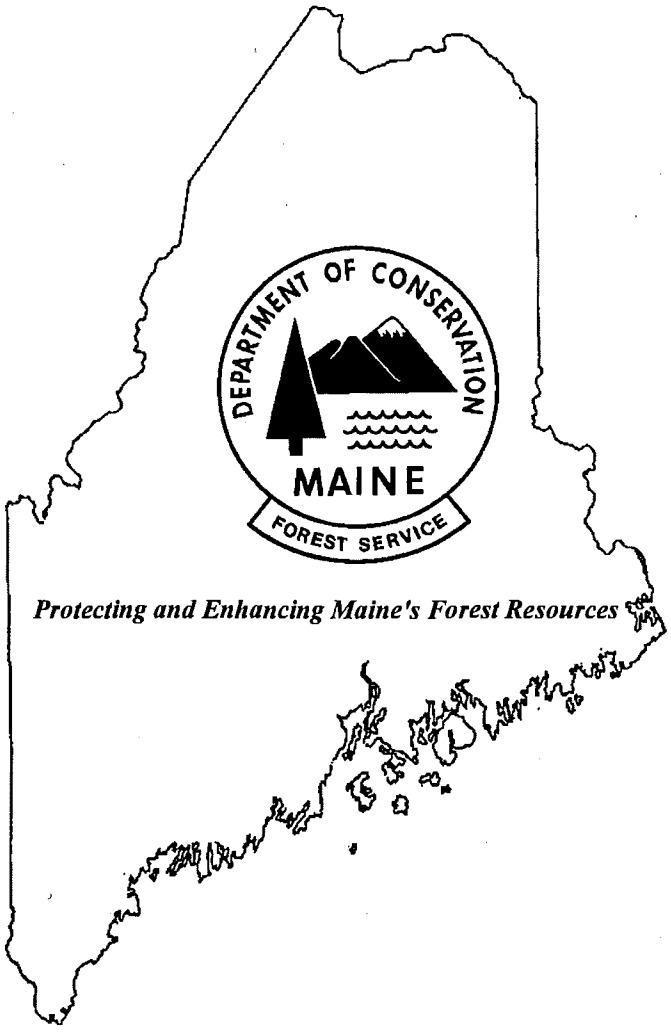
Forest & Shade Tree Insect & Disease Conditions

for Maine

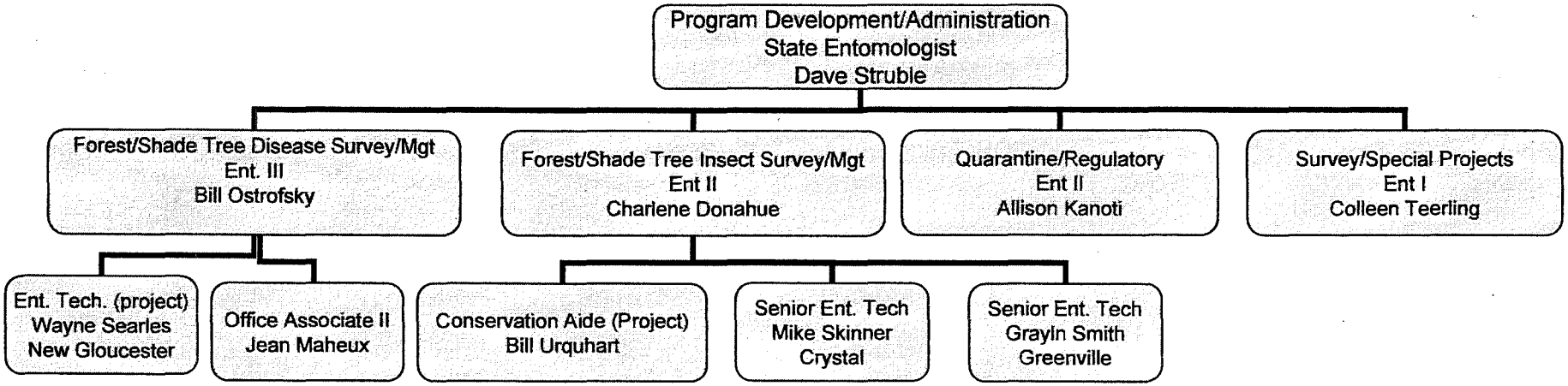
A Summary of the 2007 Situation



Forest Health & Monitoring Division
Summary Report No. 19
March 2008

Maine Forest Service
MAINE DEPARTMENT OF CONSERVATION
Augusta, Maine

Forest Health & Monitoring Division
Insect & Disease Management Unit



Forest Insect & Disease—Advice and Technical Assistance

Maine Department of Conservation, Maine Forest Service
Insect and Disease Laboratory
50 Hospital Street, Augusta, Maine 04330
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***
50 Hospital Street Augusta, Maine 04330-6514 Phone: (207) 287-2431 Fax: (207) 287-2432 Hours: Mon.-Fri. 7:30 a.m. - 4:30 p.m. (call ahead as we are often in the field) Charlene Donahue, Forest Entomologist (207) 287-3244 charlene.donahue@maine.gov Allison Kanoti, Forest Entomologist (207) 287-3147 allison.m.kanoti@maine.gov Colleen Teerling, Forest Entomologist (207) 287-3096 colleen.teerling@maine.gov William Ostrofsky, Forest Pathologist (207) 287-3008 bill.ostrofsky@maine.gov Wayne Searles, Entomology Technician Bill Urquhart, Conservation Aide Jean Maheux, Office Associate II	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.

Acknowledgements

This summary has been compiled by William Ostrofsky, Allison Kanoti, Colleen Teerling and Charlene Donahue. The information has been collected from a variety of projects which represents the efforts of the entire staff of the Forest Health and Monitoring Division's Insect & Disease Management Work Unit. The Entomology Laboratory and Field Staff has the lead responsibility for most projects and activities reported here, but all the information also reflects the work of many other cooperating individuals and organizations.

Most information in this report has been generated with cooperative projects supported by funds and staff of the USDA Forest Service, the Pine Tree State Arboretum, and other state agencies, and from cooperators in other New England states and the Maritime Provinces of Canada. Administrative and field staff in the Forest Inventory Work Unit of the Forest Health and Monitoring Division also have provided critical support that facilitates our work.

Finally and most importantly, our thanks go to our clients; the woodland owners, managers, arborists, Christmas tree growers, foresters, and landscape professionals, for support in keeping us informed of what you see on your properties and during the course of your work.

Forest & Shade Tree – Insect & Disease Conditions for Maine
Reports for the 2008 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. No one will be added to or kept on our mailing list automatically.

Individual's Name _____

Mailing Address _____

_____

_____

Telephone_____

E-Mail Address_____

I prefer to receive (check one):

☐ Hard Copy ☐ Electronic Version

Area of Interest (*only check one*):

☐ Academic Institution ☐ Arborist
☐ Forester ☐ Christmas Tree Grower
☐ Government Agency ☐ Library
☐ Nursery/Greenhouse ☐ Interested Individual

Comments:_____

_____

Return your Completed Form To: **Insect & Disease Laboratory**
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Augusta, Maine 04330-6514

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Printed under appropriation numbers 013 04A 2120 522 FHM6 and 010-04A-5221-522

Issued 03/08
Initial printing of 800 copies

FOREST & SHADE TREE INSECT & DISEASE CONDITIONS FOR MAINE – A SUMMARY OF THE 2007 SITUATION

State Entomologist's Comments

I took the opportunity, when preparing to write a few comments for this year's annual summary, to look at the reports for the last 20 years. Each report is a vignette that captures the forest health issues for that year, complete with the steps being taken to address those issues. The specific threat and potential impacts of greatest concern varied from year to year; ranging from native pests like spruce budworm and forest tent caterpillar to the exotic pests such as white pine blister rust, gypsy moth, and browntail moth. Situations such as sugar maple decline and white pine decline were less clear-cut, requiring extensive investigation to identify potential causes before we could craft a response.

Although this trip down Memory Lane brought back unique personal memories, it also illustrated how little things have changed. The threats facing Maine's forest and shade tree resource today are remarkably similar to those in the reports. Spruce budworm shows signs of resurgence in jurisdictions to our west. Forest tent caterpillar has caused serious defoliation, dieback and decline elsewhere in New England. Nonnative pests like emerald ash borer, Asian longhorn beetle, and sudden oak death are all very real threats; and hemlock woolly adelgid has already established a foothold in southern York County.

And, the role of the Forest Health & Monitoring Division has departed very little from the policy elucidated in the 1923-1924 Forest Commissioner's Report by Henry Pierson, Maine's first State Entomologist: "The general policy followed in carrying on the entomology work has been to concentrate as much as possible on determining the best economic control for the more serious forest insect pests." Additionally, that same article refers to a Department bulletin entitled "Insects Attacking Forest and Shade Trees", a title quaintly similar to the title of this report.

Our primary responsibility remains to protect the forest, shade and ornamental tree resources of the state from significant insect and disease damage and to provide pest management and damage prevention for homeowners, municipalities, and forest landowners and managers; thereby preserving the overall health of Maine's forest resources. The only real addition has been the action of the 118th Legislature, expanding our responsibilities to incorporate conducting a permanent inventory of Maine's forest resources on a 5-year annualized cycle.

I can report that we continue to deliver on those core responsibilities. Despite the budget-driven reductions in staffing over the years, we have been able to utilize new survey methods and monitoring tools, and cooperative projects with our neighbors and client/cooperators to maintain viable early warning and information delivery systems. We may not be all we would like to be, but we have not yet knuckled under.

And in this regard I would reiterate and reaffirm a statement from the introduction to the 1992 Summary Issue - Insect & Disease Conditions Report:

> "As this Summary Report is being prepared the Administration and Legislature are investigating various possible changes in government structure with an eye toward cost savings and improved efficiencies. This process has just started with no endpoint well defined. It is the position of the Maine Forest Service that any resultant changes in structure must leave an organization able to address the needs of Maine's forest and shade tree resource and its owners and managers...."

This 15 year-old statement still captures the critical point. Irrespective of the changes, we need to deliver our core mission.

That said, I would be less than honest if I did not inform you regarding the extent of the challenge we are currently facing. While we are working with partners within the state to maintain our program in a period of fiscal austerity, President Bush, in his 2009 budget proposal to Congress, seeks to slash the State and Private Forestry program of the U.S. Department of Agriculture's Forest Service. The Cooperative Lands Forest Health program (which provides a significant level of support to our program) is facing a 77% reduction. It is these funds that have allowed us to successfully address problems such as hemlock woolly adelgid; without them our monitoring and remediation efforts will be severely hampered.

While it is not unusual for the Administration to use the President's Budget to put forward a low opening bid, which is then adjusted by Congress, the budget proposed for 2009 is inordinately draconian. We do not yet

know how this will play out but I don't expect the process to be either swift or painless. Although it is difficult to maintain our focus on program delivery in the midst of such budgetary turmoil, it is in just such times that it is most critical to demonstrate that the current resources are being used efficiently to effectively address our statutory responsibilities.

In this regard, the strong contribution being provided by you our client /cooperators has become even more critical. Your efforts strengthen our capacity to gather information regarding pest and forest conditions, and effectively disperse it out to the larger public. Although we try to acknowledge you, the few words written here do not begin to convey the extent of our reliance or express our appreciation for your contribution.

The Forest & Shade Tree Insect & Disease Condition Reports serve as one of the primary vehicles for relaying general information from us to you; it is critical that they be useful. We sincerely hope that you will read them, use them, and keep in touch with us regarding information or suggested improvements so that they continue to meet your needs.

