/2007	200	
		YWD2	10/24/2008	622	
		YWD3	10/30/2008	500	
		YWD3	12/3/2008	500	
		YWD3	***11/5/2009***	***500***	
		YWD4	11/6/2008	100	
		YWD5	***12/2/2009***	***250***	
Ln (Intermountain)					**100**
	Kittery				100
		KIT1	4/11/2008	100	
Total Number of HWA Predators Released in Maine's Infested Area 2004-2009:					**28506**

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 browning caused by the larch casebearer that has been so common in recent years was much reduced in 2009. There were very few larch stands showing signs of damage, giving the trees another year reprieve from early season defoliation.

Larch Sawfly
Pristiphora erichsonii
Host: Larch (*Larix* spp.)

There were again scattered reports of larch sawfly damage this year; we will continue to monitor the situation.

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 2009.

Table 4. 2009 pine shoot beetle trap sites (*Italics* indicate traps within the quarantine area).

Town	County	Type
Livermore Falls	*Androscoggin*	*Red Pine Plantation*
Minot	*Androscoggin*	*Red Pine Plantation*
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
Anson	*Somerset*	*Red Pine Plantation*
Deblois	Washington	Biomass Plant
Jonesboro	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 2009. Pheromone trap catches averaged 1.1 moths per site. This number is skewed to the 'high' side by two traps in northwestern Maine with average trap catches of 15.7 and 8.5 moths (Figure 2). All other sites that had moths averaged four or fewer moths per site. Only 59 percent of the sites had any spruce budworm at all. No larval activity or defoliation was observed during field surveys. The MFS will continue to monitor this serious pest.

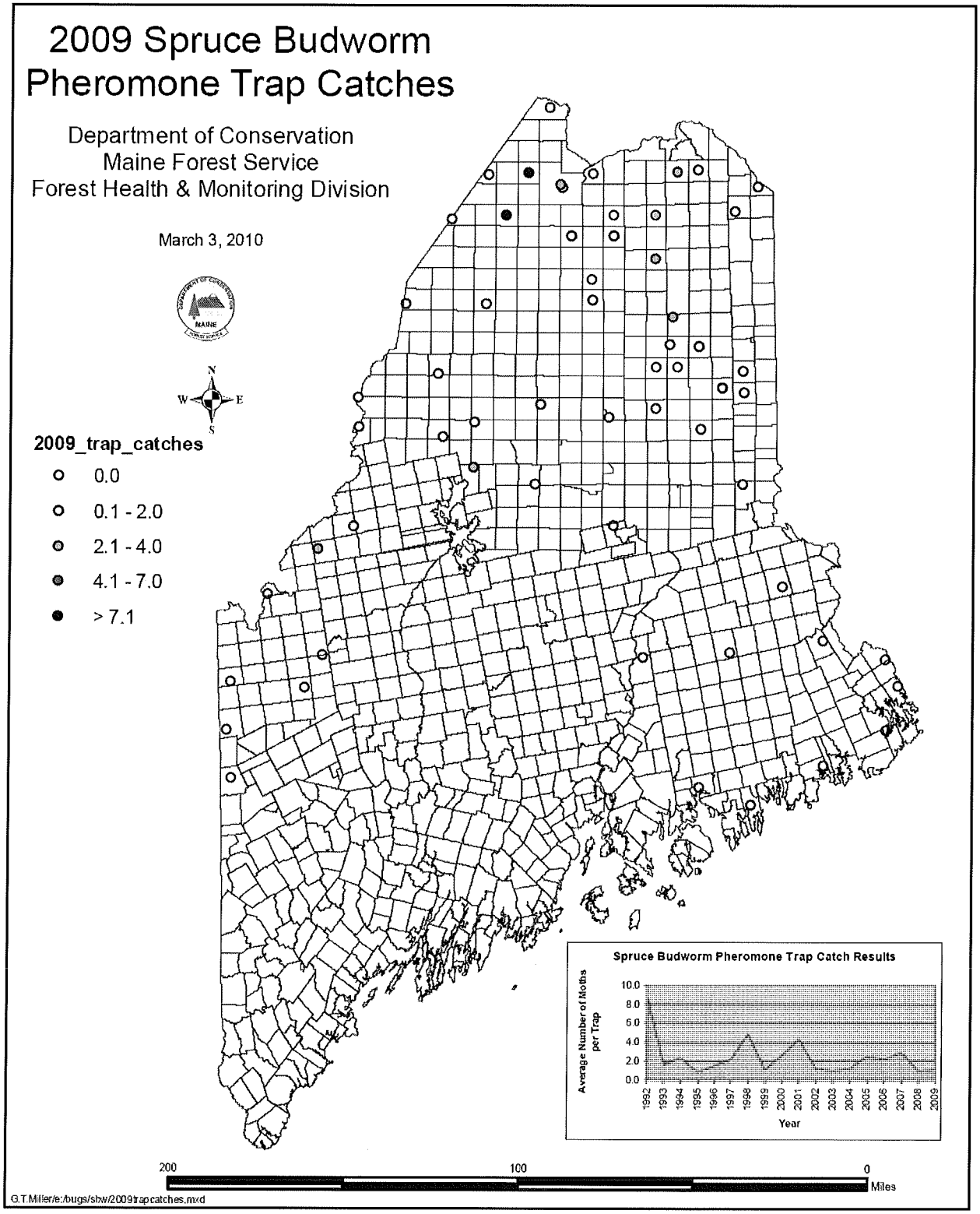


Figure 2. 2009 spruce budworm pheromone trap locations and catches in Maine.

Insects: Hardwood Pests

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

Browntail moth defoliation was heavy in Bath, West Bath, Brunswick, and Topsham at the southern terminus of Merry Meeting Bay. Heavy infestations are ongoing on one island off Freeport and one island off Kennebunkport. Total defoliation covered 758 acres. The populations were high enough so that it caused considerable stress to residents. There was some private ground treatment and more is expected in 2010. The browntail moths are primarily in red oaks in this area and chemical control is the only viable option, other than cutting trees – which some home owners are opting to do. Winter surveys will continue to be conducted to monitor the population.

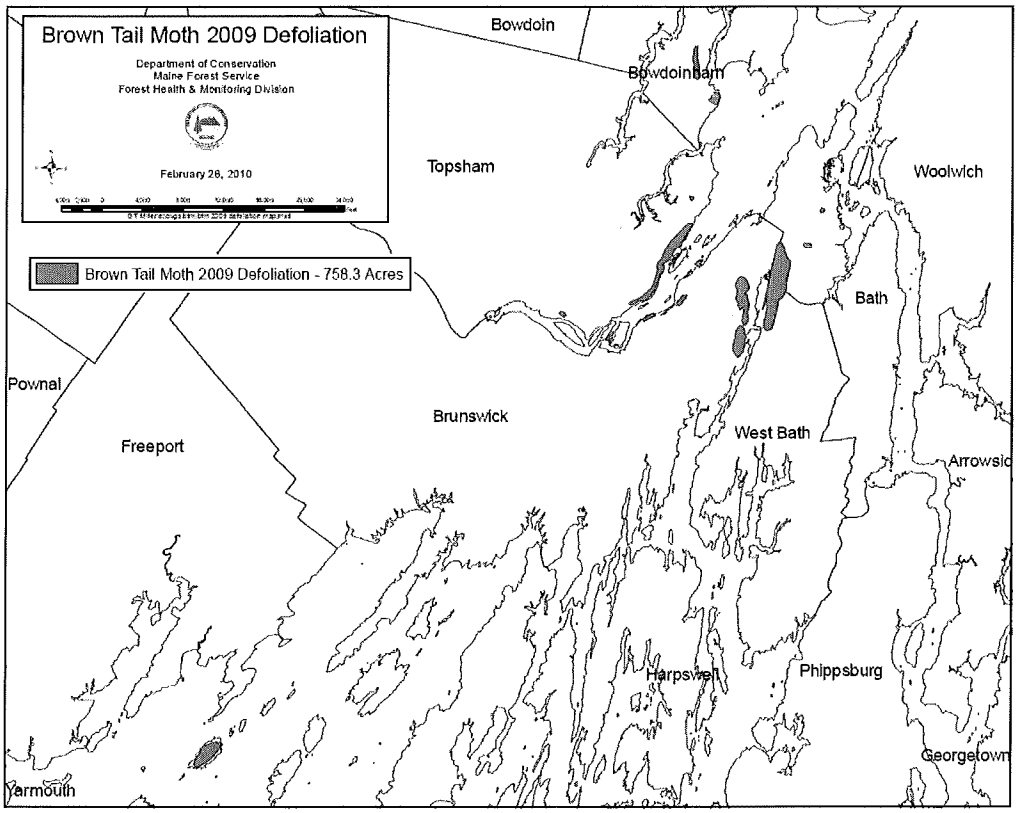


Figure 3. Browntail moth defoliation in 2009

Preliminary surveys indicate the same areas defoliated in 2009 will see browntail moth returning in 2010. The early season larval activity will again give local residents rashes.

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.

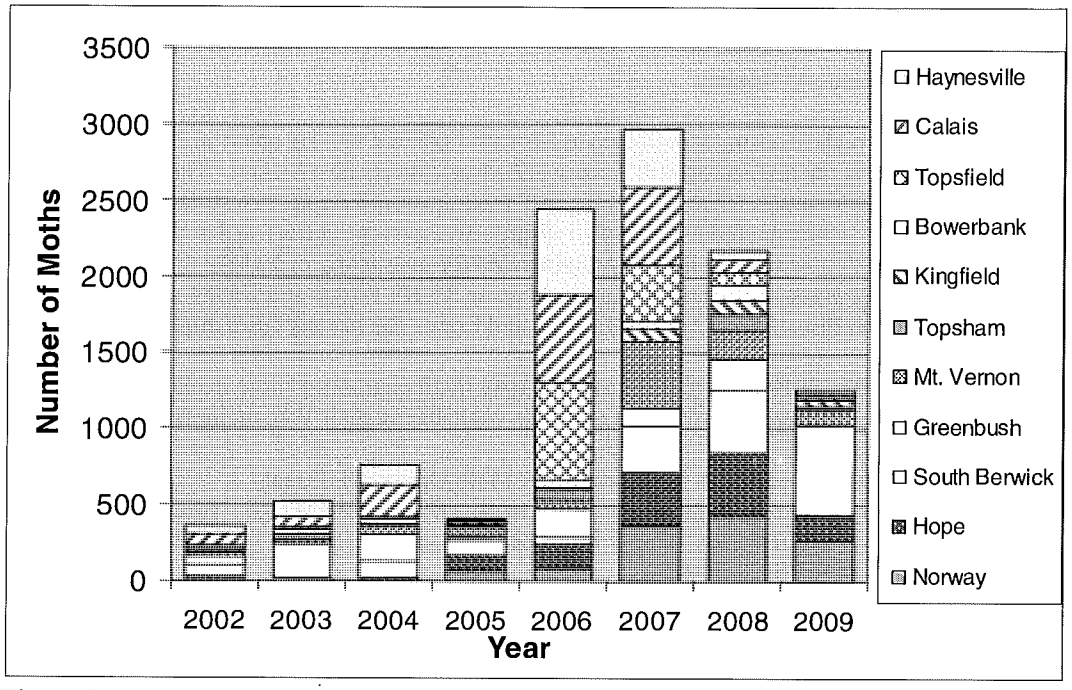


Figure 4. Total number fall webworm (*Hyphantria cunea*) moths caught in selected light traps

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

Forest tent caterpillar numbers remained low in 2009 with no defoliation of forest trees from this leaf feeding insect. But a few traps are pushing the numbers up again so this bears watching. States to the west and south of Maine have recently had a significant outbreak of forest tent caterpillar but it has subsided in those areas.

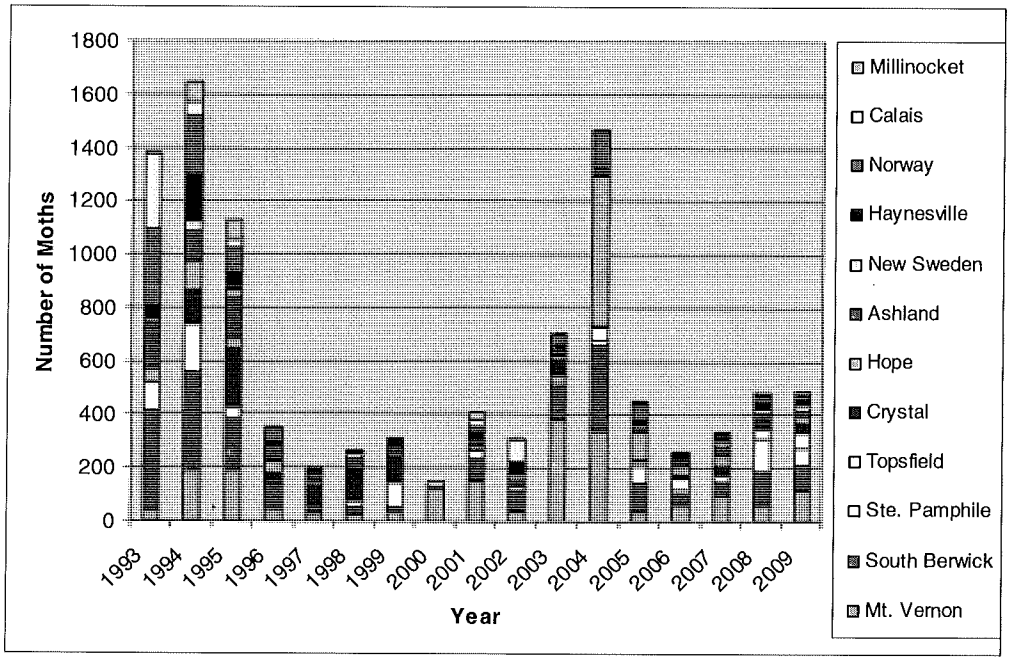


Figure 5. Total number of forest tent caterpillar (*Malacosoma disstria*) moths caught in selected light traps

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

No defoliation of hardwoods resulting from gypsy moth larval feeding was recorded in 2009. The 2009 fall egg mass survey indicates that the population will remain at endemic levels next season. Three hundred and four (304) pheromone traps were set in towns adjacent to the gypsy moth quarantine zone (transition zone) and these traps captured approximately 4100 male moths (Table 5). Eighty-five percent of the traps in the transition zone had fewer than 10 male moths (n=252) or were in towns recommended for quarantine in 2008 (n=7). Counts were down from 2008 in many areas. Egg mass surveys turned up positives in T5 R8 WELS and T6 R8 WELS in Penobscot Co., Trout Brook Township in Piscataquis Co. and Bigelow and Lower Enchanted Townships in Somerset Co.

State rules were changed in 2010 to make the parallel gypsy moth quarantine more explicit. The rules are under Maine Department of Agriculture, Plant Industry and are available on their Website or by request from this office.

The following areas have been added to the State Gypsy Moth Quarantine Area:
- All of Baxter State Park (entire townships of : Trout Brook Twp, T6 R10 WELS, Nesourdnahunk Twp, T5 R9 WELS, T4 R9 WELS, T3 R10 WELS, Mount Katahdin Twp and portions of: T6 R8 WELS, T4 R10 WELS, T2 R10 WELS, T2 R9 WELS, T3 R8 WELS)
- Penobscot County: Mount Chase, T5 R8 WELS, T6 R8 WELS
- Somerset County: Bigelow Township , Lower Enchanted Township

Table 5. Trap summary for gypsy moth pheromone traps in Maine's transition zone. Numbers indicate number of male moths caught during the season. ***Bold italics*** indicate towns added to quarantine in 2010.

Aroostook Co.

Town	Max	Min	Sum	avg/trap
Ashland	0	0	0	0.0
Blaine	0	0	0	0.0
Bridgewater	3	0	6	1.5
Easton	0	0	0	0.0
Fort Fairfield	0	0	0	0.0
Hammond	4	2	6	3.0
Hersey	50	22	105	35.0
Littleton	10	1	15	3.0
Ludlow	10	5	39	6.5
Mars Hill	0	0	0	0.0
Masardis	0	0	0	0.0
Merrill	22	5	51	12.8
Monticello	6	0	8	2.7
Moro Plt	30	10	68	17.0
Nashville Plt	1	0	1	0.5
Portage Lake	1	0	1	0.5
Presque Isle	0	0	0	0.0
Smyrna	9	3	46	6.6
Westfield	3	0	5	1.3
			351	6.6

Franklin Co.

Town	Max	Min	Sum	avg/trap
Alder Stream Twp	6	1	17	3.4
Chain of Ponds Twp	6	1	13	3.3
Coburn Gore	7	2	11	3.7
Jim Pond Twp	4	1	14	2.8
Massachusetts Gore	5	1	11	2.8
Stetsontown Twp	5	0	21	2.3
Tim Pond Twp	7	2	28	3.5
			115	3.0

Oxford Co.

Town	Max	Min	Sum	avg/trap
Lynchtown Twp	7	1	15	3.0
Upper Cupsuptic Twp	9	0	17	4.3
			32	3.6

Penobscot Co.

Town	Max	Min	Sum	avg/trap
T3 R7 WELS	46	12	182	26.0
T4 R7 WELS	58	24	180	36.0
T5 R8 WELS	**300**	**270**	**570**	**285.0**
T6 R7 WELS	130	50	305	101.7
T6 R8 WELS	**300**	**200**	**700**	**233.3**
			1937	96.9

Piscataquis Co.

Town	Max	Min	Sum	avg/trap
Beaver Cove	2	0	3	0.5
Big Moose Twp	3	0	5	1.7
Bowdoin College Grant East Twp	8	1	17	4.3
Bowdoin College Grant West Twp	4	0	9	2.3
Days Academy Grant Twp	1	1	2	1.0
Frenchtown Twp	3	0	7	1.2
Harfords Point Twp	2	2	4	2.0
Lily Bay Twp	3	0	10	1.0
Moosehead Junction Twp	3	2	14	2.8
Mount Katahdin Twp	***15***	***15***	***15***	***15.0***
Nesourdnahunk Twp	***88***	***88***	***88***	***88.0***
Rainbow Twp	10	10	10	10.0
Shawtown Twp	1	0	1	0.5
Spencer Bay Twp	2	0	6	1.0
T1 R12 WELS	14	1	88	7.3
T1 R13 WELS	2	0	7	0.9
T2 R12 WELS	3	0	9	1.8
T2 R13 WELS	0	0	0	0.0
T3 R10 WELS	***0***	***0***	***0***	***0.0***
T3 R11 WELS	8	2	19	4.8
T3 R12 WELS	4	2	9	3.0
T3 R13 WELS	0	0	0	0.0
T4 R10 WELS	***10***	***10***	***10***	***10.0***
T4 R11 WELS	***2***	***1***	***5***	***1.7***

Piscataquis Co. (cont'd)

Town	Max	Min	Sum	avg/trap
T5 R11 WELS	3	0	7	1.8
T6 R10 WELS	***215***	***0***	***445***	***55.6***
T6 R11 WELS	0	0	0	0.0
T7 R15 WELS	0	0	0	0.0
Trout Brook Twp	***400***	***49***	***449***	***224.5***
			1239	11.5

Somerset Co.

Town	Max	Min	Sum	avg/trap
Attean Twp	3	3	3	3.0
Bigelow Twp	***29***	***6***	***109***	***15.6***
Dennistown Plt	1	1	2	1.0
Flagstaff Twp	23	1	63	10.5
Jackman	3	0	8	1.1
Johnson Mountain Twp	2	0	3	1.0
King & Bartlett Twp	3	1	14	2.3
Long Pond Twp	0	0	0	0.0
Lower Enchanted Twp	***135***	***4***	***177***	***35.4***
Misery Gore Twp	3	3	3	3.0
Moose River	1	0	2	0.7
Pittston Academy Grant	3	0	5	1.7
Rockwood Strip T1 R1 NBKP	2	1	3	1.5
Sandwich Academy Grant Twp	4	2	8	2.7
Sandy Bay Twp	2	0	3	1.0
Sapling Twp	1	1	1	1.0
Soldiertown Twp T2 R3 NBKP	1	0	2	0.5
Squaretown Twp	8	3	21	5.3
T3 R5 BKP WKR	4	1	9	2.3
Taunton & Raynham Academy Grant	4	0	4	1.3
Tomhegan Twp	1	0	1	0.3
Upper Enchanted Twp	5	0	9	2.3
			450	5.9

Leafhopper Damage to Balsam Poplars and Willows
Hosts: Balsam Poplar (*Populus balsamifera*), Willows (*Salix* spp.)

Balsam poplars in the towns of Bangor, Bradford, Winterport, and Frankfort have received significant leaf damage, caused most probably from the feeding of an unidentified species (or possibly several species) of leafhopper insects. Several genera and species of leafhoppers have been reported to feed on balsam poplar, and the typical damage is seen as a leaf bronzing or browning. The damage is sometimes referred to as "hopperburn." On magnification, the leaf feeding appears as thousands of tiny "craters" on the undersurface of the leaf.

The "graying," browning and early defoliation of native willows along waterways throughout central and southern Maine also appears to be from leafhopper damage. In the past, the early browning of willow foliage was caused by the imported willow leaf beetle (*Plagiodera versicolora*). But close examination this year indicates that the majority of the damage is from the same stippling on the undersides of the leaves as was seen on the balsam poplar. There is some leaf beetle skeletonizing but it is minor compared with the damage caused by the tiny leafhopper punctures. Leafhoppers thrive in a moist environment; between the willows lining waterways and the wet June and July, conditions were ideal for leafhopper damage.

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

Large aspen tortrix has been at outbreak levels in Quebec for three years. The light trap in St. Phamphile (T15 R15 WELS) has been catching high numbers of moths since 2004 but there has been no associated defoliation of the poplar. This year traps in Allagash and Haynesville had elevated moth numbers and a very localized population of moths dropped down in Houlton causing quite a stir. The moths, minus most of their wing scales, blanketed a few businesses in downtown Houlton. They dropped their eggs wherever they were – on lightposts and buildings - not bothering to look for hosts. That batch will not do much. A survey of the surrounding area did not turn up more moths or subsequent defoliation.

Oystershell Scale
Lepidossaphes ulmi
Host: Beech (*Fagus grandifolia)*

Oyster scale continues to infest beech trees in the Greenville area.

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

There is still no sign of winter moth moving up from the south.

Diseases and Injuries

Diseases: Native

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

Anthracnose diseases were widespread, and caused some moderate and localized serious damage, especially in mid- and south-coastal communities. Oak anthracnose (*Apiognomonia quercina*) was observed on samples from Gorham and Yarmouth (Cumberland Co.), Gardiner and Monmouth (Kennebec Co.), and Camden (Knox Co.). Maple anthracnose (*Kabatiella apocrypta*) was recorded from Livermore Falls and Turner (Androscoggin Co.), Gardiner (Kennebec Co.), Thorndike (Waldo Co.), and Cornish (York Co.). Infection levels for both oak and maple anthracnose was light; neither caused any significant defoliation or damage. Some moderate to heavy damage to paper birch from birch anthracnose (*Septoria betulae*) occurred in the northwestern region of Maine. Following a line from approximately Rangely (Franklin Co.) to Greenville (Piscataquis Co.), and points to the northwest of that line, and especially in the higher elevations, the crowns of birches were affected. Aerial surveys of the region indicated birches in several non-contiguous areas that totaled approximately 50,723 acres were affected. Moderate anthracnose damage was observed on ashes, and resulted from infection by *Gnomoniella fraxini*. While widespread throughout central and southern Maine, ash anthracnose caused moderate damage only in near-coastal locations, where damage was sometimes compounded by ash leaf rust.

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

Armillaria root rot continues to be widespread and common on trees declining from mechanical injuries or other biotic and abiotic stresses. Cases of "post-logging decadence," where residual trees decline several years after a partial harvest has taken place provide a constant reminder of the importance of using silviculturally and environmentally sound harvesting practices. Most recently, one hardwood stand in Hope (Knox Co.) that had been partially harvested approximately eight years ago exhibited dieback, decline, and substantial mortality of large pole and saw timber-sized trees of valuable red oak and ash. *Armillaria* root rot was extensive on all the declining and dead trees.

Armillaria root rot was also associated with another disease condition in 2009 in Maine. Numerous reports of dying ornamental Arborvitae (Northern white-cedar) were received from throughout the state, starting in early spring, and extending into the summer. In nearly all cases, the affected plants were multi-stemmed trees planted as hedgerows. Often, only one plant or one "sector" of the multi-stemmed plant had died. *Armillaria* has been the only pathogen consistently associated with the damage. It is not known if unusual weather conditions (colder temperatures, excessive snow cover, high soil moisture) have been responsible for this apparent sudden increase in damage, or if ornamental planting stock is of cultivars especially sensitive to root rot or to Maine conditions. The nursery practice of culturing multi-stemmed plants is suspected to be a factor that may predispose trees to infection. The problem has not been observed in any advance regeneration of Northern white-cedar in natural stands, where trees develop as single-stemmed individuals.

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

Ash leaf rust was reported from Rockland and Thomaston (Knox Co.), and Bucksport (Hancock Co.) and was likely present in other mid- and south-coastal communities, as well. A moderate level of dieback was observed on host trees in Rockland. Severe defoliation and dieback did not occur, as it has on past occasions, despite the excessively wet weather experienced in the months of June and July.

Black Knot of Cherry
Apiosporina morbosa
Hosts: Cultivated and Wild Plums, Prunes, and Cherries (*Prunus* spp.)

Commonly found throughout the state, this disease was reported causing some significant orchard damage in Westfield (Aroostook Co.), and was also reported from China (Kennebec Co.) in 2009.

***Dothiorella* Wilt of American Elm**
Dothiorella ulmi
Hosts: American Elm (*Ulmus Americana*), Slippery Elm (*U. rubra*)

Numerous American elms in Kennebunkport (York Co.) have been seen exhibiting slow dieback and decline symptoms for several years. The trees were first thought to be affected with Dutch elm disease, known to occur commonly throughout the region. However, culturing and isolation attempts failed to recover *Ophiostoma ulmi*, the causal agent of Dutch elm disease, even though this pathogen is usually easy to culture from symptomatic branches. On closer examination, fruiting of *Dothiorella ulmi* was observed on cultured branch tissues. This pathogen also causes a wilt of American elms (sometimes referred to as native elm wilt or elm dieback), but is much less aggressive than *O. ulmi*. Symptoms are very similar to those of Dutch elm disease. The distribution of *Dothiorella* wilt in Maine is unknown, but is likely widespread, and probably results in the occasional misdiagnosis of declining elms in other communities.

Fir Needle Casts
Lirula nervata, Lirula mirabilis, Isthmiella faullii, Rhizosphaera pini
Hosts: Balsam Fir (*Abies balsamea*); Fraser Fir (*A. 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*) were observed on two and three year-old needles from Gorham (Cumberland Co.), Nobleboro (Lincoln Co.), Corinth and Hampden (Penobscot Co.), and Sangerville (Piscataquis Co.). *Rhizosphaera pini* was also identified from the Sangerville location and in Belgrade (Kennebec Co.).

One sample of *Rhabdocline* needle cast (*Rhabdocline pseudotsugae*) on Douglas-fir (*Pseudotsuga menziesii*) was identified from an ornamental planting in Falmouth (Cumberland Co.).

Flooding Injury

Numerous reports of excessive soil moisture and flooding were received throughout the spring and summer. Hemlocks seemed to be the most affected, probably because they often occur on low, poorly-drained soils and have relatively shallow root systems. Hemlock decline as a result of flooded soils was noted from Cape Elizabeth (Cumberland Co.), Lewiston (Androscoggin Co.), Lincolnville and Montville (Waldo Co.), and Manchester (Kennebec Co.). Hemlocks in native stands as well as individual ornamental trees were affected.