Personnel Notes

Since our last summary issue, we were successful in filling the vacant Entomologist 1 position. **Colleen Teerling** came to work for the Division in June of 2007 after a long stint working in the Maritimes with Don Ostaff and Dan Quiring (Canadian Forestry Service - Maritimes Research Station and University of New Brunswick, respectively). Among the other things from her Maritimes experience, she worked on balsam woolly adelgid and gypsy moth, and was the principal investigator studying pests of white spruce plantations in the Maritimes. Shortly after she was hired we gave her a trial by fire, having her cover for Allison Kanoti who was out on Maternity leave. I am happy to report that Colleen survived, thrived, and has proved a valuable addition to our staff.

Softwood Insect Pests

Arborvitae leaf miners (A complex of four species) - Arborvitae leaf miners are a perennial problem but populations appear to be on the rise again. Cedar stands across northern and eastern Maine are thin and off-color due to a variety of factors with arborvitae leaf miner being one of them (see Disease section for further discussion). Ornamentals are also showing higher levels of damage from the leaf miners in 2007 then in recent years.

Balsam gall midge (*Paradiplosis tumifex*) -Galls formed by the larvae were visible on some foliage this year, but currently population levels are still low throughout Maine. If you had needle loss from the galls on fir foliage this year then be on the lookout for the tiny orange midge flying in May.

Balsam woolly adelgid (*Adelges piceae*) - Balsam woolly adelgid populations continued at low levels in 2007. Trunk phase has been reported on scattered trees in northern reaches of the adelgid's distribution, perhaps related to the mild winter and spring temperatures. Mortality of heavily damaged fir continues to occur but it becomes less obvious as old stands are salvaged or fall to the ground. Patches, two to ten acres in size, of dead fir will remain a common sight in eastern Maine for several more years. Fir grown for Christmas production should be watched closely for signs of this pest.

Eastern larch beetle (*Dendroctonus simplex*) - 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 and central portions (including Downeast) of the state exhibit the highest mortality rates. Most tree mortality is in association with other stress factors, particularly extremes in water availability.

Hemlock borer (*Melanophila fulvoguttata*) - Hemlock borer is an insect that finishes off hemlock trees stressed by drought, site disturbance, hemlock looper or other factors. We frequently get calls with people asking why the hemlock(s) on their property died; although there are obvious borer signs, the underlying problems are what really killed the tree. That being said, once there is a large beetle population in a tree and the tree dies, the beetles will go looking for another tree to infest. So carefully - very carefully - remove the tree and dispose of the wood before the beetles emerge in the spring and move to a neighboring tree. Try to avoid damaging neighboring hemlocks, including driving over their roots as they do not like to be disturbed and this will set them up for infestation by the hemlock borers.

Hemlock woolly adelgid (*Adelges tsugae*) - Hemlock woolly adelgid (HWA) was first detected in native hemlocks in Maine in 2003. It has been found scattered over approximately 15,000 acres in five towns in the southernmost tip of the state (Kittery, Wells, York, Eliot and South Berwick). Populations continue to thrive within the previously infested area, and new spot infestations have been found both within the core infested area and on the leading edge of the infestation.

The Maine Forest Service is carrying out an integrated slow-the-spread management program to reduce the spread and impact of established adelgid populations in York County. Some of the highlights of our slow-the-spread effort this year include:

- The existing HWA quarantine was updated and expanded to reflect the current status of the infestation. The major change was to create an intrastate quarantine parallel to the existing interstate quarantine on movement of hemlock material. The quarantine regulates movement of hemlock material from the five infested towns and Ogunquit, which is surrounded by infested towns.
- 3000 *Sasajiscymnus tsugae* and 1400 *Laricobius nigrinus* predator beetles were released in the towns of Kittery and York. These releases were conducted on State, land trust and water district holdings. To date the MFS has released 20,500 *S. tsugae* and 1700 *L. nigrinus*. Sampling at past release sites have yielded adults and larvae of *S. tsugae*.
- Hemlocks on 63 properties in four infested towns were sprayed with Talstar plus oil to reduce populations of HWA that create a high risk for artificial spread. The most prominent site was the Kittery Rest Stop where the MFS partnered with the Maine Department of Transportation to reduce adelgid populations.
- Public outreach efforts including presentations, media coverage, posters and web-site material continued. These have yielded confirmed reports of new infestations.

- A report of infested outplanted nurserv stock in Brooklin, ME was confirmed. The infested tree was removed and destroyed and surrounding planted hemlocks were sprayed with Talstar plus oil. No native hemlocks were detected in the vicinity of the infested tree.
- Perhaps due to the mild winter and spring of 2005-2006 and 2007-2008 HWA populations increased within the previously infested area, and new spot infestations were found scattered in an abutting area of 500 acres in South Berwick and York. Dense populations of adelgid will probably continue to be found in known infestations and new spot infestations will be probably turn up in 2008.

Landowners should monitor their forest and shade tree hemlocks for the presence of HWA. Suspected HWA specimens can be bagged in a Ziploc-style bag and mailed to the insect and disease lab (Allison Kanoti, Insect and Disease Lab, 50 Hospital Street, Augusta, ME 04330). Information that should be sent with samples includes: Contact Name, Address, Phone Number, E-mail and Tree Location (Latitude/Longitude coordinates and a map preferred).

Pine shoot beetle (*Tomicus piniperda*) – The Maine Forest Service (MFS) has trapped for pine shoot beetle, *Tomicus piniperda* (PSB) in Maine since 1999. During trapping surveys performed between 2000 and 2003 PSB was collected in Oxford and Franklin Counties. In January of 2007, Maine's quarantine was expanded to include the entire State except Aroostook and Washington Counties.

During 2007, trapping targeted specifically to PSB was conducted by MFS at 16 sites (seven industrial sites that handle pine and nine plantations/natural stands with hard pines) in five counties. An additional 20 industrial locations were trapped by MFS for a suite of exotic wood borers and bark beetles, including PSB. Our USDA APHIS cooperators serviced a network of 12 sites targeted to PSB in Washington County. They did not recover PSB in those traps; however they did capture one PSB in a trap set for *Sirex* woodwasp detection in Franklin County. This site was not far from previous PSB recovery sites.

Number of Pine Shoot Beetles Caught at Positive Trap Sites in Oxford and Franklin Counties, Maine from 1999-2007

Years with positive trap catch	Oxford County	Franklin County			
	Adamstown (number)	Rangeley (number)	Carabasset Valley (number)	Kingfield (number)	Coplin Plantation (number)
2000	1				
2001	1	1			
2002		3	1	1	
2003	1	4			
2007					1*

*Caught late in the season in a *Sirex* woodwasp trap by USDA APHIS cooperators

If funding allows, MFS plans to trap at least ten sites in Aroostook County, at least four sites in Oxford and Franklin Counties, and two quarantine-related sites in Washington County. USDA APHIS cooperators will trap for PSB in Washington County. Additionally MFS plans visual surveys for damage in Oxford and Franklin Counties for the summer of 2008.

Pine Leaf Adelgid (*Pineus pinifoliae*) - Damage from pine leaf aphids was noticeable in 2007. The aphids feed on the shoots of white pine and kill the shoots. In alternate years the aphids form galls on black or red spruce. This damage is hard to distinguish from the *Pityophthorus* bark beetles (see next entry). Close inspection of the dead shoots will reveal either cast skins of the aphids and the stem is shriveled or the stem is hollow where the beetle was feeding.

***Pityophthorus* sp.** -Twig borer damage on white pine trees was high in 2007. It was not uncommon for mature trees to have regularly spaced flagging branches over the entire tree. Close examination of the dead branches revealed *Pityophthorus* beetles inside. Although the beetles do not do any lasting damage, the flagging was striking in the amount seen across the State this year. Most of the flagging shoots have now dropped off or lost their needles and are no longer obvious.

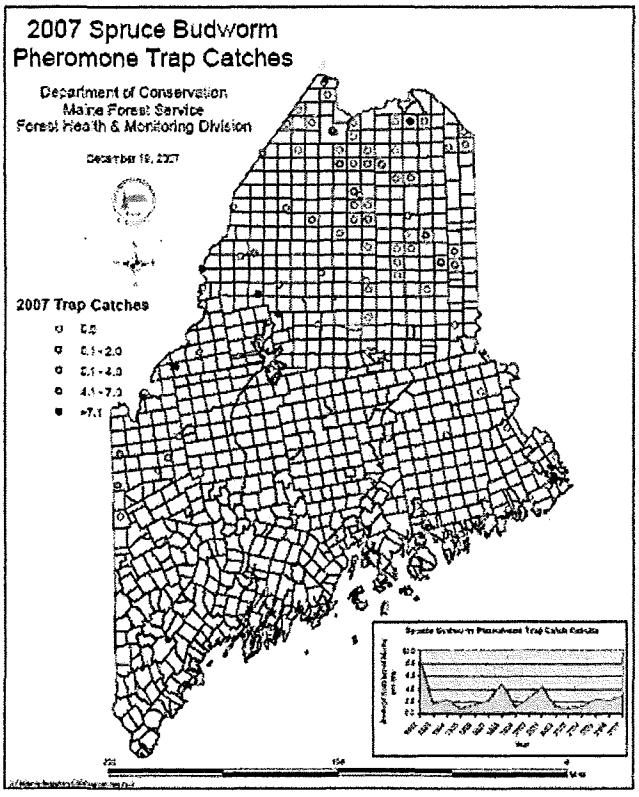
Spruce Beetle (*Dendroctanus rufipennis*) - Spruce Bark Beetle (*Dendroctonus rufipennis*) - Spruce beetle has been a problem along the coast of Maine for many years now. In the 1990's there was a severe infestation of bark beetles that resulted in many stands succumbing to the beetle. In the past three years the beetle has increased again particularly in the Mount Desert Island area. Spruce trees that are mature, mostly ones that escaped the fire of 1947 and are over 18" in diameter, are being attacked by the bark beetles. The beetles have also been found in red pine, where they are heavily encased in pitch with minor damage, and also in white pine adjacent to heavily infested spruce. The beetle is native to North America and attacks stressed trees. Water level fluctuations, overmaturity for the site and poor soil are all underlying stressors contributing to making the trees susceptible to beetle attack.

There is little that can be done to save trees once they have large numbers of bark beetles in them. Trees that have been heavily attacked should be cut and removed from the site or debarked and the bark chipped, burned or buried. Cutting the trees and removing the bark will help reduce the number of beetles that can infest other trees. This work is best performed in late fall and winter to reduce the spread of beetles during the removal process. Work should be completed before May when the adult beetles begin to emerge from the trees and search for new hosts.

The beetles feed in the cambium layer just under the bark and can complete their life cycle even if the tree has been cut down. The wood can be salvaged but the bark from the trunk of the tree needs to be destroyed by chipping, burning or burying. These bark beetles only attack the bole of the tree so branches and tops of trees less then four inches can safely be chipped on site.

Managing forest stands can reduce the potential for spruce beetle outbreaks. High value specimen spruce trees can sometimes be protected with a trunk drench insecticide during an outbreak but this is costly and will need to be continued as long as the outbreak persists in an area. Another possible way to help landscape trees through droughty times by properly watering them, although this takes forethought long before there is a beetle problem.

Spruce budworm (*Choristoneura fumiferana*) - Monitoring of low level spruce budworm populations continued in 2007. Traps were deployed at 64 locations throughout the northern part of the State. These traps were tended by Maine Forest Service, Irving Woodlands and Baxter State Park personnel. The population remains at very low levels but with a slight increasing trend over the past three years. Of particular note is the population increase along the western and northern borders of Maine. Quebec is seeing a similar increase in moth catches to the west of Maine. No larval activity or defoliation was observed during field surveys. The MFS will continue to monitor this serious pest.