Internal Decay of Sugar Maple
Climacodon septentrionalis
Hosts: Sugar Maple (*Acer saccharum*) and occasionally other hardwoods

This native disease was noted in Winterport (Waldo Co.) in 2009, but commonly occurs throughout the state. The disease frequently occurs and becomes most noticeable on mature and over-mature sugar maples. As with most other internal decay pathogens, *C. septentrionalis* can gain entrance through wounds on main stems and through broken branches. The decay then develops slowly, often over decades. Trees are not often killed outright, but become hazardous and eventually will structurally fail.

Ozone Damage Monitoring

A total of 18 towns were surveyed in 2009 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, initiated in 1994. Suspect

samples of white ash obtained from one site (Swanville, Waldo Co.) were submitted to the regional program lab for diagnosis and evaluation. Results have not yet been confirmed. No other indicator plants in any of the other sites were judged symptomatic for ozone injury.

Physiological Growth Anomaly

An apparent growth anomaly was observed in at least two species, red maple and red oak, over the course of the summer. In both species, multiple instances of new leaf and shoot growth were observed during the mid- to late portion of the growing season. The shoot tip growth was quite conspicuous in that the young foliage and stems retained a bright red color, typical of new shoot growth in the early spring. The condition was noted through the summer and into the early fall. It is suggested that the cause of this was the extended and excessive wet weather experienced throughout July and into early August, allowing continued shoot growth development through an extended season. The condition was widespread throughout central and southern Maine, where rainfall was more continuous through the summer than in more northern regions. The effect of this phenomenon is unknown, but it may have led to some twig dieback from early fall frosts and winter injury. This can be assessed early this spring, as buds flush for the 2010 season.

***Phomopsis* Oak Branch Galls**
***Phomopsis* spp.**
Host: Oaks (*Quercus* spp.)

Oak branch galls caused by *Phomopsis* spp. were reported on northern red oak from Portland (Cumberland Co.), and Whitefield (Lincoln Co.).

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

The disease is widespread throughout Maine, and continued to cause moderate to severe damage this year wherever it occurred. The continued wet spring and summer seasons during the past several years have allowed the development of high inoculum levels, especially in plantations and roadside plantings. Heavy damage to advance regeneration of red pine developing in thinned strips in a plantation in Amity (Aroostook Co.) was observed. It has become evident that damage to red pines, and to other species of exotic hard pines, continues to increase and that this disease often occurs in conjunction with infections from *Sirococcus conigenus*.

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

Widespread in Maine, root and butt rot of red pine caused by *Heterobasidion annosum* was most recently identified from a plantation in Blanchard (Piscataquis Co.). The disease is expected to increase in importance, as many red pine plantations are reaching or have already reached a size where intermediate thinning practices are required. Freshly-cut stumps are known to be the primary sites where stand infections can become established. Many plantations were established after the clearcut harvesting that was done during the spruce budworm salvage efforts of the 1970's and 1980's.

***Sirococcus* Tip Blight**
Sirococcus conigenus; S. piceicola; S. tsugae
Hosts: Pines (*Pinus* spp.) Eastern Hemlock (*Tsuga canadensis*); Spruces (*Picea* spp.);

Shoot tip blights caused by species of *Sirococcus* appear to be causing increasing damage in several conifers. Two host species groups (hard pines including red pine, and white and Colorado blue spruces) are known to have been damaged by *Sirococcus* tip blight for many years. Recently a new host, Eastern hemlock, was confirmed for this disease in late 2009. Damage from this disease on hemlock has been observed since 2006.

Sirococcus piceicola on Spruces:
Samples of *Sirococcus* tip dieback on spruce were received from Lovell (Oxford Co.), and from Lyman and Kennebunkport (York Co.). The pathogen is assumed to be the recently-established species, *S. piceicola*, based on host specificity.

Sirococcus conigenus on Red Pines:
Moderate to heavy infection of red pine in natural stands was observed in central (T3ND, Hancock Co.) and Downeast (T29MD BPP, Washington Co.) regions of Maine. The pathogen was also identified from Northfield (Washington Co.). Damage in all areas appears to have increased slowly but steadily for the past several years.

Sirococcus tsugae on Eastern Hemlocks:
Since 2006, a tip blight of Eastern hemlocks has been observed across a wide area in central and southern Maine. The tip blight apparently affects only the distal-most tips of branches, seldom killing more than 0.5 inch of shoot tip growth. Infection has been observed only on current-season shoot tips, so primary infection is believed to occur early in spring, probably within days after new shoot growth is initiated. Identification of the pathogen from fruiting structures collected in fall of 2009 was confirmed by USDA APHIS as being *Sirococcus tsugae* by genetic typing. This is the first report of *S. tsugae* occurring on Eastern hemlock in the United States. The disease is common in understory advance regeneration of hemlocks in natural stands, and to date has been reported from Androscoggin, Cumberland, Kennebec, Knox, Lincoln, Oxford, Sagadahoc, and York counties.

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

Spruce needle cast continues to be widespread and locally severe. Although reports of the disease were again fewer than those from a few years ago, the damage is expected to have increased during the exceptionally wet growing seasons of 2009. Heavy losses of needles infected during the 2009 year are anticipated for next spring.

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

Tar leaf spot of Norway maples caused severe leaf infections, leaf browning and curling by mid-summer, and premature leaf drop this year to affected trees wherever the host trees occurred. The epidemic was very noticeable to the public, and prompted the most inquiries of all the tree disease questions asked of our clinic this season. The wet April and the excessively wet June and July clearly favored development of this disease. Street trees and ornamental Norway maples in most of the larger towns in the state, including Lewiston and Auburn (Androscoggin Co.), Portland and Brunswick (Cumberland Co.), Ellsworth, Bar Harbor, and Northeast Harbor (Hancock Co.), Belfast, Camden, Rockland, and Thomaston (Knox Co.), Bangor and Brewer (Penobscot Co.), as well as many other communities all experienced significant leaf damage from this disease. A trace amount of tree re-foliation did occur during late August and September, but it is not expected to have been enough to cause any significant damage. However, some branch dieback may be visible next spring on some individual trees.

***Verticillium* Wilt of Maples**
Verticillium alboatrum*; *Verticillium dahliae
Host: Maples (*Acer* spp.)

Only a few reports of *Verticillium* wilt of maples were received in 2009. Samples were received from Lewiston (Androscoggin Co.), Augusta (Kennebec Co.), and Brewer (Penobscot Co.). Leaf and flagging-branch symptoms of *Verticillium* infections may have been "masked" by the extensive tar leaf spot infections, since Norway maple is especially susceptible to both of these diseases. No incidences of *Verticillium* wilt on species of maples other than Norway maple were received or observed in the field.

Wetwood
Several Genera of Bacteria Including *Erwinia*, *Enterobacter*, *Klebsiella*, and *Pseudomonas*
Hosts: Hardwoods and Softwoods

A report of bacterial wetwood in white pine was received from Portland (Cumberland Co.) in 2009. Wetwood is an internal condition of wood that results from the infection by one or several species of bacteria. The bacteria gain entrance to trees via either naturally occurring or human-caused mechanical wounds. During periods of active sap flow, especially in the early spring, wounds can ooze moisture and fermentation products from within the tree stem. This fluxing sometimes appears as a slime or foam along the bole or at the base of affected trees.

Diseases: Non-Native

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

Beech bark disease occurs statewide, and continues to cause losses in stand productivity and timber values, in addition to reducing beech nut production, an important wildlife food for a wide variety of birds and small and large mammals. With a few exceptions, the dynamics of beech bark disease causal agents (*Neonectria faginata* and *Cryptococcus fagisuga*) have not been intensively studied in the eastern hardwood forests now considered to be in the aftermath phase of disease development. Analysis of Forest Health and Monitoring data from over the past 10 to 15 years has indicated fluctuations in mortality intensity of beech that sometimes has not been predicted or easily explained. As the disease has developed for over one hundred years in North America, a greater and greater proportion of forests with beech are now considered to be in the aftermath stage. An examination of scale population levels and *Neonectria* cankering intensity with respect to biophysical regions would be of significant help in determining high-risk regions and in predicting future population changes in the inciting agents.

To this end, an investigation was initiated to determine the relationship of Maine's biophysical regions to beech scale population intensity and fluctuations in 2009. Additional funding support for this project was obtained from the USDA Forest Service, and will be used to continue the work in 2010 and 2011. A preliminary assessment of a ground survey method was tested in two stands in each of six towns in 2009. One hundred American beech were rated for beech bark disease and scale characteristics in each stand. Baseline data and scale population comparisons will be analyzed when the entire survey is completed. A more complete description of the survey, along with some preliminary statistics from the 1000 sample trees representing the Western Foothills Biophysical Region are presented in Appendix B.

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

This disease has been static at moderate levels for many years. This year, the town of Yarmouth (Cumberland Co.) announced that a particularly important American elm had contracted the disease. The elm has a 114-foot crown spread and is 100 feet tall, with a diameter at breast height of over 8 feet. This tree is believed to be the largest American elm in New England, and has held that title for several decades. It is estimated to be approximately 230 years old. The tree was removed in January, 2010, with the wood being utilized by a variety of Maine artisans for the production of historic-tree artifacts.

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 2009 for this disease. Inspection of the most recent site (Brunswick, Cumberland Co.), where an intensive eradication effort was undertaken in 2007-2008, has revealed no new infections. This site will be monitored closely for several more years, as it is outside the current quarantine zones.

Assistance was again provided for the larch canker intensification project in Washington Co. being conducted by Dr. David Houston (Retired, USDA Forest Service). An intensive assessment of canker development on trees monitored for a period of 10 years will be conducted at two of the study sites in 2010.

Herbicide Injury

Damage to a pine and hardwood plantation in Newport (Penobscot Co.) was judged to have been caused by herbicide spray drift from nearby agricultural fields. Primary damage was observed as terminal leader twisting and curling, and significant needle yellowing on red pines. Other species in the plantation were also affected with symptoms commonly associated with herbicide drift.

White Pine Blister Rust
Cronartium ribicola
Hosts: White Pine (*Pinus strobus*); Currants and Gooseberries (*Ribes* spp.)

This year as in the past, there have been numerous questions received regarding planting of "resistant" varieties of *Ribes* species in the quarantine zone established for white pine blister rust control. 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 currants.

The disease remains a significant threat to white pine production throughout the state. High levels of the disease were reported from Crystal and Amity (Aroostook Co.), Bar Harbor (Hancock Co.), and Stacyville (Penobscot Co.) in 2009.

Diseases: Unknown Origin

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

A managed stand of white ash showing decline symptoms was examined in Dover-Foxcroft (Piscataquis Co.) in 2009. Inspection of the stand revealed no obvious or primary insect activity, and no apparent causal root rots or other fungal pathogens. Many symptoms were similar to those attributed to ash yellows, a phytoplasma disease that affects phloem function. The symptoms included some minor bark cracking and splitting, epicormic sprouting (witches brooms) along the main stem with small yellow leaves on sprouts, and top dieback. Trees of all sizes have been affected to varying degrees, and some mortality has occurred over the past several years. Harvesting and dissection of some of the affected trees by the landowner further supported the described symptomatology of ash yellows. Although the phytoplasma has never been isolated or formally confirmed from Maine ash trees (due to the specific and elaborate lab procedures required to identify the pathogen), the disease has been confirmed from other New England states. Other white ash stands in Maine suspected of declining as a result of this disease have been found in Baldwin (Cumberland Co.) and Farmington (Franklin Co.) in past years.

Bacterial Leaf Scorch
Xylella fastidiosa
Hosts: Primarily Oaks (*Quercus* spp.); Other Hardwoods including Maples, Elms, and Ashes (*Acer* spp., *Ulmus* spp., *Fraxinus* spp.)

A survey was conducted for bacterial leaf scorch disease for the second year, during late summer and fall of 2009. Sites in a total of 32 towns were examined across central and southern Maine areas. Oaks (and a few other hardwoods) were the principal species inspected. Survey sites were located in the following towns: Portland, Standish, and Windham (Cumberland Co.); Augusta, Oakland, Waterville, West Gardiner, Winthrop, and Winslow (Kennebec Co.); Camden, Hope, and Rockland (Knox Co.); New Vineyard, Paris, and Waterford (Oxford Co.); Bangor, Hermon, and Newport (Penobscot Co.); Norridgewock and Smithfield (Somerset Co.); Belfast, Frankfort,

and Winterport (Waldo Co.); Addison, Cherryfield, and Deblois (Washington Co.); Alfred, Kennebunk, North Berwick, Sanford, Waterboro, and Wells (York Co.).

As last years' survey showed, the oaks were found to be in excellent condition overall. No samples were submitted for testing, as no appropriate symptomatic material was found. During 2008, one sample from American elm was submitted and found to yield a weak positive reaction for the pathogen. Although the suspect tree was revisited again this year, extensive leaf damage from black spot (*Gnomonia ulmea*) rendered the leaves unsuitable for sampling. No diagnostic leaf scorch symptoms were observed on this tree, as there had been last year.

White Pine Declines
Host: White Pine (*Pinus strobus*)

Four specific instances of sudden, localized mortality of white pine were reported this year. Mortality in one stand, located in T6ND BPP (Washington Co.) was found to have been associated with recent harvesting activity and an unusually aggressive occurrence of *Dendroctonus valens*, the red turpentine beetle. The harvesting was well-executed with minimal residual stand damage, and completed on frozen soils. Mortality has so far been restricted to a small group of about a half-dozen white pine in the small saw log size class. A second stand, located in Norridgewock (Somerset Co.) also had mortality of white pine in the small saw log size class. At this site mortality was more scattered, but with the majority of dead trees located at an edge between field and forest. There was also a greater range in length of time individuals had died, with some recent mortality along with earlier (up to five or more years since death) mortality. No known cause could be attributed to tree decline and death in this stand.