White pine weevil (*Pissodes strobi*) - Stem deformities, resulting from the loss of the terminal leader, are very common on white pine and cause heavy economic losses to landowners annually. While this perennial problem continues to impact the growth of white pine as well as Colorado blue and Norway spruce in Maine, the situation appears static.

Hardwood Insect Pests

Browntail moth (*Euproctis chrysorrhoea*) - The browntail moth population in Maine was low and spotty in 2007. Defoliation visible from the air was restricted to 408 acres in Topsham along Merry Meeting Bay. The population appears to be increasing just north of there in Bowdoinham and may become a problem. Most other locations in the mid-coast area had just a few trees with light feeding. Populations will continue to be monitored.

Birch skeletonizer (*Bucculatrix canadensisella*) - There was scattered defoliation from *Bucculatrix canadensisella* over much of the state but it was a minor part of a complex of many defoliation causal agents. The expected birch skeletonizer problem did not reappear in eastern Maine this year.

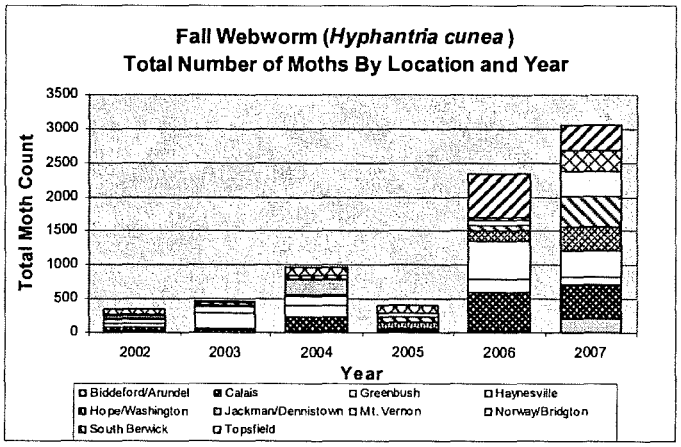
The birch skeletonizer has been up and down over the past four years. In 2003 there was heavy defoliation of birches resulting from feeding by the birch skeletonizer over most of northern and eastern Maine. A gross estimate of the scope of the damage was 750,000 acres of birch type affected in Franklin, Somerset, Piscataquis, Aroostook, Penobscot, Hancock and Washington counties. Then in 2004, populations had returned to endemic levels throughout the state. The next year, 2005, birch across a wide swath of eastern Maine were heavily impacted by this late season defoliator. Moderate to severe defoliation was spotty, ranging from individual trees intermingled in mixed hardwood types to 1000 acre patches when stands were predominantly birch.

So, although the birch skeletonizer usually stays at high levels for 2-3 years at a time, right now we are in a pattern of the population being high one year and low the next. This is a late season defoliator with damage showing up in August and September. It therefore does not generally have an impact on tree growth but does affect fall foliage for "leaf peepers".

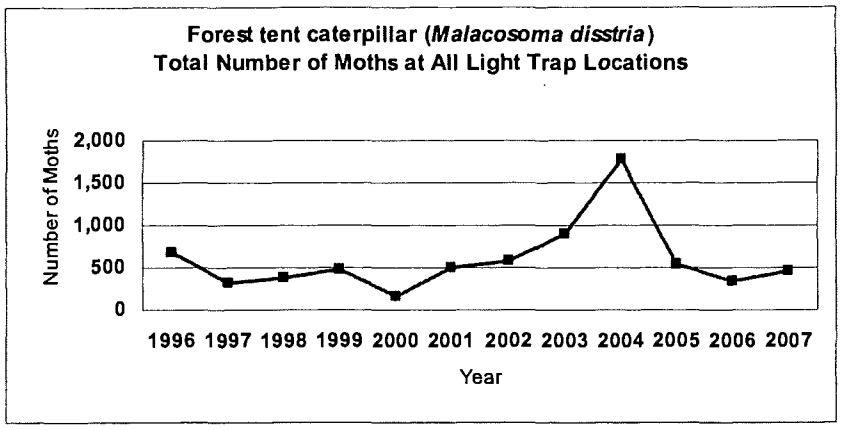
Eastern tent caterpillar (*Malacosoma americanum*) - Eastern tent caterpillar population remained low in 2007.

Fall cankerworm (*Alsophila pometaria*) - Populations of fall cankerworm were high in southern Maine. Defoliation was mapped in areas of Kennebunk, Wells, Ogunquit, York and Kittery with a total acreage of 13,414 damaged across the five towns The feeding was primarily on oak but once those trees were defoliated they moved onto other hardwood species and herbaceous plants on the forest floor. This is the second year of high numbers in this area - and also in neighboring southern New Hampshire. We can expect another year of defoliation before parasites and predator numbers will hopefully get high enough to drop the population down to a more normal level. Long time residents do not remember seeing an outbreak like this in this area of the State. The last time fall cankerworm was a problem in Maine was during the mid 1990's on boxelder in eastern Aroostook County.

Fall webworm (*Hyphantria cunea*) - Fall webworm continued at high levels in 2007, although webs were not as striking as in 2007. This insect is an aesthetic problem rather then a tree health issue, but repeated heavy defoliation may cause branch dieback.



Forest tent caterpillar (*Malacosoma disstria*) - Populations of forest tent caterpillar remained low in all but Aroostook county in 2007. Three towns, Presque Isle, Fort Kent and Fort Fairfield each had 1-10 acres of heavy defoliation with 30+ acres of lighter damage. Late instar larvae were seen moving around looking for pupation sites in an even wider area indicating a potential for an outbreak in 2008.



Gypsy moth (*Lymantria dispar*) - No defoliation of hardwoods resulting from gypsy moth larval feeding was recorded in 2007. The 2007 fall/winter egg mass survey in the infested area indicates that the population will remain at endemic levels next season.

Portland and Augusta City Arborists each reported spotty defoliation by gypsy moth of blue spruce landscape trees. Because this feeding behavior is atypical of North American gypsy moth and more typical of Asian gypsy moth, male and female moths and egg masses were collected and sent to the USDA APHIS laboratory in Otis, Massachusetts for DNA analysis. The results indicated we had found North American gypsy moth. Asian gypsy moth has more of an appetite for conifers and is known to feed on more than 500 species of woody plants (compared to the modest 300 of its European cousin). Asian gypsy moth is not known from this part of the world, if established it would pose a significantly increased threat to Maine's forest resource.

Regulatory activities relating to gypsy moth included trapping for male moths in uninfested towns, trapping for male moths at sites with compliance agreements to receive regulated forest products, scouting for additional life stages in locations with high trap catches and establishing and maintaining compliance agreements. Two hundred forty-eight (248) pheromone traps were set outside the quarantine zone; these traps captured approximately 1900 male moths. Scouting for egg masses focused on towns with high male moth catches including: in Aroostook County, Hersey, Moro, Smyrna and T7 R5 WELS; in Penobscot County, Mt. Chase, T3 R7 WELS and T4 R7 WELS; in Piscataquis County, Lily Bay Township and T1 R12 WELS; and in Somerset County, Bigelow, T3 R4 BKP WKR, and Flagstaff. Egg masses were found in T3 R4 BKP WKR. If you suspect you have found gypsy moth larvae, pupae, female moths or egg masses outside the regulated area please collect a sample and mail it to Allison Kanoti. Directions for mailing samples are found in the advice and assistance section on page *i*

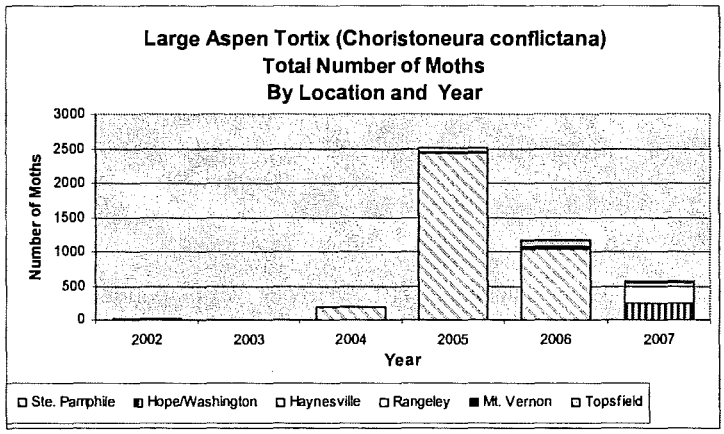
The area regulated by the State and Federal Gypsy Moth Quarantines was expanded twice in 2007 to include an additional 32 towns in portions of Aroostook, Franklin, Penobscot, Piscataquis and Somerset Counties. The quarantine line runs from Houlton, southwest through Greenville to Parkertown Township on the western border (Map and town list beginning on page 25). Forest products with bark, *regardless of species,* originating in or having been stored in the area quarantined for Gypsy Moth are regulated. They may move freely within the quarantined area. However, they may not be moved outside the quarantined area without either being

1) inspected and certified by a state or federal agent or
2) destined for a facility holding a current compliance agreement with the Maine Forest Service to receive uncertified gypsy moth regulated articles.

The Maine Forest Service currently maintains compliance agreements with 10 facilities for receipt of Gypsy Moth regulated material. This list is fairly plastic, for an updated list of pre-approved facilities and questions about moving

regulated products please e-mail or call Allison Kanoti at allison.m.kanoti@maine.gov or (207) 287-3147. More details are available in the Forestry Related Quarantines Section on Page 20.

Large Aspen Tortrix (*Choristoneura conflictana*) - Large aspen tortrix is a hardwood defoliator that feeds primarily on aspen although during outbreaks it will also feed on other hardwoods. It has been defoliating hundreds of hectares in Quebec for the past three seasons and we have been seeing the moth flights in western Maine from this infestation. The light trap in St. Pamphile in particular has been overloaded with moths (note: The St. Pamphile trap did not run in 2007). There has been no noticeable defoliation in Maine but the number of moths caught in other light traps around the State has increased in 2007. This is an insect to look for in 2008. Epidemics are controlled after a few years by a wide array of parasites and predators with relatively little harm done to the trees.



Maple Trumpet Skeletonizer (*Epinota aceriella*) and **Oak Trumpet Skeletonizer (*Epinota timidella*)** - Both these late season insects have been noticeable this year. Although they make the leaves look odd by folding them up the amount of feeding they do is insignificant.

Saddled prominent/green striped mapleworm/variable oakleaf caterpillar complex (*Heterocampa guttivitta, Dryocampa rubicunda, Lochmaeus manteo* and others) - Populations of the saddled prominent complex have returned to endemic levels in areas impacted over the past two years.

Satin moth (*Leucoma salicis*) - Satin moth has been at low levels since 2002.

Winter moth (*Operophtera brumata*) - Winter moth is a European pest that feeds on oak, maple, ash, basswood, apple, crabapple and blueberry. It has been in the Canadian Maritimes for decades and is kept under control by two parasites - a wasp and a fly. More recently, winter moth has been devastating the hardwoods in eastern Massachusetts and has spread throughout that state and Rhode Island.

Three years of pheromone trapping in Maine have yielded a handful of winter moth males (determined by DNA testing) in South Berwick, Kennebunkport, Portland, Bristol and Jonesport. Only males are attracted to the traps so it is possible to have moths in the traps but no active population. Males can fly or get blown long distances. The females not only are not attracted to the traps but they are flightless. There has been no defoliation in the areas where the moths have been caught except in Kennebunkport. Ground checks of larvae in that area in the spring were all fall cankerworm, which has a similar life history and feeds on similar hosts. Samples taken inland in 2007 contained no winter moth.

To further complicate matters there is a third insect, the Bruce spanworm, *Operophtera bruceata*, that is very closely related to the winter moth and is native to North America. It is virtually indistinguishable from the winter moth (at least for humans). Initial moth dissections and genetic sequencing being run at the University of Massachusetts indicates most of the moths caught in the pheromone traps in Maine were the native Bruce spanworm. Some of you may wonder what the big fuss is all about. The problem is that although *we* have difficulty telling these nondescript brown moths apart apparently insects can easily tell the difference. The native species rise and fall without causing too much problem to the trees. The winter moth on the other hand can and does kill trees. We will continue looking for winter moth in Maine.

Tree Diseases and Injuries - 2007

Diseases: Native

Anthracnose of Hardwoods
Hosts: Ashes, Birches, Maples, American Beech, Oaks

With very few exceptions, hardwoods were not affected by anthracnose diseases during 2007. This was a significant change over what was experienced during the 2005 and 2006 growing seasons. Although rainfall was abundant throughout the spring, summer, and into the fall, the weather pattern was punctuated with dry periods, apparently inhibiting significant disease development. Only one report of sugar maple anthracnose (from Ellsworth), and two reports of oak anthracnose (from Boothbay and Cape Elizabeth) have been diagnosed. The high levels of anthracnose defoliation in paper birch (caused by *Septoria betulae*), and to a lesser extent yellow birch, observed in 2006 was not seen in 2007.

Armillaria Root Rot
Armillaria mellea
Hosts: Numerous hardwood and coniferous woody species

Armillaria root rot, a common and widespread disease that usually affects trees that have been stressed by injuries, insects, or other diseases, was identified from Warren (Knox County), Farmington (Franklin County), Waterboro (York County), and Augusta (Kennebec County). Balsam fir was the host at the first three locations, while paper birch was the host at the Augusta location. These occurrences are noteworthy in that the frequency of reports is lower than in many years. Again, adequate soil moisture conditions for the past several years may have been a factor in helping trees recover from, or avoid certain stress factors.

Ash Leaf and Twig Rust
Puccinia sparganioides
Host(s): White Ash (*Fraxinus americana*)

Again, ash leaf rust was not reported as causing damage this year. This disease has been at very low levels now for a period of about five years.

Balsam Fir Needlecasts
***Lirula* spp., *Isthmiella* spp.**
Host: Balsam Fir (*Abies balsamea*)

A fair number of calls have been received over the past month regarding balsam fir problems. Some fir mortality is still occurring in isolated Christmas tree plantations, primarily in mid- and south coastal areas. This damage is attributed to abnormally wet soil conditions of the previous two growing seasons, and is not expected to continue after this year. Needlecast diseases, also still evident from previous wet years, are still causing concern in ornamental and Christmas tree plantings. In addition to the commonly occurring *Lirula* and *Isthmiella* needlecast fungi, a less common pathogen, *Rhizosphaera pini*, was recently identified from balsam fir in Porter, Maine. No registered fungicides are available for control of these pathogens. Chemical controls are usually not warranted, and several of these needlecasts have two- and three-year life cycles, making fungicide timing and control difficult. As with the damage from saturated soils, the fir needlecast diseases are expected to diminish if our weather conditions remain near normal in 2008.

Balsam Fir Tip Dieback
Fusicoccum abietinum
Host: Balsam Fir (*Abies balsamea*)

Numerous reports and samples were received in mid-summer concerning a tip dieback on balsam fir. On an individual affected tree usually a few, but sometimes many branch tips were dying or dead. The branch

tips hold needles that are bright reddish-brown in color. Needles remain attached to the twigs: needle cast diseases have not been found on samples examined. In most instances, the branch is killed approximately six to eight inches back from the tip. There are several reported causes of this kind of symptom development, but the one that seems to fit samples we have observed is the result of a minor canker-causing fungus, *Fusicoccum abietinum*. This disease has been referred to as "balsam fir red flag." It appears in late spring and early summer as a very slight constriction between the living portion of the twig and the dead portion. This disease is generally considered unimportant except in landscape and Christmas tree plantings. Tree aesthetics can be improved simply by clipping and removing the dead tips.

Occasionally, very small mechanical injuries have been found associated with the tip dieback syndrome. In these cases, damage may have occurred from hail, or possibly by feeding from adult *Monochamus* spp. (pine sawyer and related) beetles. Some trees may have damage from one or the all causes indicated here. In any case, damage is expected to be minor and easily corrected by pruning.

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

Caliciopsis pinea is a canker pathogen that causes considerable pitching from infected locations on the stems of white pine. Although several true firs (*Abies* spp.) are reported to be hosts as well, the disease in Maine is known only on white pine. Characteristically occurring in stands on well-drained soil, and in overstocked stands of high-density , the elongated cankers in the mid-to upper bole region are damaging, but apparently do not result in direct mortality of trees. Slow-growing, overstocked stands may have a substantial percentage (over 50 %) of trees affected. The excessive pitching at the canker may at first appear as that of a blister rust canker. However, blister rust cankers tend to be more circumferential in shape, and tree death (at least above the canker) almost always occurs. This disease has been found scattered throughout the central and southern portions of the state. In 2007, Caliciopsis canker was diagnosed in Milford (Penobscot County).

Fir-Fern Rust
Uredinopsis mirabilis
Host(s): Balsam fir (*Abies balsamea*); Sensitive fern (*Onoclea sensibilis*), and other fern species

Fir-fern rust infection was present at low levels statewide in 2007. Symptoms were conspicuous on Christmas trees in a few plantations, but damage was minimal. There were no reports received of loss of tree mechantability from this disease in 2007.

Northern-White-Cedar Decline
Host: Northern-White-Cedar (*Thuja occidentalis*)

Personnel from the USDA Forest Service, in cooperation with the Maine Forest Service and the Michigan Department of Natural Resources, have conducted a survey of the condition of northern-white-cedar in Maine and in Michigan. Inventory data has indicated an abnormally high level of dieback and decline in many areas, and the survey is attempting to substantiate the trend and determine causal factors. Assistance with the Maine portion of the survey was provided by several individuals of the Maine Forest Service, Forest Health and Monitoring Division. Several stands of northern-white-cedar were surveyed in northern Maine in the Ashland area, and across central Maine, from Madison to Penobscot. Insect and disease conditions observed included scattered, light damage from arborvitae needle miner, needle blight (tentatively identified as *Phomopsis*, *Macrophoma*, or both), several internal decays of both brown and white rotting fungi (likely including *Armillaria mellea* and *Poria subacida* among others) and mechanical injuries from both natural and timber harvesting-related causes. A poster was developed and presented at a recent Forest Health workshop, and is included in the Appendix section of this Annual Summary Report. This poster can also be viewed at the Maine Forest Service Forest Health and Monitoring website (http://www.state.me.us/doc/mfs/idmhome.htm).

Pine Needle Cast
Lophodermium pinastri
Host(s): Pitch Pine (*Pinus rigida*)

Pine needle cast on pitch pine was prevalent, but much less severe than in the past few years. Last year, approximately 11,000 acres of the pitch pine type was affected by heavy crown infections. In 2007, although the disease was still evident, infection of current year needles appears to have been significantly reduced. Trees are recovering well. By late summer, the growth of current-season needles was giving the crowns a healthy, full appearance. While some needle infection may be expected during any single year, we anticipate that the damage will be less severe in 2008, and trees will continue to recover.

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

The disease was widespread and damaging throughout Maine this year. Substantial crown loss has occurred throughout central and southern Maine, especially. Heavy infestations also have been noted in red pine plantings and plantations in southern Aroostook County, southern Penobscot County, and in Topsfield (Washington County). Mortality of long-affected trees is apparently increasing. The unusually wet weather conditions of 2005 and 2006 likely have resulted in the high levels of infection and damage seen in the 2007 growing season. While drier spring seasons may reduce infections levels somewhat, the high inoculum loads that trees and stands now carry will result in this disease being a serious and chronic problem.

Pitch Pine Needle Rust
***Coleosporium asterum* (= *solidaginis*)**
Hosts: Pitch pine (*Pinus rigida*); Red pine (*Pinus resinosa*)

This disease was recently identified from pitch pine in the Hiram area, and likely occurs throughout the range of pitch pine in Maine. It may also occur on red and jack pine. Rust-colored needles typical of many similar needle rusts on two- and three-needled pines become evident by mid- to late May. The disease is started by spores formed on goldenrod or aster. In spring, small white tubes which discharge orange spores appear on the needles. These spores infect the alternate hosts, chiefly aster and goldenrod, where the fungus can maintain itself (re-infecting the host plant) indefinitely. This pathogen usually is of little importance on older trees but can damage younger trees. Only needles are infected; branch and stem cankers do not occur, as with some other rusts (see White Pine Blister Rust, below). There are no controls, except reducing the amount of goldenrod or aster in the area.

It should also be noted that another needle disease, this one attributed to *Lophodermium pinastri*, is the primary cause of the heavy needle browning and needle loss on pitch pine throughout the Saco River drainage. It is still too early in the season to assess infection levels for Lophodermium needle cast for 2008 but surveillance will continue.

Red Rot of White Pine
***Phellinus pini* (=*Fomes pini*)**
Host(s): Pines, Spruces

Red rot of eastern white pine is considered to be one of the most serious internal decays of pine in Maine. It occurs throughout the state, and results in substantial volume and value loss to the pine lumber industry. The occurrence of *Phellinus pini* is usually not noteworthy in the sense of being a new or dramatic disease. It is well-known and common. However, stands severely damaged by red rot are unusual. A white pine decline syndrome was described and studied in detail by Maine Forest Service personnel and others during the late 1990's and the early 2000's. The decline was the result of drought on sites that allowed for only very shallow rooting of white pine. The decline syndrome has largely disappeared as the result of abundant moisture levels that Maine has had for the past several years. However, a few stressed stands are still

apparent. Examination of one such stand in Jefferson (Lincoln County) revealed as many as 25% of the stems exhibited sporophores of *Phellinus pini*. The trees were mature, but not exceptionally large, over-mature, nor over-stocked. A severe decline of the trees was apparent. A reasonable speculation is that the abundant occurrence and fruiting of this pathogen is related to a long period of stress to which the stand was subjected at an earlier time.

Root and Butt Decay of Oaks
***Grifola frondosa* (*Polyporus frondosus*)**
Host: Northern Red Oak (*Quercus rubra*)

This root pathogen was found fruiting at the base of numerous mature and over-mature northern red oaks in Rockland (Knox County). It is likely that this is a relatively common, but weakly aggressive pathogen on oaks in central and southern Maine. No oak mortality was associated with this occurrence.

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

The most frequent disease sample received at the lab during the year was that of spruce needle cast, caused by *Rhizosphaera kalkhoffii*. White spruce and Colorado blue spruce in particular have been heavily damaged over the past two years from excessive needle loss caused by this disease. Substantial damage has occurred on ornamental Colorado blue spruce and white spruce throughout the state. In addition, observations in two separate natural stands in the Aroostook River valley near Fort Fairfield have shown that the disease has also caused substantial needle loss and tree decline on native, naturally occurring white spruce in forest stands. Complicating this condition of stand health is the presence of the spruce beetle (*Dendroctonus rufipennis*), a native insect that favors the older, largest trees for breeding. Some tree mortality attributed to the spruce beetle is occurring in these stands, and is reported to be fairly common throughout the Aroostook region. The extent to which the needle cast may predispose these trees to beetle infestation is not known, but the disease is undoubtedly another significant stress with which the affected trees must deal. In any case, this appears to be the first documentation of significant damage to natural stands of white spruce by *Rhizosphaera kalkhoffii* in Maine.