The two other decline situations were very similar to each other, and quite distinct from the first two areas described above. These stands are located in Denmark and Waterford (Oxford Co.). Rapid mortality occurred in both stands immediately following a light thinning. In both cases, residual trees were selected based on apparent good health and vigor, and in neither case did the harvesting operation result in any significant stand damage. No primary root or stem pathogens and no primary insects were observed in these stands, although five species of secondary bark beetles were recovered from the dying trees. The Waterford stand had significant levels of white pine needle cast (*Canavirgella banfieldii*) on overstory trees, as well as on advance white pine regeneration. It is unknown if the needle cast has been a significant predisposing factor to mortality in one or both of these stands.

White Pine Needle Cast
Canavirgella banfieldii
Host: White Pine (*Pinus strobus*)

After a brief respite from elevated infection levels of this pathogen in 2008, the disease returned once again to a high incidence in 2009. White pine needle cast was especially prevalent in the western counties of Oxford, Franklin, and Somerset, but occurred throughout central, southern, and eastern regions, as well.

Crowns of many affected trees appear quite thin as a consequence of their losing all but the current-season needles. White pines generally hold a two-year (and sometimes a three-year) complement of needles. Initially, this disease was thought to be of little long-term consequence, as environmental conditions which promote high infection levels rarely occur in sequential years. However, conditions have been highly favorable for disease development now for at least four consecutive years. Negative effects on tree growth and vigor as a result of repeated, high infection levels by this pathogen are quite possible, but are not as yet quantified.

Division Activities

Aerial Survey

In 2009 most of the aerial survey was flown in August as there were few early season defoliator problems and the weather made it difficult to schedule flights. Browntail moth defoliation mapping was flown at the end of June between rainstorms, before the trees re-foliated.

The Maine Forest Service uses aerial flights as one tool in assessing the health of the forest. MFS-FHM division staff conduct initial "leaf-on" detection aerial overflights for much of Maine (over 70% of the state) to detect potential damage/stress. Some of the flights conducted by division staff are to delineate a known forest problem. We try 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

This year a major focus was training and outreach on the issue of how firewood movement spreads invasive pests. 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.

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). Funding from the Maine Outdoor Heritage Fund (MOHF) allowed us to produce factsheets and bookmarks on firewood. As much 'face time' as possible was put into the effort this year as that had 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*" message and/or "*Be on the Lookout for Invasive Insects*" was promoted at fairs, festivals, camper shows, outdoor shows and other gatherings. Personal contact was made with campground owners to impress on them the importance of campers not moving firewood and campground presentations were made during the summer to communicate directly with campers.

The Maine Forest Service created a Public Service Announcement (PSA) that was 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 summer. Both the MFS and ME Dept of Agriculture have Websites on firewood and/or invasive insects. The MFS firewood Website had 7,343 hits in 2009 and the Invasive Threats page had 8,045 visits. Groups that have 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. A game demonstrating the spread of invasives through firewood movement was developed and beetle costumes were made and used as outreach tools. The costumes proved very effective as they caught people's attention which is the hardest part of getting a message out.

Training sessions were held for all Maine Department of Conservation (DOC) staff on how to identify major forest pests that may be inadvertently moved with firewood, and their damage. Training was also provided to the Maine Campground Owners Association and State Park managers on the risks of firewood movement. Foresters and other interested groups were given training by MFS staff as requested.

Data from State campgrounds were analyzed for high camper visits from the area quarantined for invasive insects and private campground risk was ranked by MECOA. Forty-four high risk campgrounds were then surveyed for ALB and EAB. No invasive insects or their damage was detected. Purple traps for EAB were set out in 13 campgrounds or high risk sites. No EAB were caught.

A pilot study 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 was mapped. Surveys are being conducted over the winter.

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 67 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 2009 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 2009 in locations from South Berwick to Allagash to Topsfield (Table 6). Moth catches were again low overall and pest species in particular were down. This can be attributed in part to the weather. All the traps run during the month of July and some start in mid-June. This was a particularly wet time in Maine, making it difficult for the moths to fly.

Table 6. 2009 light trap locations.

Trap Location	Start Date	End Date	No. Nights
Allagash	July 3, 2009	July 30, 2009	30
Ashland	July 3, 2009	July 30, 2009	30
Bowerbank	June 17, 2009	July 30, 2009	45
Calais	June 17, 2009	July 30, 2009	45
Crystal	July 3, 2009	July 30, 2009	30
Exeter	June 17, 2009	July 30, 2009	45
Frost Pond - T3 R11 WELS	June 17, 2009	July 30, 2009	45
Haynesville	June 17, 2009	July 30, 2009	45
Hope	June 17, 2009	July 30, 2009	45
Kennebunk	June 17, 2009	July 30, 2009	45
Kingfield	July 3, 2009	July 30, 2009	30
Millinocket	June 17, 2009	July 30, 2009	45
Mount Desert	June 17, 2009	July 30, 2009	45
Mount Vernon	June 17, 2009	July 30, 2009	45
New Sweden	July 3, 2009	July 30, 2009	30
Norway	June 17, 2009	July 30, 2009	45
Rangeley	June 17, 2009	July 30, 2009	45
Sedgwick	June 17, 2009	July 30, 2009	45
Shirley	June 17, 2009	July 30, 2009	45
South Berwick	June 17, 2009	July 30, 2009	45
Ste. Aurelie -Big Six Twp	July 3, 2009	July 30, 2009	30
Ste.Pamphile-T15 R15 WELS	July 3, 2009	July 30, 2009	30
Topsfield	June 17, 2009	July 30, 2009	45
Topsham	June 17, 2009	July 30, 2009	45

Pest populations of significance are reported in the appropriate section of this report. These traps can also be used to monitor for invasive species coming into the State.

Monitoring for Emerald Ash Borer

The Maine Forest Service responds to reports of possible emerald ash borer (EAB) infestations and monitors for EAB by using traps and biosurveillance. More details about these activities can be found in Appendix A.

Public Assistance

Public assistance in 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 506 electronic and paper subscriptions in 2009. Six *Conditions Reports* and one *Annual Summary Report* were produced in 2009.

Lab staff gave 80 talks this year on topics including disease prevention, museum pest management, biosurveillance, invasive insects, quarantines and summary of pest conditions in the State. Those talks reached over 2600 people. In addition, our summer interns presented ten talks on invasive species and firewood, reaching more than 400 additional participants. We had approximately 20 interviews with journalists in local, state, regional and national outlets. In addition, dozens of written pieces were submitted to publications of organizations including the Small Woodland Owners Association of Maine, Maine Camping Guide, North Maine Woods Association, Northeastern Lumber Manufacturers Association, Forest Products Council and others. We distributed information about forest insects and diseases at 14 separate functions, and made contact with approximately 6000 people.

Almost 1000 calls were recorded in our pest log database in 2009. This does not account for all calls coming in, as some are inevitably left unrecorded. Of the 990 recorded calls, 27 percent were forest or shade tree-disease related and 55 percent were insect-related, the remaining 18 percent were not classified as insect or disease related calls.

Of the 264 disease-related calls, 118 were leaf and needle diseases, 27 were shoot diseases and 19 were root diseases. There were 71 unique diagnoses among the 264 calls. The top three disease issues were all foliage or needle diseases, which is a reflection of the excessive moisture we have had in recent years (Table 7).

Of the 543 calls related to insects and their relatives (such as spiders, mites and ticks), 112 were not directly forest health related and 368 were potential forest pests. The remaining 63 did not fall into either category. Some of the non-forest related insect calls are referred to cooperators in the extension system. There were 148 unique diagnoses among the 543 calls. The top four insect-related subjects were concerning exotic forest insects (Table 7). This reflects a successful outreach campaign regarding exotic wood borers and press coverage of hemlock woolly adelgid and elongate hemlock scale. Also among the top insect calls were calls related to browntail moth and *Cerceris fumipennis*. A non-insect, non-forest health-related group, spiders also made our top five insect and kin list.

We responded to 24 human health calls (not related to forest insects), which ranked fifth in our clinic calls with a specific identification. Many were tick calls and some were related to the recent upswing in eastern equine encephalitis among horses. We can and do refer tick-related calls to the Maine Medical Research Center Lyme Disease group, although walk-ins are often identified as deer tick or not, because this is the quickest way to handle this type of call. Other, more complicated health related calls are referred to Maine Center for Disease Control. However, there is no longer a medical entomologist on-staff and we often end up with repeat clients even after referral—especially cases likely to be delusions of parisitosis. These are not cases we are equipped to handle, nor is there a viable outlet for the clients' concerns within the public sector.

Table 7. Ten most common clinic calls with an identified problem and five most common insect and kin and disease/abiotic calls.

Identification	No. Calls	Rank	Rank in Insects and Kin	Rank in Diseases/Abiotic
Asian longhorned beetle	143	1	1	
Anthracnose	33	2		1
Tar spot	30	3		2
Emerald ash borer	27	4	2	
Hemlock woolly adelgid	27	4	2	
Human health-not forest insect-related	24	5		
Rhizosphaera needlecast	24	5		3
Elongate hemlock scale	21	6	3	
Abiotic	18	7		
Browntail moth	17	8	4	
Cerceris fumipennis	13	9	5	
Spiders	13	9	5	
Armillaria root rot	11	10		4
Firewood	11	10		
Sirococcus shoot blight	11	10		4
Dutch Elm Disease	8	13		5

A subset of the division's Web pages received over 130,000 hits in 2009 (Table 8). Some highlights include: over 6,300 hits on the homepage, over 9,000 hits on invasive threats pages, more than 8,000 hits on firewood pages, almost 10,000 hits each on quarantine and hemlock woolly adelgid pages, more than 850 hits on elongate hemlock scale page in four months, and a combined 67,500 hits distributed among 47 insect and disease factsheets.

Table 8. Summary of Web page hits on of a subset of Forest Health and Monitoring pages in 2009.

Subject Area	Number of Hits	Number of Pages
Fact Sheets	67522	47
Quarantine	9949	6
Hemlock Woolly Adelgid	9653	6
Invasive Threats	9008	2
Firewood	8125	2
Other	7347	14
Index Pages	6793	2
Home Page	6307	1
Cerceris fumipennis	5092	5
Insect Collection	2880	1
Elongate Hemlock Scale	863	1
Total:	**133539**	

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 (Table 9). More information on the quarantines is contained in the section: **Forestry Related Quarantines in Maine – 2009**.

Table 9. Summary of Compliance Agreements in 2009

Quarantine	Number of Compliance Agreements
European Larch Canker	9
Gypsy Moth	17
Hemlock Woolly Adelgid	19 regulated area/ 7 unregulated area
Pine Shoot Beetle	6

In addition to the mandatory compliance agreements related to the quarantines, voluntary compliance agreements were set up to monitor material coming from infested trees in the Massachusetts regulated area for Asian longhorned beetle (ALB). The material coming to Maine was not regulated because it had been processed by companies trained to meet federal standards for de-regulation, and operating under federal compliance agreements. However, Maine Forest Service and Maine Department of Agriculture personnel, as well as receivers, had some concerns about the material and wanted to implement additional safeguards.

After initial contact from a receiver in Central Maine, MFS contacted potential receivers across the state to determine whether they would be accepting chips from the Worcester area—this included mulch producers and biomass burners. The three facilities that were considering receiving material in 2009 entered into voluntary compliance agreements. The additional safety measures for movement of material from the ALB regulated area included limits on the season of receipt to exclude movement during the adult active period, expedited use of material, and random checks on chip size compliance. In addition the receivers agreed to allow trapping at their sites. Traps were hung at each site and baited with an ethanol lure. There is no commercially available lure for ALB, so in addition to using the ethanol lure, traps with a large surface area were used. The trap catches were screened for ALB and none were detected.

Talks with federal ALB program managers continue in an effort to reach a more comfortable official arrangement for the disposition of material from the ALB regulated area as opposed to the current voluntary arrangement.

Forestry Related Quarantines in Maine – 2009

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.org/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 2009: 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.

The following areas have been added to the State Gypsy Moth Quarantine:

i. All of Baxter State Park (entire townships of : Trout Brook Twp, T6 R10 WELS, Nesourdnahunk Twp, T5 R9 WELS, T4 R9 WELS, T3 R10 WELS, Mount Katahdin Twp and portions of: T6 R8 WELS, T4 R10 WELS, T2 R10 WELS, T2 R9 WELS, T3 R8 WELS)
ii. Penobscot County: Mount Chase , T5 R8 WELS, T6 R8 WELS
iii. Somerset County: Bigelow Township , Lower Enchanted Township

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 2009:** 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.

V. Pine Shoot Beetle

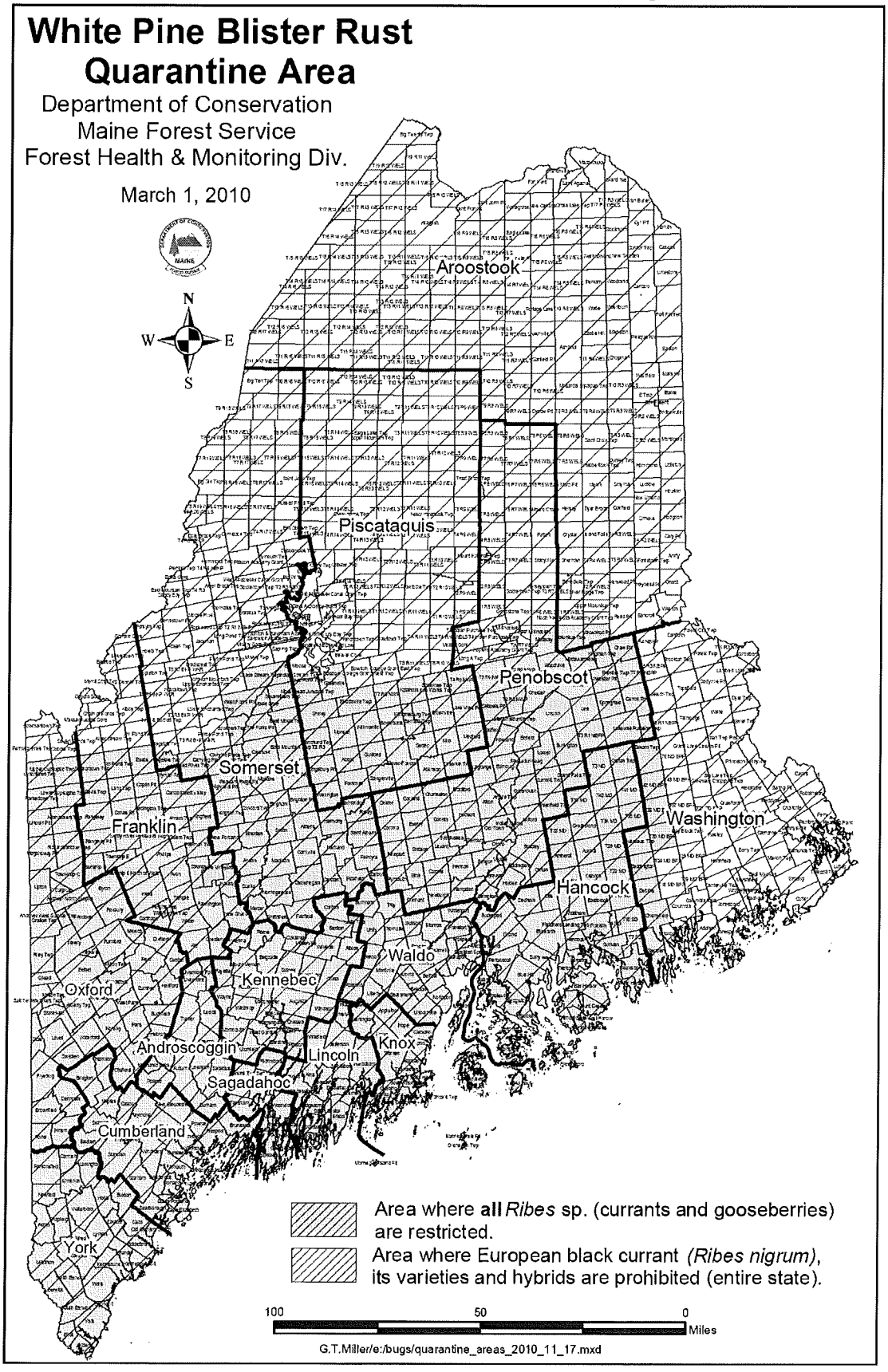
a. Rules and Regulations:

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.

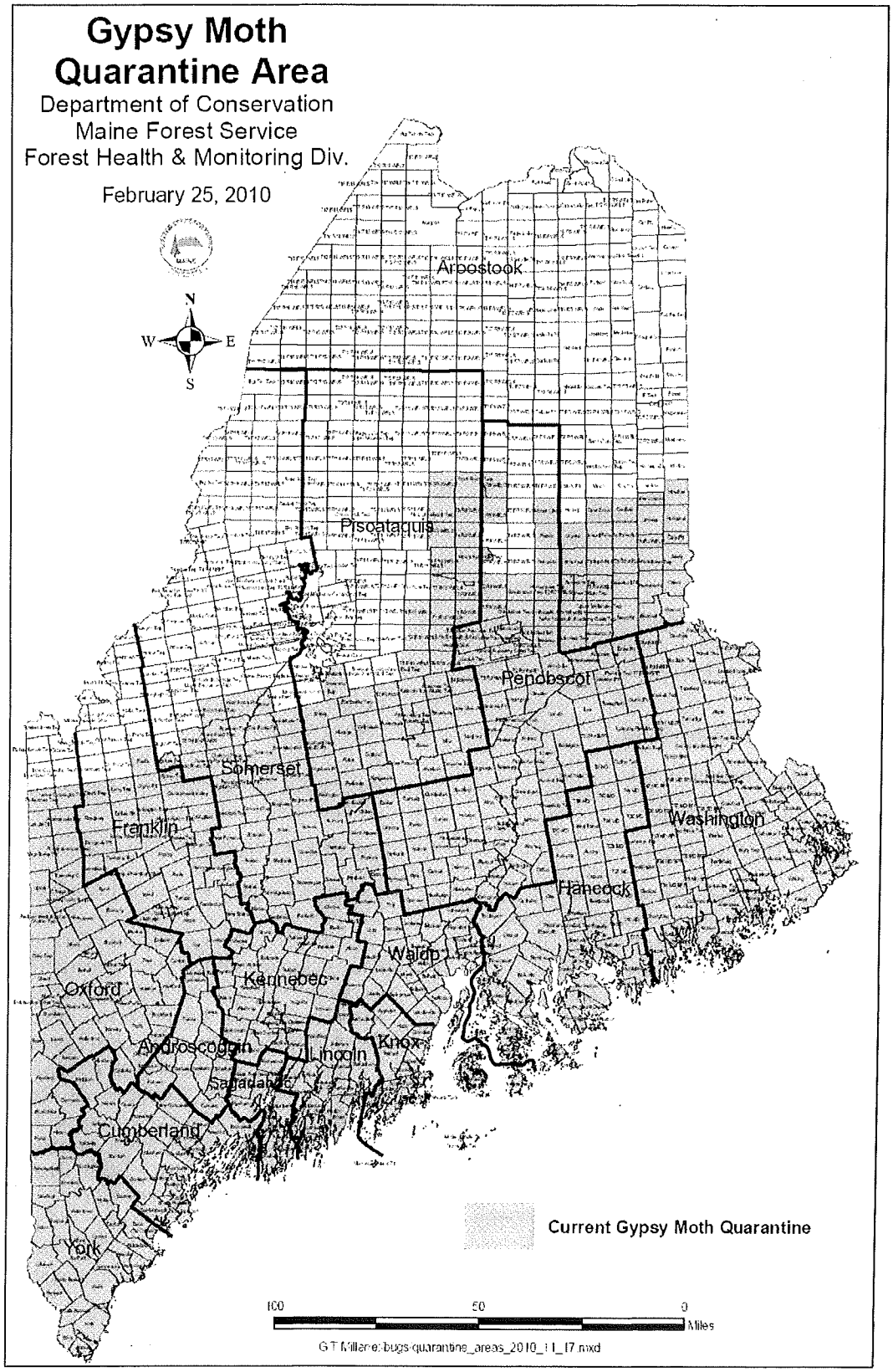
Somerset County: Anson, Athens, Bald Mountain Twp T2 R3, Bigelow Twp, Bingham, Bowtown Twp, Brighton Plt, Cambridge, Canaan, Caratunk, Carrying Place Town Twp, Carrying Place Twp, Chase Stream Twp, Concord Twp, Cornville, Dead River Twp, Detroit, East Moxie Twp, Embden, Fairfield, Harmony, Hartland, 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 (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.

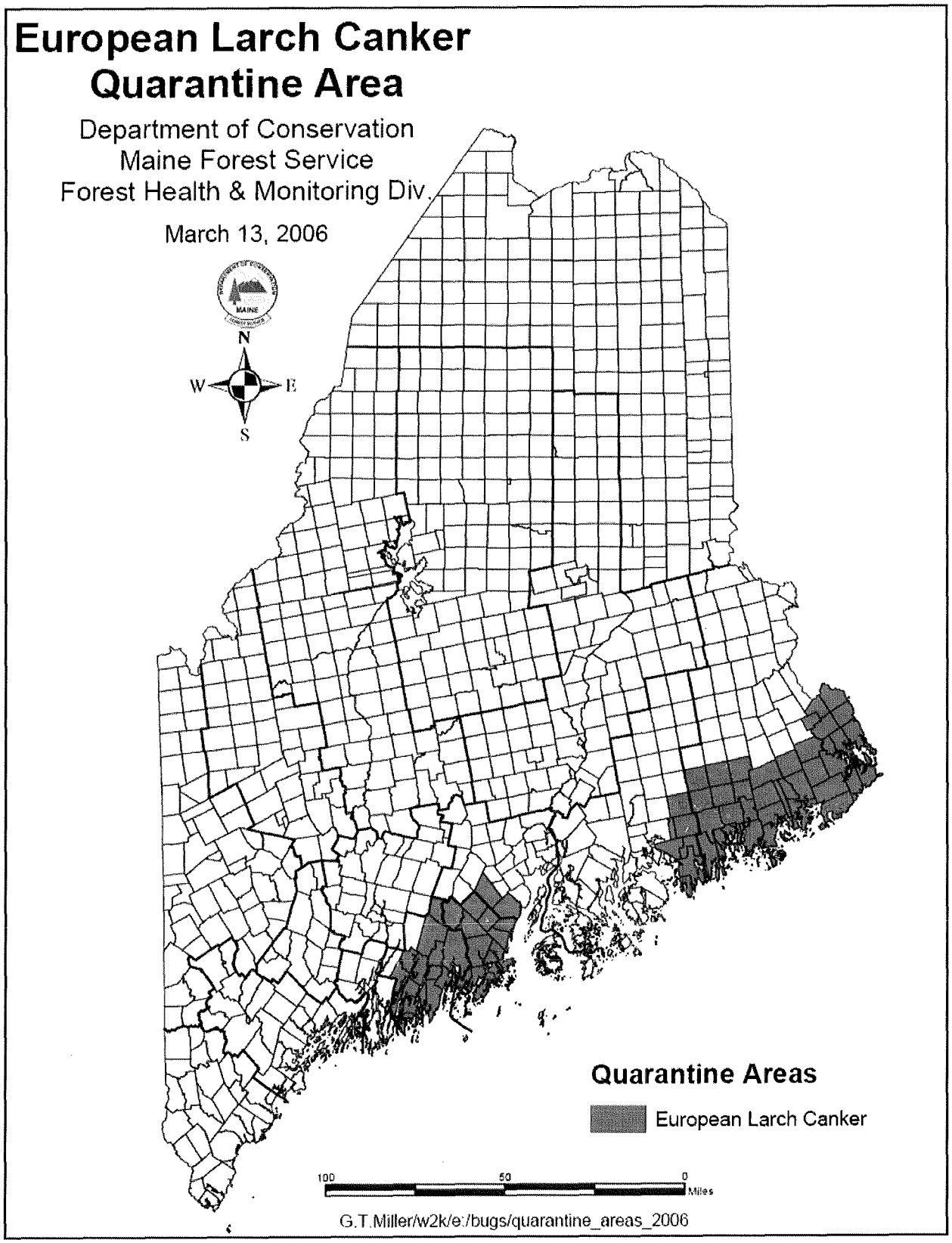
Somerset County- Anson, Athens, Bald Mountain, Bigelow Twp, Bingham, Bowtown, Brighton Plantation, Cambridge, Canaan, Caratunk, Carrying Place, Carrying Place Town, Concord Plantation, Cornville, Dead River, Detroit, East Moxie Twp, Embden, Fairfield, Harmony, Hartland, Highland Plantation, Lexington 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

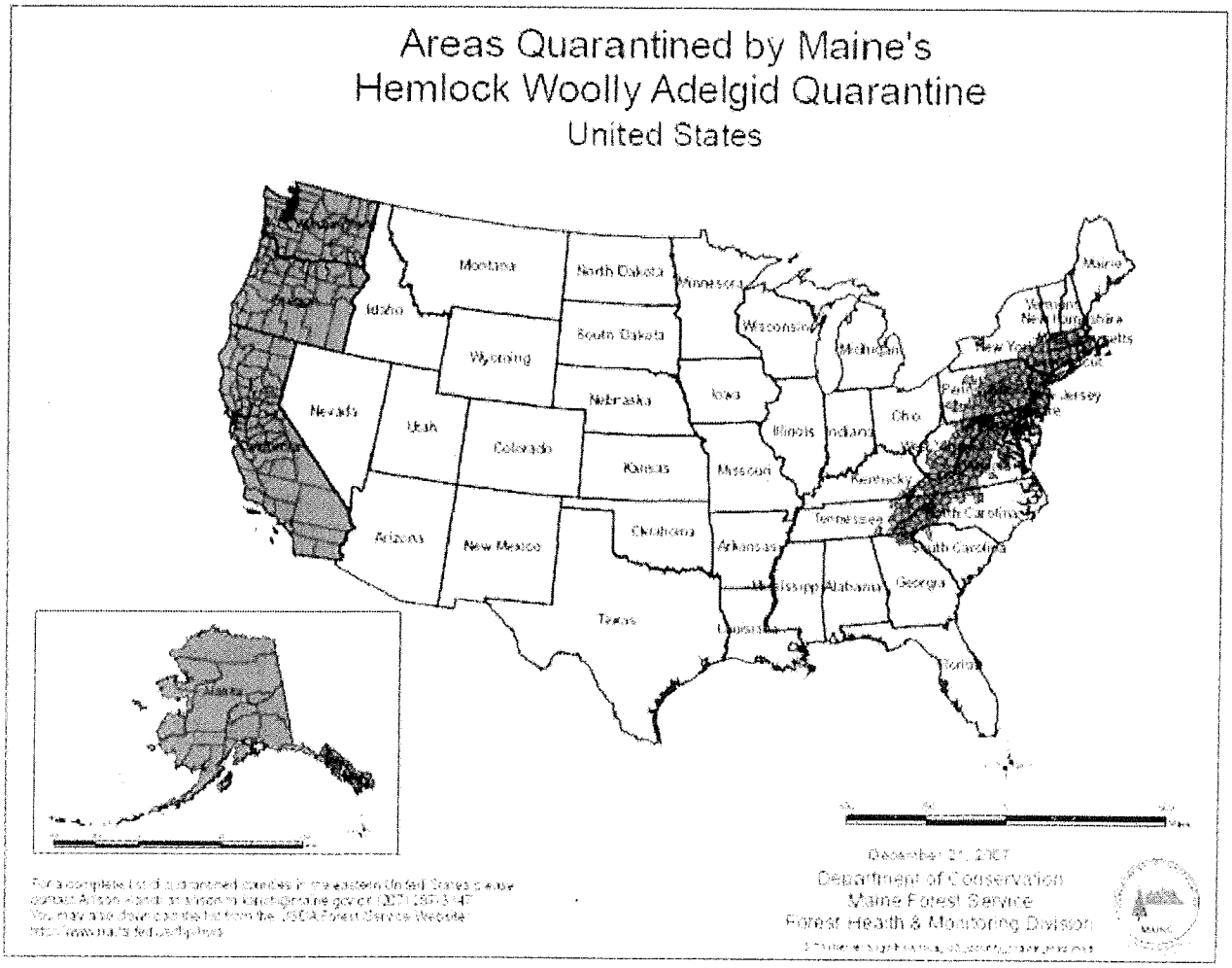
Knox County - Appleton, Camden, Cushing, Friendship, Hope, Owls Head, Rockland,, Rockport, South Thomaston, St. George, Thomaston, Union, Warren, and Washington.