Tarspot of Maple
Rhytisma acerinum
Host(s): Norway, Red, Sugar, and Silver Maple (*Acer* spp.)

Numerous reports of tar leaf spot on Norway maples were received in late August, September, and October. Many urban and suburban Norway maples in North Yarmouth, Auburn, Rockland, and Camden (Cumberland, Androscoggin, and Knox counties) were infected. Tar leaf spot is usually an incidental leaf disease because it causes damage so late in the season, and because under normal weather conditions infections are usually very low. The fungus infects the leaves early in the spring, but the black fruiting structures (the "tar spots") don't form until late summer. The disease caused some early defoliation, with leaf loss occurring in early to mid-September, but is expected to be of little consequence to overall tree health. No reports of tar leaf spot on hosts other than Norway maple were received

Twig Dieback of Juniper and Arborvitae
Host: Northern-White-Cedar (*Thuja occidentalis*)

In 2007 several calls and samples were received during the late spring and early summer concerning branch tip dieback symptoms on both eastern red-cedar (and other species of *Juniperus*), and on northern white-cedar (*Thuja occidentalis*). In some instances, the problem has been found to be the result of an Arborvitae leaf miner infestation (covered in the Insect section of this Annual Summary Report). In other cases, several fungi have been the primary cause. Branch tip infection by the foliar pathogens *Phomopsis* and *Kabatina* can result in dieback of the terminal four to six inches of branch tips.

Weather

Unusually Wet Weather

In 2006, numerous Christmas tree growers reported mortality of recent (within the previous two years) transplants of balsam fir stock, and of occasional, scattered larger trees of unhealthy appearance. The problem was most evident in south-central and coastal areas in the towns of Bath (Sagadahoc County), Nobleboro (Lincoln County), North Yarmouth, and Portland (Cumberland County). The problem was diagnosed as being caused by the extremely wet weather conditions which have prevailed during the previous two years. Recommendations have been limited to cultural practices; improving drainage, planting on the driest portions of the available property, and removing affected stock as soon as the disease syndrome becomes evident. Site inspections and information obtained from many growers have indicated that the condition has substantially abated during the 2007 growing season. However a few growers have again seen some tree mortality from this in 2007. Although moisture has been abundant this past season, the extreme flooding and soil saturation conditions of 2005 and 2006 has not occurred.

Hail and Wind

Several severe thunderstorms were reported throughout Maine during the summer season. Some had accompanying micro-bursts, and several localized but severe incidences of tree breakage and uprooting were reported. One particular windstorm occurred on April 17th and 18th, the Patriots Day storm. Several stands, many in the mid-coastal region, experienced significant windthrow, especially to the red and white spruces, white pine, and other conifers.

This summer has seen the development of several serious thunderstorms in many areas of the state. Often accompanying these storms comes hail capable of causing considerable damage to crops and buildings, as well as to trees. Hail can strip trees of foliage, and cause large numbers of small, mechanical wounds to the bark of branches and main stems. Lesions occur primarily on the upper side of twigs. Branches on the side of the tree that faced into the direction of the storm receive the heaviest damage. Heavily damaged twigs and branches can die back from the tip.

An intense hailstorm occurred in central Maine during late August of 2007. The hail damage was centered on the town of Rome (Kennebec County), where 2-inch-diameter hail stripped trees of foliage and caused significant branch and stem wounding. The affected area included 7,817 acres of mixed hardwood stands.

While the direct mechanical damage may appear obvious, the long-term effects of such wounding are often more serious. Injuries caused by hail can act as entry courts for pathogenic fungi. In particular, infection is especially favored for fungi able to grow in bark tissues and cause cankers. Both *Neonectria (=Nectria) galligena*, the common perennial target canker of birches and other hardwoods, and *Diaporthe alleghaniensis*, a disease of yellow birch, are known to infect trees through hail injuries. Tip blight of hard pines caused by *Diplodia pinea* has also been shown to increase rapidly following hail damage. Infection by these and other fungi can result in branch die back and crown loss for several years following the initial damage. In addition, the dying and dead tissues can be attractive to wood borers and other insects that favor weakened trees.

Little can be done to prevent hail injury. However, treating smaller, damaged ornamental trees may be practical. Pruning heavily damaged twigs and branches shortly (within a month or so) after the storm will help to ensure that the tree doesn't become infected with canker fungi, or become attractive to secondary insect pests. Pruning branches with older injuries that also exhibit die-back symptoms is also recommended. Older injuries that appear to have callused well, and have not resulted in branch die back can be left to recover.

Lightning

An unusual occurrence of lightning strikes was examined on York Water District lands in the town of York (York County). A small hemlock stand of about 2 acres in size was found to have many recently-killed trees in a clustered, but somewhat irregular pattern. On examination it was found that 7 trees within a 0.25 acre area had been recently hit by lightning. Two of the trees were large white pine, while the others were hemlock. All but one of the strikes appeared to have occurred at the same time. Causes of this unusual

lightning activity are unknown. York Water District personnel indicated that some areas in the watershed had been quarried long ago and may hold scrap iron metal-works. They also suggested that the surficial geology is naturally high in iron.

Diseases: Non-Native

Beech Bark Disease
***Cryptococcus fagisuga* and *Neonectria faginata* (*Nectria coccinea* var. *faginata*)**
Host(s): American beech

Beech bark disease occurs statewide, and continues to cause losses in site productivity and timber values, in addition to resulting in decreased wildlife food for a wide variety of birds and small and large mammals. This chronic disease has affected Maine's forests for over eighty years. Although statewide population levels of the scale insect have been relatively low in recent years, observations in eastern Washington County in 2006 indicated that there are some local areas where the scale populations appear to be increasing. In 2007, heavy scale populations have been noted in Oakland (Kennebec County). Abundant fall (October) fruiting of *Neonectria coccinea* var. *faginata* was also observed in Oakland, and in Sumner (Oxford County).

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

Dutch elm disease continues to take its toll in remnant individuals in forest and landscape settings. The disease was observed to be quite aggressive in the mid-coast area in 2006 and again in 2007. In Dover-Foxcroft (Piscataquis County) as in Thomaston (Knox County), resistant elms that were planted ten to twelve years ago were dead and dying from Dutch elm disease. It is suspected that the recent wave of mortality is the result of *O. novo-ulmi*, the more aggressive strain of the pathogen.

Incipient infections, apparent as limited areas of wilting at branch tips, may often be successfully pruned from trees if caught sufficiently early. Immediately prune out these flagging branches, and peel back the bark from excised branches to look for the stained or streaked sapwood which is a telltale sign of infection. Prune back the branches until only clean sapwood is located for a distance of 5-10 feet, taking care to sterilize pruning tools between cuts. Make the final cut at a branch junction to avoid leaving a branch stub. This procedure will not work on trees where the disease is well established throughout the tree, but is worth a try in early stages of infection.

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

This disease, which remains under State and Federal quarantines, has been known to occur in Maine since 1981. Larch canker was found in Brunswick (Cumberland County) in late January of 2007. Because this find was located outside the current Federal Quarantine area for larch canker, and because it represented a new County location for this disease, an intensive survey was conducted during the spring and fall to assess larch canker status. The ground survey was concentrated in towns bordering those already included in the Federal quarantine (refer to the Quarantine section of this Annual Summary Report), and the "buffer" towns currently within the quarantine, but in which no larch canker had yet been found. In all, 43 towns were surveyed, with approximately 1900 larch examined. In addition, numerous larch stands were surveyed in 6 towns by helicopter in mid-September. In addition to the Brunswick location, larch canker was also found in No. 14 Township, a "buffer" town presently within the quarantine, but previously un-infested. The information is now being processed by the Maine Forest Service, the Maine Department of Agriculture, USDA Forest Service, and APHIS, to determine regulatory options.

Sudden Oak Death
Phytophthora ramorum
Host(s): Oaks and numerous other tree and shrub species

This serious root disease is damaging stands of native oaks and a large number of other hardwood species in California and Oregon. In 2007 the disease was also been found in the states of Washington and Mississippi in natural stands. The pathogen is easily spread by movement of contaminated soil and in waterways. Because of its wide host range, and because many susceptible species are important to the nursery and landscape trades, the potential exists that the pathogen may be moved from infested to non-infested areas, even though strict quarantine regulations are in place. In 2006, this pathogen was found on infected nursery stock shipped into Farmingdale (Kennebec County), and was promptly eradicated. *Phytophthora ramorum* has not been found in natural forest stands in Maine, but a survey was conducted this summer here and in several other northeastern states to monitor for this disease. In Maine, four watersheds were monitored in 2007 to screen for the presence of *P. ramorum*. Screening is done by placing Rhododendron leaves in streams for two weeks, and then assaying the leaves for infection by the pathogen. Rhododendron leaves used in the survey were graciously provided by the Pine Tree State Arboretum. The four watersheds are located in Gardiner (Kennebec County), Brunswick (Cumberland County), Wells (York County), and Fryeburg (Oxford County). These watersheds were sampled a total of five times during the growing season. No *P. ramorum* has been found, but all four locations have shown the presence of other *Phytophthora* species. Further sampling is currently being planned for the 2008 season.

White Pine Blister Rust
Cronartium ribicola
Host(s): White pine (*Pinus strobus*), Currants and Gooseberries (*Ribes* spp.)

This disease remains static at moderate levels, but is common throughout the state. Division personnel provide on the ground technical assistance to landowners interested in pursuing *Ribes* suppression. This spring, a small *Ribes* eradication effort was conducted on a property of approximately 35 acres in size in Eliot (York County). The white pine stand had abundant natural white pine regeneration, with high levels of mortality as a result of blister rust infection. Approximately 1000 *Ribes* plants were treated with an herbicide application. The property owner and Maine Forest Service personnel participated in the one-day control effort. Diagnoses of white pine blister rust were also recorded for Brooks (Waldo County), Sidney (Waldo County), Orono (Penobscot County), Eliot and Sanford (York County), Rockland (Knox County), and Jackman (Somerset County).

White pine blister rust is a long-standing pest management problem for the white pine lumber and ornamental industries in Maine. A substantial effort has been made over the past 90 years to manage the disease by removing the *Ribes* hosts that occur in close proximity to pine stands. Although support for direct control activities has been substantially reduced over the past 15 years, the pine resource continues to benefit from the sustained past efforts to mange the disease. Because intensive, direct control activities are no longer in frequent public view, complacency towards the problem has increased, while awareness has decreased. However, a strict quarantine still remains in effect regarding the importation, movement, and planting of *Ribes* species (refer to the Quarantine section of this Annual Summary Report). Continued adherence to the quarantine guidelines will help to maximize the beneficial effects of the past control efforts for a longer period of time.

Diseases: Origin Unknown

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

Butternut canker continues to cause damage to the butternut resource. No new information on status or distribution was obtained in 2007. Because this tree species occurs uncommonly, and is widely scattered as individuals and not as forest stands of any size, the disease often goes unnoticed or unrecognized. The disease has been found in all counties except Washington County.

Hemlock Tip Dieback
Host: Eastern hemlock (*Tsuga Canadensis*)

At several locations throughout central and southern Maine, hemlocks exhibited a branch tip dieback that was most notable during the spring and summer months. Symptoms appeared similar to frost injury, with the new shoot growth first turning black, and curling downward. Later, the affected tips appeared a lighter brown in color. These symptoms, however, were not associated with any late frost events. The symptoms developed well into the summer months, and the cause has remained undetermined. Literature indicates that hemlocks are susceptible to *Sirococcus strobilinus*, and that some symptoms of this disease are similar to what has been observed on hemlocks in Maine. However, attempts to observe, culture, and identify signs of this pathogen have been unsuccessful to date. The disease has been observed in Waterboro, Wells, Freeport, and Arundel.