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, Berry Township, Calais City, Cathance Township, Centerville Township, Charlotte, Cherryfield, Columbia, Columbia Falls, Cooper, Cutler, Debolis, Dennysville, East Machias, Eastport, Edmunds, Harrington, Jonesboro, Jonesport, Lubec, Machias, Machiasport, Marion, Marshfield, Meddybemps, Milbridge, Northfield, Pembroke, Perry, Robbinston, Roque Bluffs, Steuben, T18 MD BPP, T19 MD BPP, T24 MD BPP, T25 MD BPP, Trescott, 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:
All or parts of 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

Connecticut: Fairfield, Hartford, Litchfield, Middlesex, New Haven, New London, Tolland, Windham

Delaware: Kent, New Castle, Sussex

Georgia: Fannin, Habersham, Lumpkin, Rabun, Stephens, Towns, Union, White

Kentucky: Bell, Harlan, Powell

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 (town-by-town quarantine)

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

New Hampshire: Hillsborough (town-by-town quarantine), Rockingham (town-by-town quarantine), Strafford

New Jersey: Atlantic, Bergen, Burlington, Camden, Cape May, Cumberland, Essex, Gloucester, Hudson, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Ocean, Passaic, Salem, Somerset, Sussex, Union, Warren

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

Pennsylvania: Adams, Allegheny, Bedford, Berks, Blair, Bradford, Bucks, Cambria, Carbon, Centre, Chester, Clinton, Columbia, Cumberland, Dauphin, Delaware, Elk, 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: Bristol, Kent, Newport, Providence, Washington

South Carolina: Greenville, Pickens, Oconee

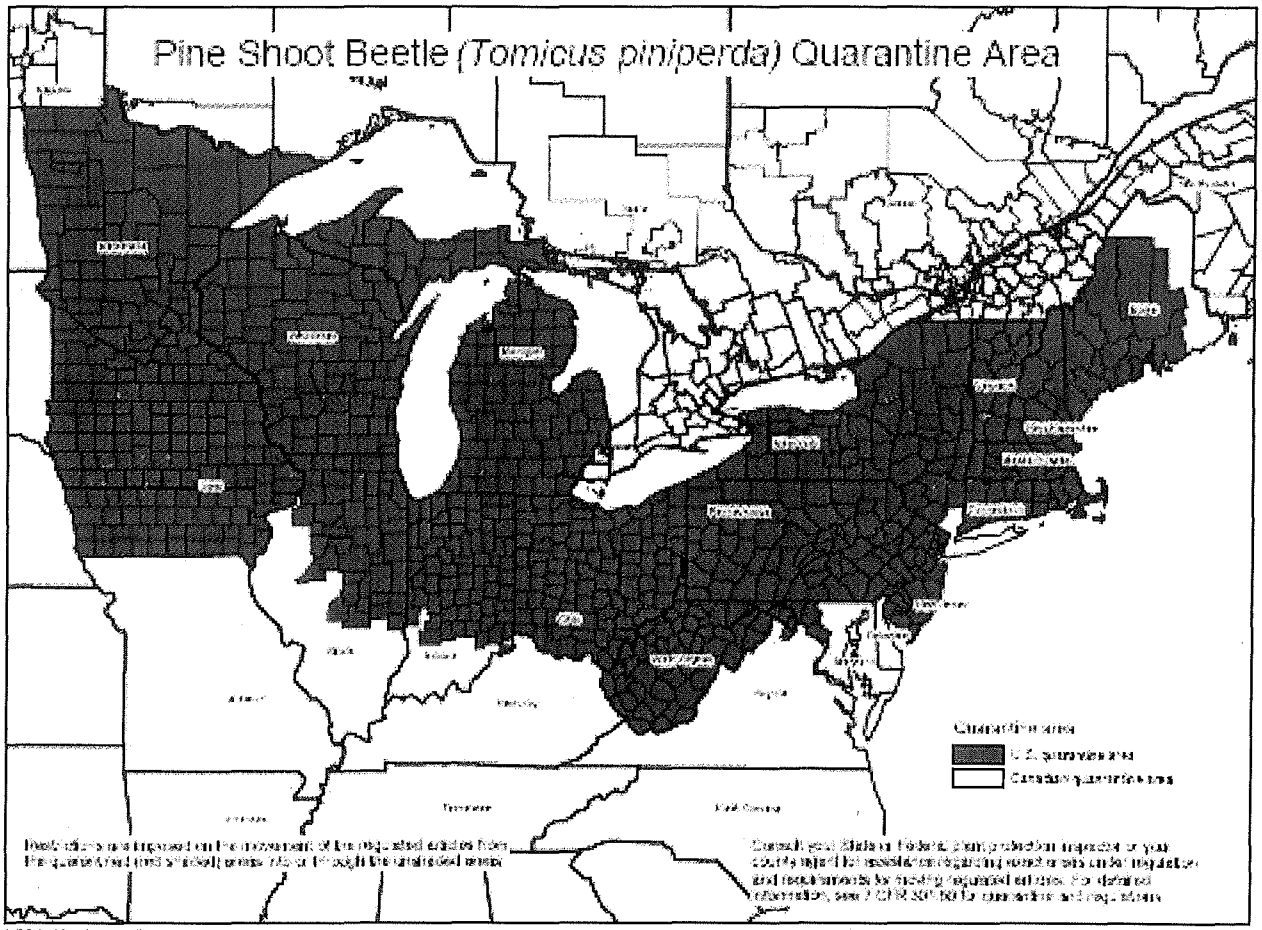
Tennessee: Blount, Campbell, Carter, Cocke, Grainger, Greene, Hamblen, Hamilton, Hancock, Hawkins, Jefferson, Johnson, Knox, Loudon, Monroe, Polk, Rhea, Sevier, Sullivan, Unicoi, Union, Washington

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, 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

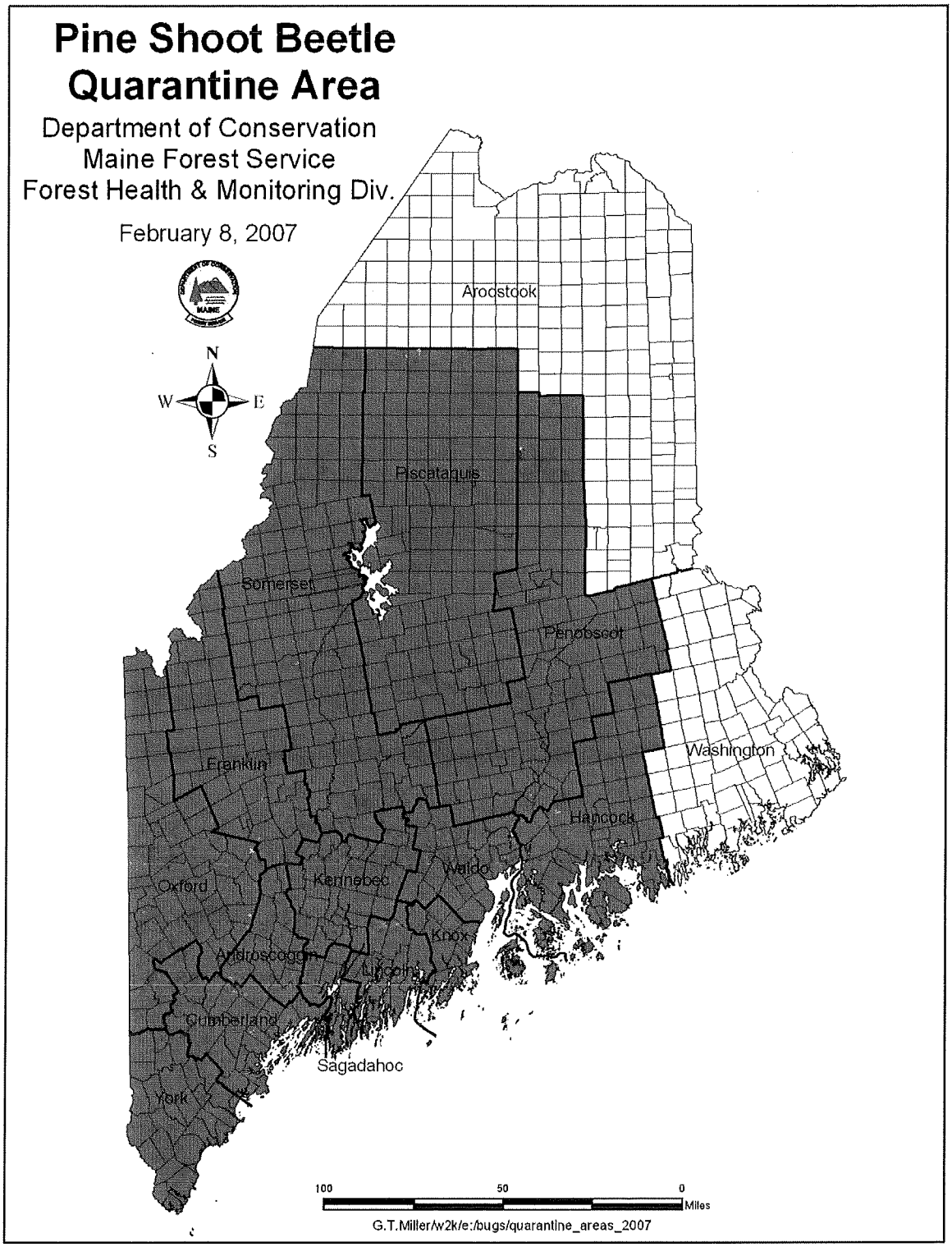
West Virginia: Barbour, Berkeley, Boone, Braxton, Cabell, Fayette, Grant, Greenbrier, Hampshire, Hardy, Jefferson, Kanawha, McDowell, Mercer, Mineral, Mingo, Monongalia, Monroe, Morgan, Nicholas, Pendleton, Pocahontas, Preston, Raleigh, Randolph, Summers, Tucker, Upshur, Webster, Wood, Wyoming

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.
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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.
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8. Trial, Jr., H. and A. Thurston. Spruce Budworm in Maine: 1978. December, 1978. 109 pp.
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10. Struble, D., W. Kemp and H. Trial, Jr. Evaluation of a Reduced Dosage of Orthene for Spruce Budworm Control in Maine: 1977 and 1978. December, 1979. **Unpublished**.
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.
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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.
23. Trial, Jr., H. and M.E. Devine. Spruce Budworm in Maine: Results of the 1984 Project, Biological Conditions in 1984, and Expected Infestation Conditions for 1985. April, 1985. 75 pp.

24. Trial, Jr., H. and M.E. Devine. Spruce Budworm in Maine, Results of the 1985 Project, Biological Conditions in 1985 and Expected Infestation Conditions for 1986. August, 1986. 71 pp.

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

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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.

34. Trial, Jr., H. and M.E. Devine. The Impact of the Current Hemlock Looper, *Lambdina fiscellaria* (Guen.), Outbreak in Selected Severely Damaged Stands of Eastern Hemlock. December 1994. 16 pp.

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

36. Trial, Jr., H. and M.E. Devine. The Impact of the Hemlock Loopers, *Lambdina fiscellaria* (Guenée), and *L. athasaria* (Walker) on Eastern Hemlock and Balsam Fir in New England. November, 1995. 24 pp.

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. Revised May 2002 including 3 additional pages of larval data.

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.

44. Foss, K.A. and R.G. Dearborn. Preliminary Survey of Mosquito Species (Diptera: Culicidae) with a Focus on Larval Habitats in Androscoggin County, and Additional Larval Data for Portland, Maine during 2002. December, 2002. 51 pp.

MFS 03/09

Appendices

Appendix A

Monitoring for Emerald Ash Borer (*Agrilus planipennis*)

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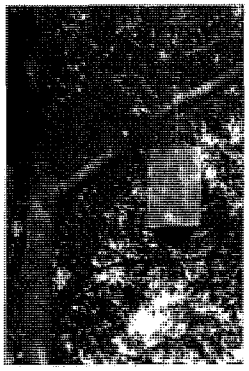
168 State House Station, Augusta, Maine 04333-0168

Introduction: Emerald ash borer (EAB) is a serious invasive pest of ash (*Fraxinus* spp.) 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 eight years, and has the potential to destroy ash in North America in the same way that chestnut blight destroyed the American chestnut population.

A significant proportion of new infestations of EAB are caused by people moving infested 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. The Maine Forest Service has an active "*Leave Your Firewood At Home*" campaign that is in its second year.

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.



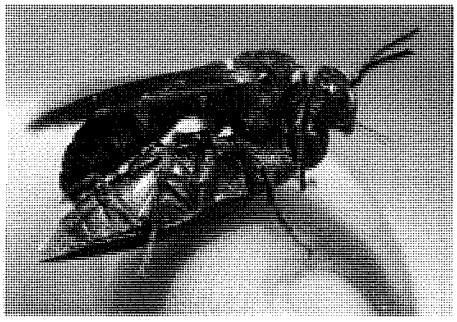
Purple prism trap survey: In the summer of 2009, the MFS participated in the second year of a national trapping trial for EAB. Traps (photo at right) were placed at 13 sites (mainly campgrounds and parks) throughout the southern and central part of the state (Table A1). At each site, two large purple sticky prism traps baited with manuca 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.

No buprestids were captured on any trap, and it appears that in Maine these traps are less successful at capturing buprestid beetles (the family to which EAB belongs) than they are in states further south.

Table A1. Locations of purple prism traps.

Town	County	Latitude	Longitude
York (Cape Neddick)	York	43.217	-070.617
Kennebunkport	York	43.391	-070.491
Biddeford	York	43.540	-070.515
Freeport	Cumberland	43.829	-070.072
Durham	Cumberland	43.927	-070.156
Damariscotta	Lincoln	44.029	-069.459
Thomaston	Knox	44.078	-069.186
Camden	Knox	44.230	-069.047
Searsport	Waldo	44.440	-068.933
Orland (East Orland)	Hancock	44.546	-068.657
Bar Harbor	Hancock	44.382	-068.203
Southwest Harbor	Hancock	44.300	-068.331
Greenville	Piscataquis	45.496	-069.584

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 prey) is a native, non-stinging wasp which nests in hard-packed sandy ground and hunts buprestid beetles, including EAB when present. It is much more efficient at finding EAB than humans are, and has the potential to find a new infestation earlier.



During the summer of 2009, additional *Cerceris* colonies were found in Maine, bringing the total to 60 colonies (Figure A1): 26 colonies are large enough to support biosurveillance (Table A2), 24 are currently too small (Table A3), and 10 are too far from ash trees to be suitable for biosurveillance (Table A4). Nests which have not yet been confirmed to be *Cerceris fumipennis* were located at an additional 6 sites.

At least some level of biosurveillance was conducted at 25 locations throughout the State, and over 350 buprestids collected. Three hundred ten buprestids have been identified so far, representing seven genera and 20 species. One genus and two species were State records new to Maine (Table A5).

Eighteen individuals or groups of volunteers 'adopted' local wasp colonies and took responsibility for conducting biosurveillance throughout the summer. Several of these volunteers also searched for and 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 were an integral part of the program and we greatly appreciate their help in making it successful.

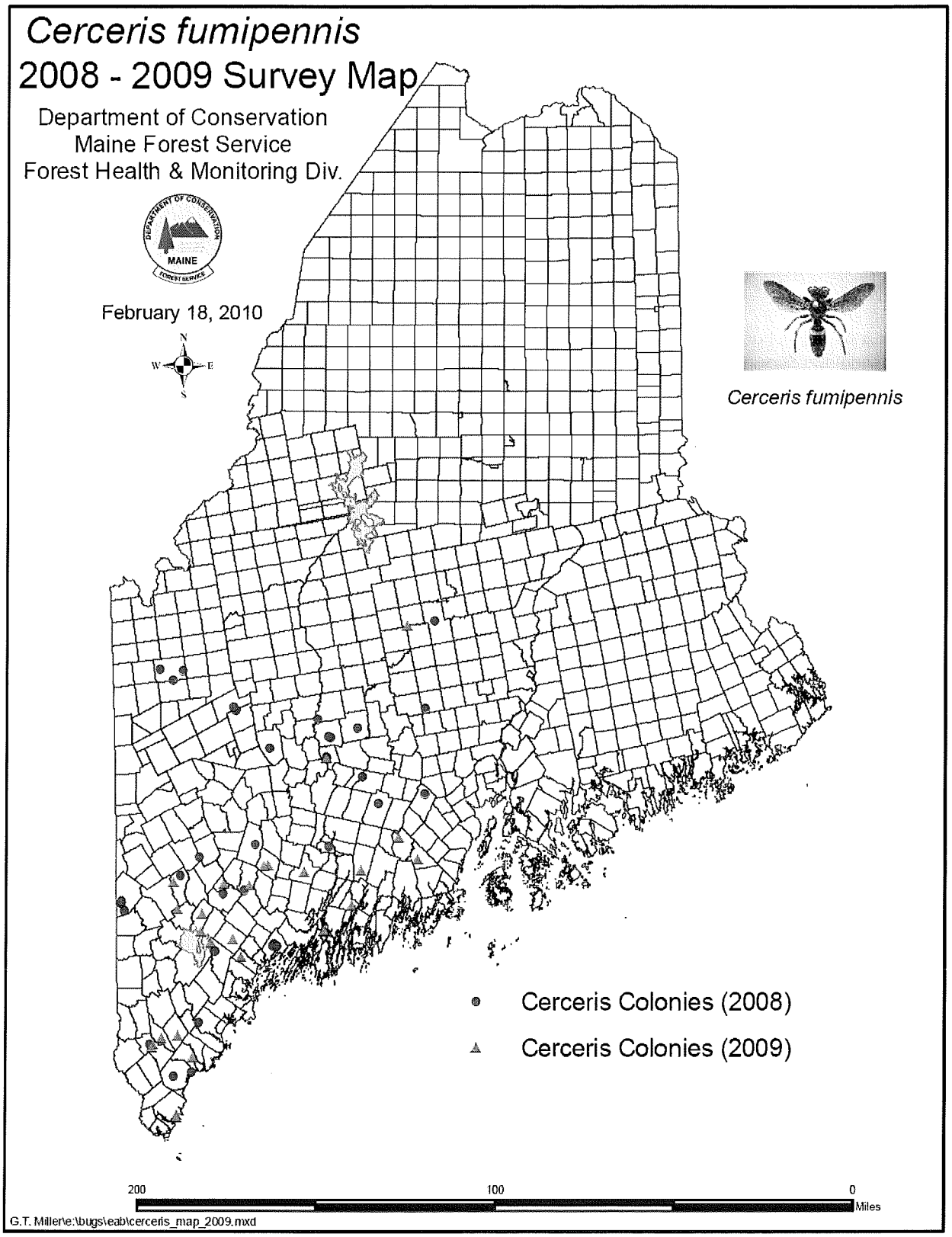


Figure A1. Location of *Cerceris fumipennis* colonies in Maine

Table A2. ***Cerceris fumipennis*** **colonies large enough for biosurveillance**
(italics indicate site where biosurveillance occurred in 2009)

County	Town	colony location	# nests
Androscoggin	*Auburn*	*private yard*	*75-100*
Androscoggin	Greene	baseball diamond	27
Androscoggin	Mechanic Falls	baseball diamond	75+
Androscoggin	*Poland*	*baseball diamond*	*100*
Androscoggin	*Turner Center*	*baseball diamond*	*100+*
Cumberland	*Freeport*	*baseball diamond*	*75+*
Cumberland	*Freeport*	*baseball diamond*	*30+*
Cumberland	Freeport	baseball diamond	150
Cumberland	*Harrison*	*baseball diamond*	*38*
Cumberland	Windham	baseball diamond	100+
Kennebec	*China*	*baseball diamond*	*23*
Kennebec	*Farmingdale*	*baseball diamond*	*50*
Kennebec	Litchfield	gravel pit	15-20?
Kennebec	*Winslow*	*baseball diamond*	*50*
Knox	Union	baseball diamond	21
Knox	*Washington*	*private yard*	*15-30*
Lincoln	*Whitefield*	*gravel pit*	*100+*
Oxford	Fryeburg	dirt road	50
Penobscot	*Newport*	*baseball diamond*	*75*
Sagadahoc	Bath	baseball diamond	25-30
Somerset	*Skowhegan*	*dirt road*	*95*
Somerset	*Smithfield*	*gravel pit*	*~100*
Somerset	*Smithfield*	*gravel pit*	*41*
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 2009)

County	Town	location	# nests
Androscoggin	Greene	baseball diamond	2
Cumberland	Casco	baseball diamond	6
Cumberland	Casco	baseball diamond	1
Cumberland	Cumberland	parking lot	6
Cumberland	Grey	cemetery	5-8
Cumberland	*Harrison*	*baseball diamond*	*10*
Cumberland	Naples	baseball diamond	3
Lincoln	*Wiscasset*	*baseball diamond*	*???*
Oxford	Fryeburg	baseball diamond	8
Oxford	*Norway*	*baseball diamond*	*10*
Piscataquis	Dover-Foxtrot	fairgrounds	3
Piscataquis	Guilford	baseball diamond	4
Sagadahoc	Bath	baseball diamond	6-7
Sagadahoc	Bath	baseball diamond	3-5
Somerset	Norridgewock	baseball diamond	4
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 2009)

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*	*30*
Oxford	*Fryeburg*	*dirt road*	*500+*
Somerset	Madison	baseball field	4
Somerset	Norridgewock	gravel pit	200-300
Somerset	*Smithfield*	*gravel pit*	*~200*
York	Wells	dirt road	3

Table A5. List of buprestids collected from *Cerceris* wasp colonies
(* indicates species new to Maine Forest Service insect collection, bold indicates new State record)

Scientific Name
Agrilus anxius
*Agrilus sayi**
Buprestis maculipennis
Buprestis maculiventris
Buprestis nuttalli
Buprestis striata
Crysobothris harrisi
*Crysobothris rotundicollis**
Crysobothris neopusilla
Crysobothris sexsignata
Dicerca asperata*
Dicerca caudate
Dicerca divaricata
Dicerca punctulata
Dicerca tenebrica
Dicerca tenebrosa
Dicerca tuberculata
Melanophila fulvoguttata
Poecilonota cynipes
Spectralia gracilipes*

Appendix B

A Survey of Beech Bark Disease Intensity as Related to the Biophysical Regions in the Aftermath Forests of Maine

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The beech scale insect (*Cryptococcus fagisuga*) and the associated *Neonectria* species which together act as the primary causal agents of beech bark disease are widespread throughout Maine, other New England states, and other areas in the aftermath zone. The disease complex is known to have been present in Maine for at least 80 years, and has probably been present in some eastern areas for a slightly longer period of time. It has been observed, and is generally accepted, that the beech bark disease is more damaging, and causes more intense cankering in eastern regions of the state compared with the western areas.

In 1990, a series of 15 biophysical regions was identified and characterized for Maine (*McMahon, J. S. 1990. The biophysical regions of Maine: Patterns in the landscape and vegetation. M.S. Thesis. Univ. Maine, Orono. 119 p.*). Additional work has since refined an additional 4 regions. The regions were developed using data on physiography, surficial geology, soils, and vegetation. This biophysical system has been found useful for elucidating several biological relationships, including vegetation composition and the distribution of certain wildlife species. It has not yet been used to assist in determining intensity of, or population fluctuations for the agents of beech bark disease.

The objective of a recently-initiated study is to compare characteristics of the beech bark disease including scale population levels and intensity of cankering, in several biogeoclimatic zones where beech stands comprise a significant component of the forest resource. A second objective is to locate, map, and document American beech putatively resistant to beech bark disease (beech scale infestation) in these stands.

Because the intensity of beech bark disease in stands generally increases from west to east through Maine, a sampling of the biophysical regions which span the breadth of the state at the mid-region of the state will be examined. Stands will be sampled in five biophysical regions: Region 3, the Central Foothills; Region 4, the Maine-New Brunswick Lowlands; Region 7, the Central Maine Embayment; Region 14, the Mahoosic and Rangely; and Region 15, the Western Foothills. Five towns within each biophysical region will be randomly selected for survey. One hundred trees in each of two stands in each of five towns in each of the five biophysical regions will be examined and rated.

The surveying protocol used was that developed by Wiggins *et al.* (*Wiggins, G. J., J. F. Grant, M. T. Windham, R. A. Vance, B. Rutherford, R. Klein, K. Johnson, and G. Taylor. 2004. Associations between causal agents of the beech bark disease complex in the Great Smokey Mountains National Park. Population Ecology 33:5:1274-1281*). This is a qualitative rating system (0 – 6: No scale, low scattered, low uniform, moderate scattered, moderate uniform, high scattered, high uniform) to evaluate the density and distribution of *C. fagisuga* and fungal perithecia of *Neonectria* species. These researchers used a rating frame of approximately 33 X 33 cm, placed on the bark at dbh, and measured two locations (North and South aspects) on the main stem to estimate insect density. This technique was modified slightly in the Maine study by using a rating frame of 33 X 15 cm, because of the smaller sized trees in Maine forests. In addition, a "trace" category was included because often one or two scale insects were present, but not enough to be considered "light" according to the original protocol.

This information will improve management recommendations in terms of timing and frequency of stand improvement and salvage operations by providing a more localized prediction of disease effects. Baseline data on disease occurrence and trends would be useful in the broader region of the eastern deciduous forests of the United States. The study will generate information useful to the following: 1) filling data gaps in disease risk models, 2) improving understanding of the distribution of tree mortality, and 3) serving as a baseline for understanding effects of climate change and other agents of insect population fluctuations on disease intensity. The following graphs depict some preliminary statistics obtained from the sampling, completed in 2009, of the Western Foothills Region.