***Macrophoma* Needle Blight of Northern-White-Cedar**
Host(s): Northern-white-cedar (*Thuja occidentalis*)

In Maine there are several disease problems common to arborvitae. Two of the diseases occasionally seen on arborvitae are *Phomopsis* needle blight and *Kabatina* tip dieback, which are actually more common on eastern red cedar *(Juniperus virginiana)*. Over the summer, a browning of arborvitae foliage that was not associated with a tip dieback typical of either known pathogen was observed. A species of *Macrophoma* has been identified as being associated with, and likely causing this needle browning. Only foliage is affected. The fungus appears as small, black "dots" (pycnidia, the spore-producing structures) on the undersurface of the foliage. From a distance, the affected foliage appears similar to that seen as natural twig-shedding during the fall months. However, foliage sections browned by *Macrophoma* are usually slightly smaller in size. The pathogen has been associated with considerable needle loss and thinning of crowns in landscape situations in Harpswell and Freeport (Cumberland County), and other areas near the coast.

The disease has also been identified from trees in Ashland (Aroostook County), Madison (Somerset County), and Augusta (Kennebec County). It likely occurs statewide, wherever northern-white-cedar is found. An initial literature review has indicated that this disease has not previously been recognized in Maine. The needle blight has been reported from Wisconsin. We suspect that it has been here in Maine, but over-looked because the symptoms are similar to other needle diseases, and because the damage, in most years, is incidental. It is also likely that the disease has become more obvious as a result of the wet seasons of recent past years. It is unlikely that infection can or will result in tree mortality

Little is known of the life cycle or etiology of the pathogen. For this reason, it is too early to suggest control recommendations, given that they may be needed. Following cultural guidelines for avoiding needle infections by other pathogens will be the best protocol for ornamental plantings. It is not expected to be a concern in natural forest conditions.

White Pine Needle Blight
Canavirgella banfieldi
Host(s): Eastern white pine (*Pinus strobus*)

This needle cast disease, first recognized and re-named in the United States in 1996, has caused widespread needle loss to both young and old white pine in western, central, and southern Maine. The fungus infects only current-year needles during June and July, and causes tan spots to appear on the elongating needles. The browning continues towards the needle tips. The base of infected needles usually remains green. A peculiar symptom of the disease is that usually not all needles in a fascicle become infected – two or three in each fascicle remain green and healthy. During the summer and fall, the affected needle parts will turn a reddish brown. The year following infection, needles are shed. The needle loss observed this year during mid-June was comprised of needles that were infected last year.

In Maine, pycnidia have been identified from one-year old needles collected when still attached to the tree. Hysterothecia have been found on older needles that have been shed and were collected on the ground. The crowns of larger trees appeared rusty and off-color before the infected needles dropped. The disease has been reported in western Maine from Waterford, Lovell, and Bethel (Oxford County), and from Rangeley, and Farmington (Franklin County). It has also been observed in Belfast and Searsport (Waldo County). Reports have also indicted noticeable levels in northern New Hampshire and Vermont. In Maine, heaviest infections appeared to have been in the western mountain region, but we suspect that the disease occurs, perhaps at less intense levels, throughout most of the central and southern Maine white pine growing region.

Damage from white pine needle cast is expected to be minimal, especially for older (larger) trees. While regeneration and sapling-size trees may experience a loss in growth, there are no known reports of white pine mortality occurring as a result of this disease. The high occurrence of this is likely the result, once again, of the extended and abnormally wet weather in the spring and summer of 2005 and 2006.

Miscellaneous

Firewood - The problem of forest insects and diseases being transported long distances with firewood has become an issue in the past few years. It is a problem that we are concerned about in the state of Maine as are people in other states and provinces throughout North America. People like their firewood. They like good deals. They like to do things the way they always have. Unfortunately we have some new players in the game, namely exotic insects and diseases, that move with the firewood.

Emerald ash borer (EAB) can be used as an example of the firewood problem. It is an insect that came to North America from Asia, probably in wood packing material, and was initially introduced into the Detroit area. This insect is killing ash trees throughout the Midwest. Movement of ash nursery stock, ash logs and hardwood firewood are now regulated both federally and at the state level, and compliance agreements with companies handling these products ensure that they are handled in such a way as to minimize spread of EAB. However, although the movement of firewood from quarantined areas is banned, few individuals are aware of this regulation or of the potential consequences of moving firewood. Transported firewood thus remains a serious source of new infestations. Sixty of 75 outlier infestations in Michigan were associated with firewood use, including campgrounds, recreation areas and cottage communities. It is believed that the initial infestations of EAB in Illinois originated from firewood brought from Michigan, and EAB was introduced into West Virginia by firewood.

In the summer of 2007, the Maine Forest Service carried out a small survey of campers in state parks of southern Maine. It showed that two of 55 people surveyed brought firewood from states or provinces under quarantine for emerald ash borer, and over 60% were unaware that there are regulations on the movement of firewood from some areas of the country.

Using firewood is not a problem. Transporting it long distance IS a problem. The Maine Forest Service has undertaken a campaign to educate people and encourage them to change their firewood habits to help protect our forests and shade trees. Our primary target audience is people who are bringing firewood to Maine but we also want people who live in Maine to help. Let friends and relatives "from Away" know that they should leave their firewood at home. Leave YOUR firewood home when you travel. If you sell firewood educate your clients, we have material that you can post or give to people. Just call, write or email us or download information off our website at www.maine.gov/firewood .

Public Assistance - This year the seasonal *Forest & Shade Tree - Insect & Disease Conditions for Maine* reports were resumed after a one year hiatus when we had a major turnover in staff. Six issues were printed and our readership is at just under 500 with both print and electronic versions available. The reports are also on our website.

Pest calls include phone calls, walk-ins, emails, letters, pictures or specimens that are responded to verbally, with a written response, a field visit, specimen identification, referral or a combination of the above. By far the winner in the pest call category in 2007 was the Diseases with Rhizosphaera Needlecast on spruce and Sphaeropsis Shoot Blight on pine leading the list. Insect calls were all over the map but the most inquires were about Spruce Beetle, Balsam Woolly Adelgid, Gypsy Moth, White Pine Weevil, Browntail Moth and Fall Webworm. Hemlock Woolly Adelgid questions logged the most Quarantine queries. Non-forestry inquiries are answered when time and complexity of the question allow or they are referred to some other knowledgeable entity. Calls about Ants, Powderpost Beetles, Spiders and Ticks were most frequent.

The staff was involved in many outreach activities in 2007. These included coordinating and developing programs and workshops, and presenting information at tradeshows and fairs. Presentations were provided to the Maine Arborist Association, the Maine Horticulture and Landscape Association, the Northeastern Forest Pest Council, the Small Woodlands Owners Association of Maine, the Common Ground Fair, the USDI National Park Service, the Maine Christmas Tree Growers Association, the Augusta Agricultural Trade Show, and many others.

Aerial Survey - Each year the Maine Forest Service flies over much of the State of Maine to assess the impact of various forest stressors. For years this survey was conducted using paper maps and a pencil. It took intense concentration to stay aware of exactly where you were on the map in relation to what you were flying over at 100 miles per hour AND map the damage AND make notes as to tree species, damage cause and intensity. In 2006, with assistance from the USDA Forest Service, we started using electronic equipment to do the aerial mapping. When

the equipment is working properly, the batteries fully charged and the surveyor knows how to use the equipment, the survey is much easier to perform and can be done in fewer days. The Maine Forest Service ranger pilots have been assisting with the survey as well. They keep an eye out for damage when they are performing their regular duties, log the areas flown and report any unusual forest conditions.

Light Trap Survey - The Maine Forest Service has been monitoring forest insect populations with an array of light traps across the State for 65 years. Traps are set up in cooperators backyards and operated nightly. The timeframe for trap operation varies from 30 to 60 days depending on the location and flight season of the moths of interest. Material from the light traps is sent to the MFS for processing and the results are used in predicting forest pest outbreaks. Twenty-four traps were run in 2007 in locations from South Berwick to Allagash to Topsfield. We would like to publicly thank all our cooperators who have diligently run traps for us over the years. One family in Ashland has run the trap for **38** years!

Brown Spruce Longhorned Beetle (*Tetropium fuscum*) Survey - This beetle is currently found only in Nova Scotia in North America. Traps were set out in Portland and South Portland to trap for the Brown Spruce Longhorned beetle (BSLB) because the ferry from Nova Scotia comes into port in Portland. The USDA-APHIS/PPQ personnel have trapped for this beetle in Bar Harbor in past years and trap in other locations Downeast on a yearly basis. The traps set out by the MFS complement the USDA survey. We also screen all other beetle samples for BSLB. No BSLB have been caught to date in Maine.

Spiders of Maine - A group of organisms that has been sadly neglected in the state of Maine are the spiders. In 2007 the Maine Forest Service joined with Inland Fisheries & Wildlife and retired USDA Forest Service Entomologist Dr. Daniel Jennings to work towards publishing a list of the spiders of Maine. Dr. Jennings has been studying Maine spiders for decades and needed some assistance in completing the project so that it could get published. When Dr. Jennings began his work there were fewer then 200 species known to live in Maine. He has brought number up to well over 600 species and continues to make more discoveries every year. The MFS has provided technical support and specimens and IF&W has provided data entry capabilities. We hope to have a publication within two years.

Forestry Related Quarantines in Maine – 2007

There are five forestry related quarantines currently in effect in Maine. They 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 allows 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, 50 Hospital Street, Augusta, ME 04330. 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 2007: In February and October of 2007 the **area regulated by the gypsy moth quarantine was expanded** to include the following additional towns:

- In Aroostook County—Amity, Cary Plantation, Dyer Brook, Forkstown Township, Glenwood Plantation, Haynesville, Hodgdon, Houlton, Linneus, New Limerick, Oakfield, Orient, T2 R4 WELS, T3 R3 WELS, T3 R4 WELS, T4 R3 WELS, TA R2 WELS;
- In Franklin County—Eustis;
- In Penobscot County—Patten, Veazie Gore;
- In Piscataquis County—Greenville, Elliotsville Township, Katahdin Iron Works Township, Shirley, T1 R10 WELS, T1 R11 WELS, T2 R10 WELS, T7 R9 NWP, TA R10 WELS, TA R11 WELS, TB R10 WELS and TB R11 WELS; and
- In Somerset County—East Moxie Township.

Pierce Pond Township and T3 R4 BKP WKR in Somerset County will be added to the quarantine area in 2008.

For a full list of regulated towns see the maps and lists at the end of this section.

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.

IV. Hemlock Woolly Adelgid

a. **Rules and Regulations:**
   i. 7 MRSA, Chapter 409, §2301-2303 of the Laws of the State of Maine.
   ii. Department of Agriculture, Food & Rural Resources, Division of Plant Industry Rules Chapter 266.

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

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

c. **New in 2007:** The quarantine area was expanded in August 2007 to include six towns in southernmost York County (Eliot, Kittery, Ogunquit, South Berwick, Wells and York) and several additional counties in states to our south and west.

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

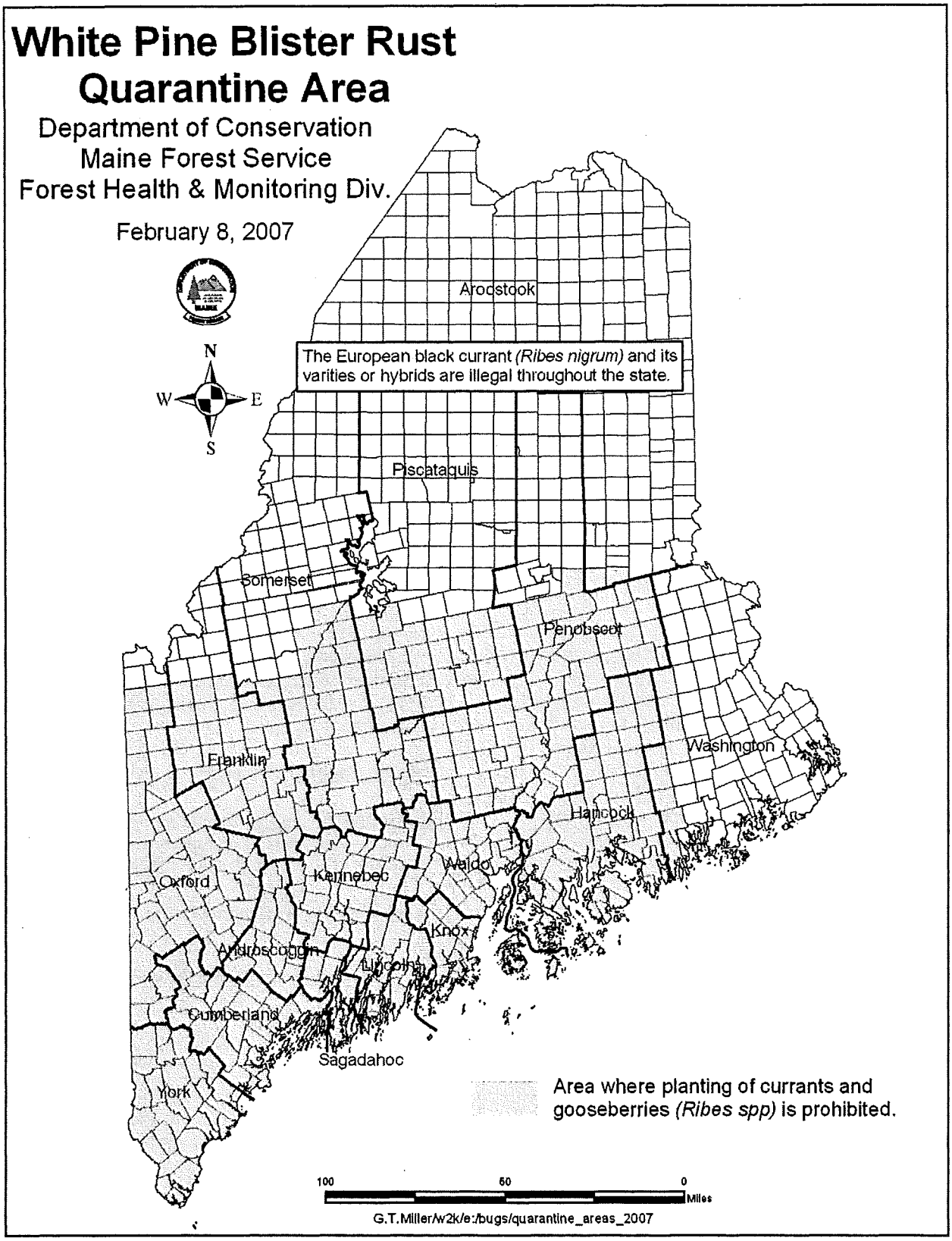
ii. 7 MRSA, Chapter 409, Section 2301 of the Laws of the State of Maine.
iii. Department of Agriculture, Food & Rural Resources, Division of Plant Industry Rules Chapter 268.

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.

c. **New in 2007:** In January the area regulated by the pine shoot beetle quarantine was expanded to include all of Maine except Aroostook and Washington Counties.

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.

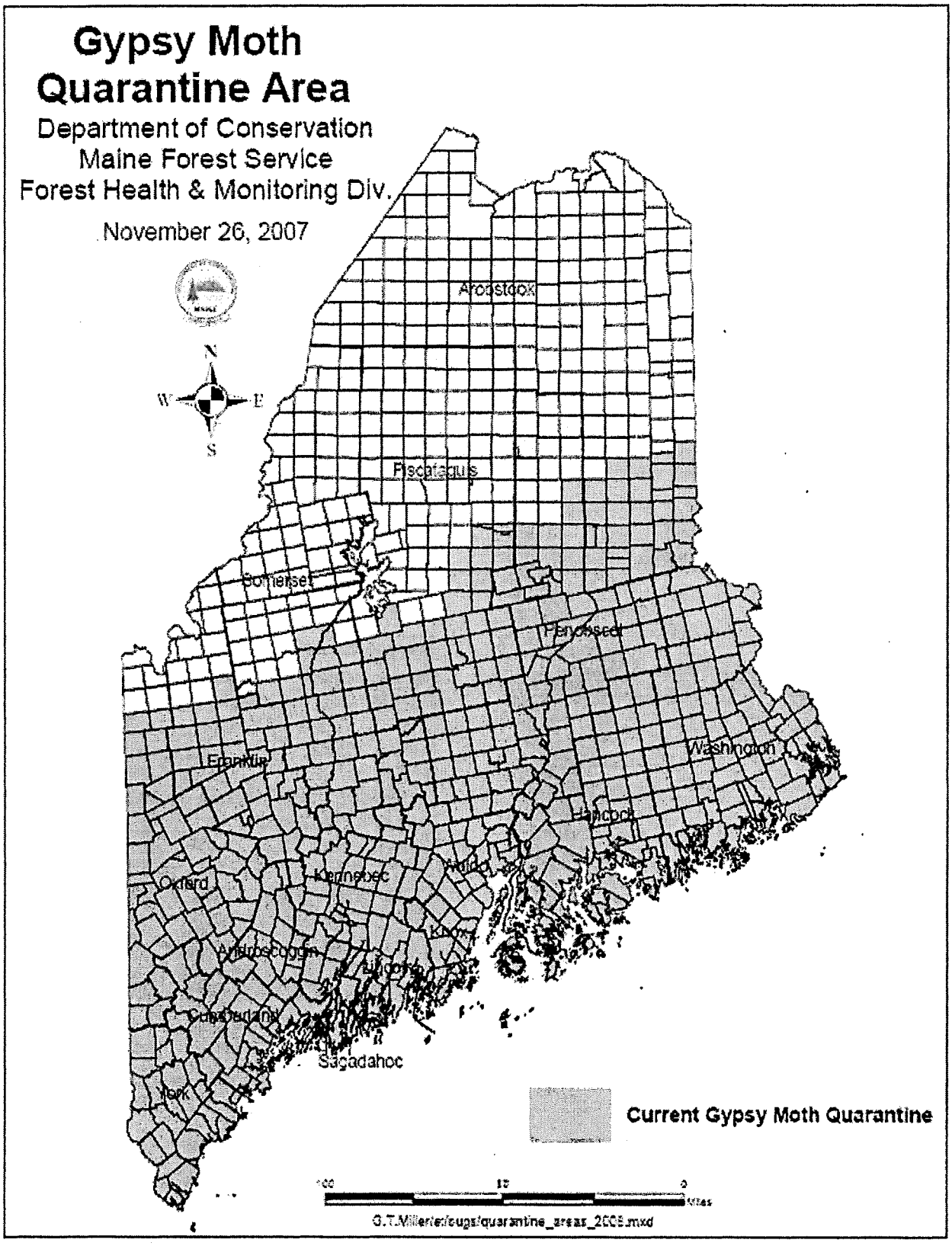
Somerset County: Anson, Athens, Bald Mountain Twp T2 R3, Bigelow Twp, Bingham, Bowtown Twp, Brighton Plt, Cambridge, Canaan, Caratunk, Carrying Place Town Twp, Carrying Place Twp, Chase Stream Twp, Concord Twp, Cornville, Dead River Twp, Detroit, East Moxie Twp, Embden, Fairfield, Harmony, Hartland,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



Towns Regulated by Maine's Gypsy Moth Quarantine

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, 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, TA R7, TA R8, TA R9, Veazie, Veazie Gore, Webster Plantation, Winn, Woodville

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, Orneville, Parkman, Sangerville, Sebec, Shirley, T1 R10 WELS, T1 R11 WELS, T1 R9 WELS, T2 R10 WELS, T2 R9 WELS, T4 R9 NWP, T5 R9 NWP, T7 R9 NWP, TA R10 WELS, TA R11 WELS, TB R10 WELS, TB R11 WELS, Wellington, Williamsburg, Willimantic

Sagadahoc County- The entire county.

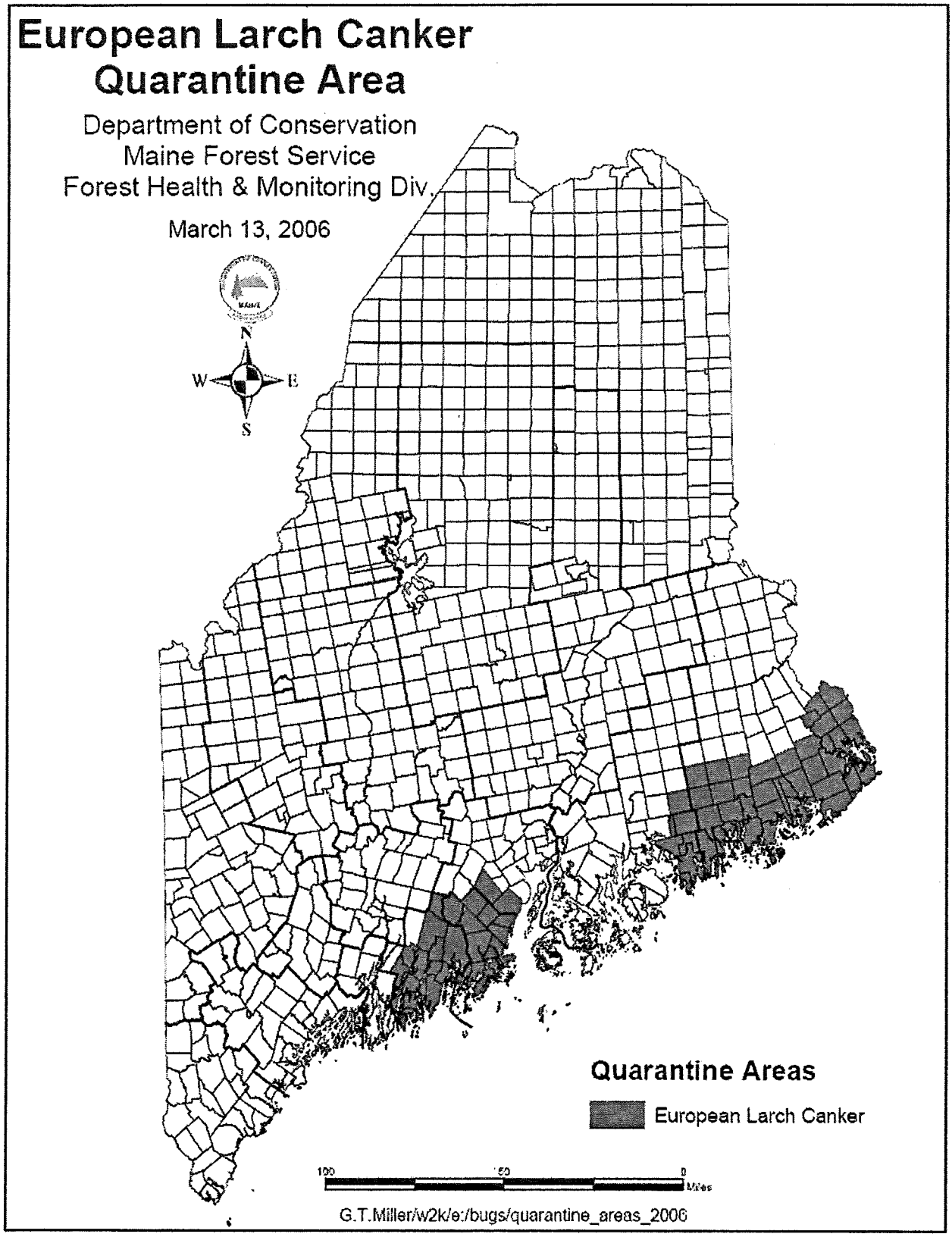
Somerset County- Anson, Athens, Bald Mountain, Bingham, Bowtown, Brighton Plantation, Cambridge, Canaan, Caratunk, Carrying Place, Carrying Place Town, Concord Plantation, Cornville, Dead River, Detroit, East Moxie Township, Embden, Fairfield, Harmony, Hartland, Highland Plantation, Lexington Plantation, Madison, Mayfield, Mercer, Moscow, Moxie Gore, New Portland, Norridgewock, Palmyra, Pittsfield, Pleasant Ridge Plantation, Ripley, Skowhegan, Smithfield, Solon, St. Albans, Starks, 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, T10 SD, T16 MD, T7 SD, T9 SD, Winter Harbor