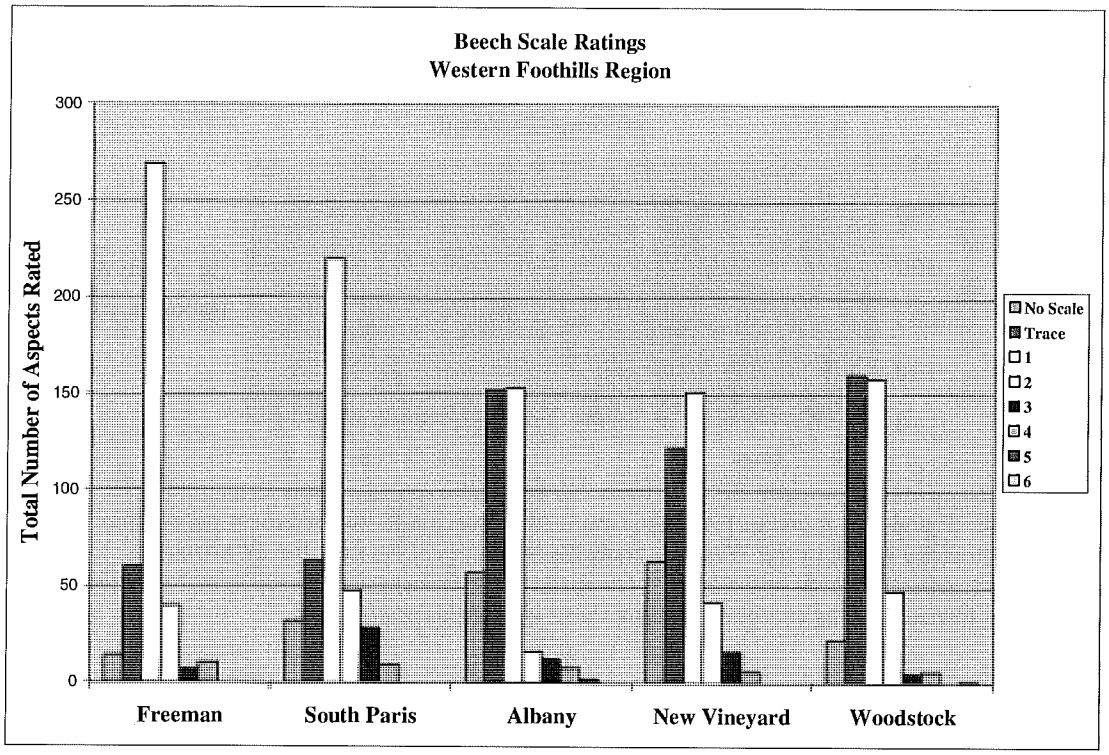

Figure B1. Beech scale (*C. fagisuga*) intensity ratings for American beech in the Western Foothills Biophysical Region. Two aspects (North and South) were rated for scale intensity for each of 200 trees in each of five towns. Rating categories follow those of *Wiggins et al., 2004*.

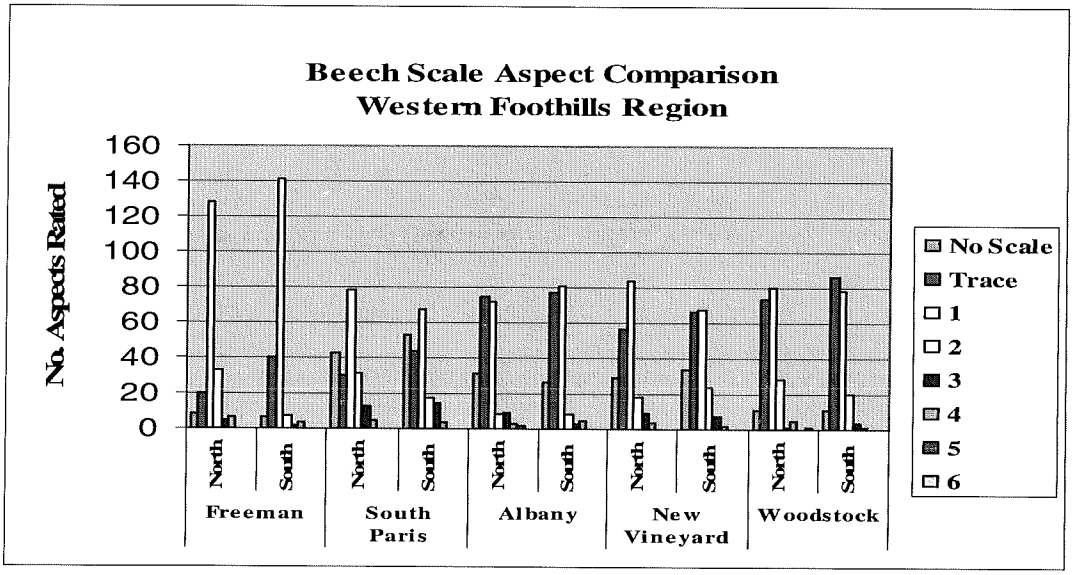

Figure B2. Beech scale (*C. fagisuga*) ratings, comparing North and South aspect population ratings for American beech in the Western Foothills Biophysical Region. Two aspects (North and South) were rated for scale intensity for each of 200 trees in each of five towns. Rating categories follow those of *Wiggins et al., 2004*.

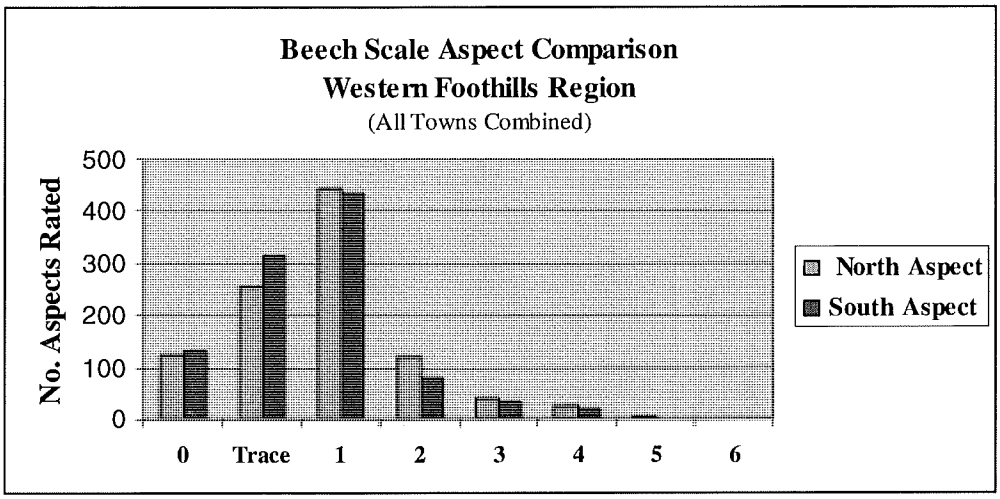

Figure B3. Beech scale (*C. fagisuga*) ratings, comparing North and South aspect population ratings for American beech in the Western Foothills Biophysical Region, for all towns combined. Two aspects (North and South) were rated for scale intensity for each of 200 trees in each of five towns. Rating categories follow those of *Wiggins et al., 2004.*

Appendix C

Pine Commodity Survey

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The Maine Forest Service worked in conjunction with the Maine Department of Agriculture and the US Department of Agriculture to survey for invasive pests that attack pines. 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 consistent with Cooperative Agricultural Pest Survey (USDA APHIS) and Homeland Security objectives.

The following insects are considered significant threats to Maine's pine resource and were surveyed for in 2009:

Bark beetle; *Hylurgops palliatus*
Bark beetle; *Hylurgus ligniperda*
Bark beetle; *Ips subelongatus*
Bark beetle; *Orthotomicus erosus*

Siberian silk moth; *Dendrolimus pini*

Siberian silk moth; *Dendrolimus superans*

European woodwasp; *Sirex noctilio*

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 checked every other week.

Table C1. Locations of bark beetle traps in 2009

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

The Siberian moths and European woodwasp traps were deployed at eleven sites in nine 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. Woodwasp traps were checked every two weeks and moth traps were checked after four weeks.

Table C2. Locations of Siberian moths and European woodwasp trapping 2009

		Dendrolimus pini	*Dendrolimus superans*	*Sirex noctilio*
Town	**County**			
Bowdoinham	Sagadahoc	0	0	0
Poland	Androscoggin	0	0	0
Wiscasset	Lincoln	0	0	0
Fairfield	Somerset	0	0	0
Belgrade	Kennebec	0	0	0
Farmington	Franklin	0	0	0
Dixfield	Oxford	0	0	0
Fryeburg	Oxford	0	0	0
Sanford	York	0	0	0
Readfield	Kennebec	0	0	0
Manchester	Kennebec	0	0	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.

Appendix D

Exotic Detection and Rapid Response Project (EDRR)

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Non-native invasive insects present one of the greatest threats to the integrity and viability of forest ecosystems because increasing world trade and travel have amplified the risks of their inadvertent introduction into forests. While exclusion is the ultimate goal, some exotic insect pests will escape detection and will become established near ports of entry or other inland import sites. A rapid system of early detection of these incipient infestations is urgently needed to prevent spread of newly established colonies of invasive species.

The USDA Forest Service and USDA Animal Plant Health Inspection Service (APHIS) are partners in running the EDRR program. Pilot projects for the rapid detection of exotic Scolytine (bark beetle) pests of conifer forests in the United States were run from 2002 to 2005 in different port locations and regions of the U.S. Maine participated in the first year pilot project in 2002. In 2006 Maine was a participant in the EDRR survey program and again this past year we trapped for invasive bark beetles under this program.

A risk analysis based on a variety of factors is used to determine what species of bark beetles will be targeted (Table D1).

Table D1. Targeted exotic bark beetle species for 2009

Scientific Name	Common Name
Hylurgops palliates	Pale spruce bark beetle
Hylurgus ligniperda	Red-haired pine bark beetle
Ips sexdentatus	Six-spined pine bark beetle
Ips typographus	European spruce bark beetle
Orthotomicus erosus	Eroded pine bark beetle
Pityogenes chalcographus	Chalcographic pine bark beetle
Scolytus schevyrewi	
Tomicus piniperda	Pine shoot beetle
Trypodendron domesticum	
Xyleborinus alni	
Xyleborus glabratus	
Xyleborus seriatus	
Xyleborus similis	

Survey locations are chosen based on the risk of invasive insects being introduced into an area. Nine sites (Table D2) were monitored in five counties. At each site three 12-funnel Lindgren traps each set with a different array of pheromones to attract different types of bark beetles. One trap has alpha-pinene ethanol lures that are general attractants for wood boring insects in conifers. Another trap is baited with ethanol lure only, as that is a degradation product of dying trees both hardwoods and conifers. The third trap uses an exotic three component *Ips* lure that is a more specific pheromone for the conifer feeding exotic bark beetles: *Ips typographus, Ips sexdentatus, Hylurgus ligniperda and Orthotomicus erosus*. Traps were set out the last week in March for all sites except Limestone, as bark beetles can begin flying as soon as the temperature warms up to 43° F. The Limestone site was set the first week of April due to the difference in climate. The trapping period ran until mid-August with traps serviced every two weeks.

Table D2. EDRR site locations for 2009

Town	County	Site Type
Auburn	Androscoggin	Railroad Yard
Bath	Sagadahoc	Woody Debris Disposal
Lewiston	Androscoggin	Woody Debris Disposal
Limestone	Aroostook	Industrial Park
Poland	Androscoggin	Bark Processor
Portland	Cumberland	Airport
Portland	Cumberland	Woody Debris Disposal
Sanford	York	Sawmill
South Portland	Cumberland	Railroad Yard

All bark beetles caught were identified to species and verified by beetle taxonomist Dr. Richard Hoebeke, Cornell University. Bill Urquhart made the initial identifications and Dr. Hoebeke remarked at the end of the season, "Bill is now an excellent scolytine identifier." It is very important to have in-house expertise in recognizing native fauna so that when exotic insects are found they can be quickly identified. The MFS also screened all trap catches for other possible invasive woodborers.

In 2009 there were a total of 8,092 (yes, we counted them!) bark beetles caught in the 27 EDRR Lindgren funnel traps at the nine sites (Table D3). The catch consisted of 50 different species with one new State record. The new bark beetle for Maine is *Xyleborus affinis* and it was found in Auburn and Bath (Androscoggin and Sagadahoc Counties, respectively). It is native to southern North America and had previously been found as far north as Massachusetts.

Two target species of the EDRR project were also found. Both of them are ambrosia beetles (these beetles have a symbiotic relationship with fungi but are classified with bark beetles). The beetles tunnel under the bark as do bark beetles. One of them, *Xyleborus seriatus,* was found for the first time in 2008 in two towns; Sanford and Livermore Falls. This year *X. seriatus* was again found in Sanford and also in Auburn. This beetle is currently known only from Massachusetts and Maine and is originally from Asia. It attacks both conifers and softwoods. No damage has been found on trees yet and no regulatory action has been taken to date. The other species on the target list found in Maine is *Xyleborinus alni.* This beetle has been recorded from Maine since 2004 when the MFS started intensive bark beetle surveys. It has been found from York to Limestone, Maine and is also established in other states in the Northeast. *Xyleborinus alni* is native to Asia and hosts include many hardwoods. It has been sent in to the MFS on at least three occasions, emerging from firewood in people's houses in Belgrade, Solon and Winthrop. They could not identify what type of wood the beetles emerged from. No action has been taken on this insect.

Table D3. Bark beetles caught in Lindgren funnel traps in 2009 EDRR Survey

Species	Number caught	Species type
Anisandrus dispar	9	
Anisandrus obesus	1	
Anisandrus sayi	760	
Conophthorus coniperda	2	
Conophthorus sp.	1	
Corthylus punctatissimus	2	
Cryphalus	1	
Cryphalus ruficollis	22	
Crypturgus	3	
Dendroctonus rufipennis	2	
Dendroctonus valens	2058	
Dryocoetes affaber	12	
Dryocoetes autographus	355	
Gnathotrichus materiarius	410	
Hylastes opacus	371	
Hylastes porculus	319	
Hylesinus aculeatus	73	
Hylesinus criddlei	7	
Hylurgopinus rufipes	6	
Hylurgops rugipennis pinifex	107	
Ips borealis	75	
Ips calligraphus	3	
Ips grandicollis	25	
Ips latidens	1	
Ips pini	202	
Lymantor decipiens	36	
Monarthrum fasciatum	2	
Monarthrum mali	17	
Orthotomicus caelatus	1341	
Phloeotribus liminaris	3	
Pityogenes hopkinsi	109	
Pityokteines sparsus	16	
Pityophthorus	66	
Polygraphus rufipennis	26	
Pseudopityophthorus	15	
Pseudopityophthorus minutissimus	1	
Scolytus piceae	1	
Trypodendron	2	
Trypodendron betulae	13	
Trypodendron borealis	2	
Trypodendron lineatum	95	
Trypodendron retusum	4	
Xyleborinus alni	**805**	**Target**
Xyleborinus saxesenii	65	
Xyleborus affinis	**2**	**New to State**
Xyleborus pelliculosus	10	
Xyleborus seriatus	**4**	**Target**
Xyleborus xylographus	5	
Xylosandrus germanus	506	
Xyloterinus politus	118	