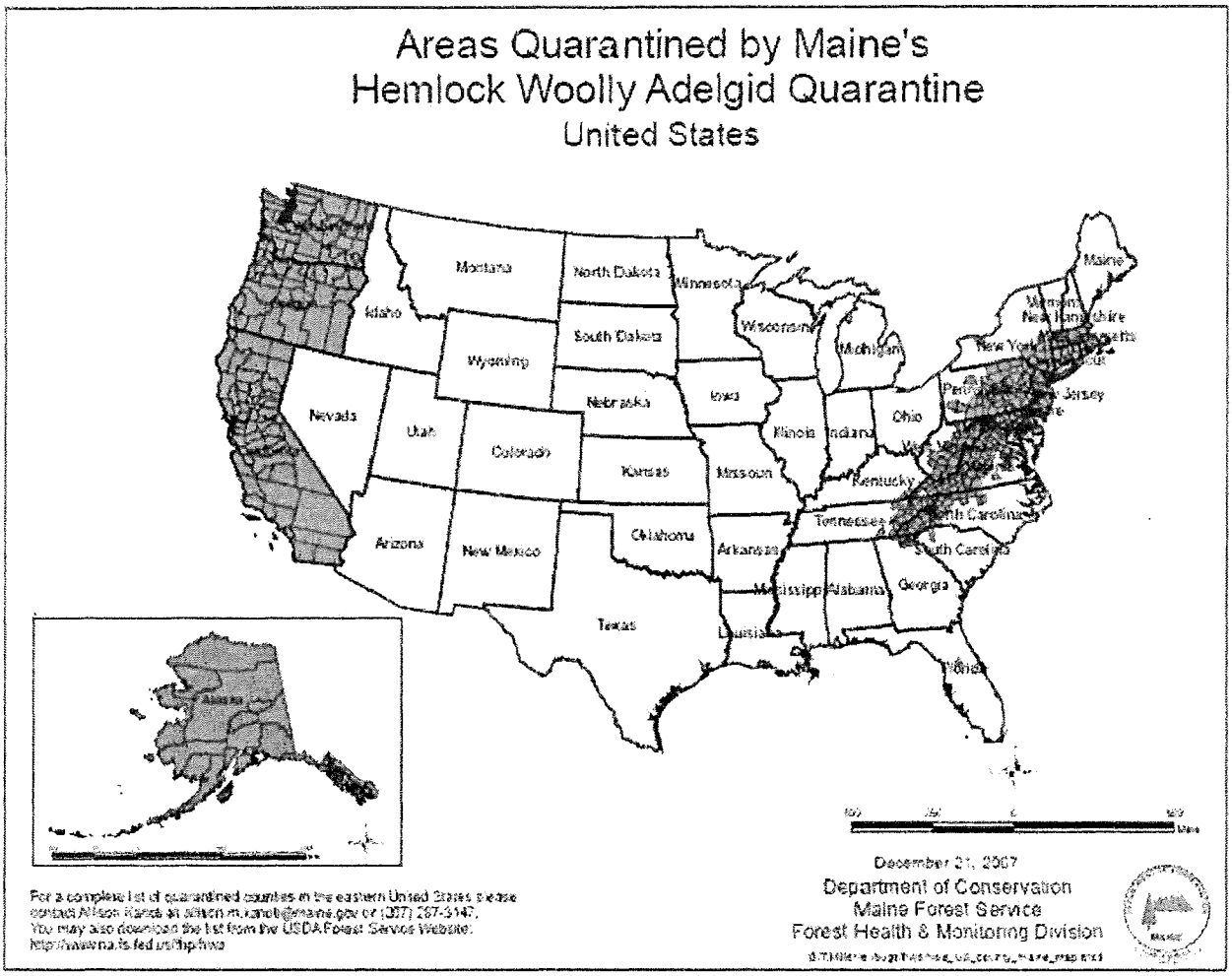
Knox County: Appleton, Camden, Cushing, Friendship, George, Head, Hope, Owls Rockland, Rockport, South St. Thomaston, Thomaston, Union, Warren, Washington

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

Waldo County: Lincolnville, Searsmont

Washington County: Addison, Baring Beals, Beddington, Calais, Centerville, Charlotte, Cherryfield, Columbia, Columbia Falls, Cooper, Cutler, Deblois, Dennysville, East Machias, Eastport, Edmunds, Harrington, Jonesboro, Jonesport, Lubec, Machias, Machiasport, Marion, Marshfield, Meddybemps, Milbridge, No. 14 Twp., Northfield, Pembroke, Perry, Robbinston, Roque Bluffs, Steuben, T18 ED, T18 MD, T19 MD, T24 MD BPP, T25 MD BPP, Trescott, Whiting, 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:

Hillsborough County: Amherst, Brookline, Hollis, Hudson, Litchfield, Merrimack, Milford, Nashua, Pelham

Rockingham County: Atkinson, Brentwood, Danville, Derry, East Kingston, Exeter, Fremont, Greenland, Hampstead, Hampton, Hampton Falls, Kensington, Kingston, Londonderry, New Castle, Newton, North Hampton, Plaistow, Portsmouth, Rye, Salem, Sandown, Seabrook, South Hampton, Stratham, Windham

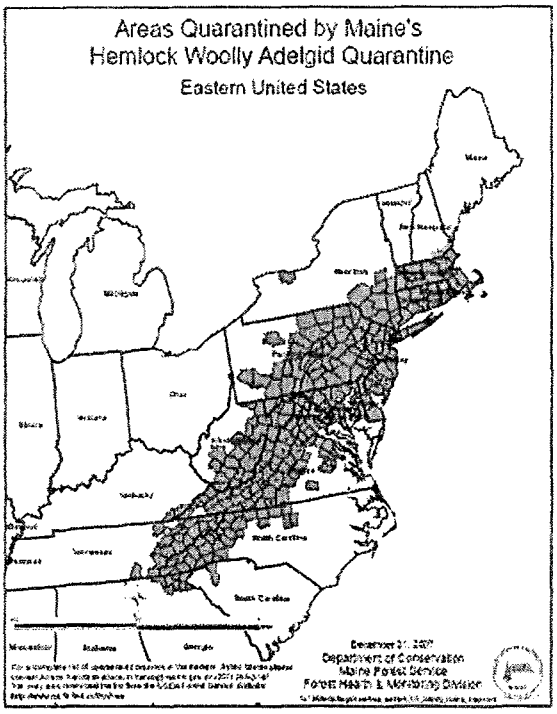
Eastern United States:

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 United States 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

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)

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, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

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, Schuylkill, Snyder, Somerset, Sullivan, Susquehanna, Tioga, Union, Wayne, Westmoreland, Wyoming, York

Rhode Island: Bristol, Kent, Newport, Providence, Washington

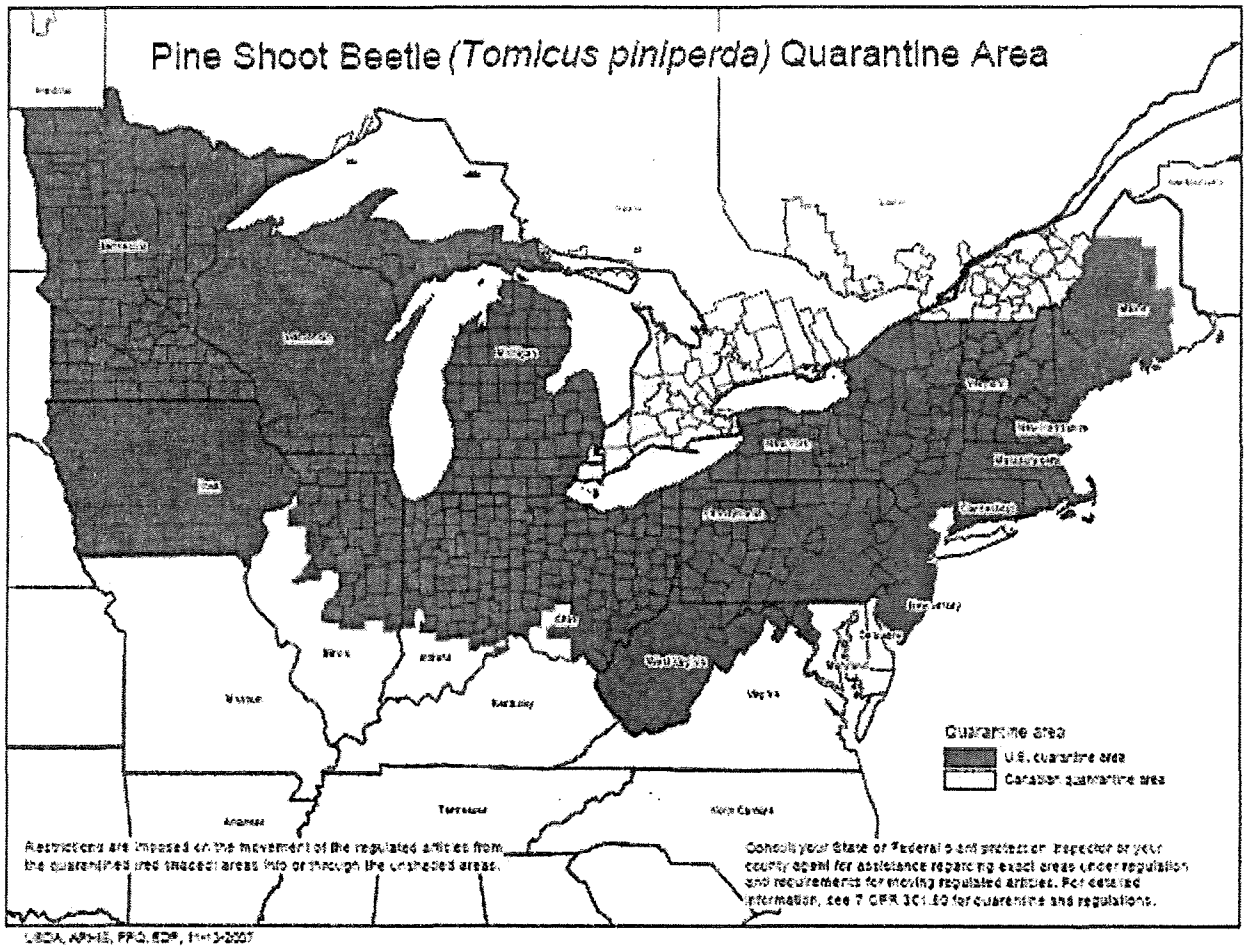
South Carolina: Greenville

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

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

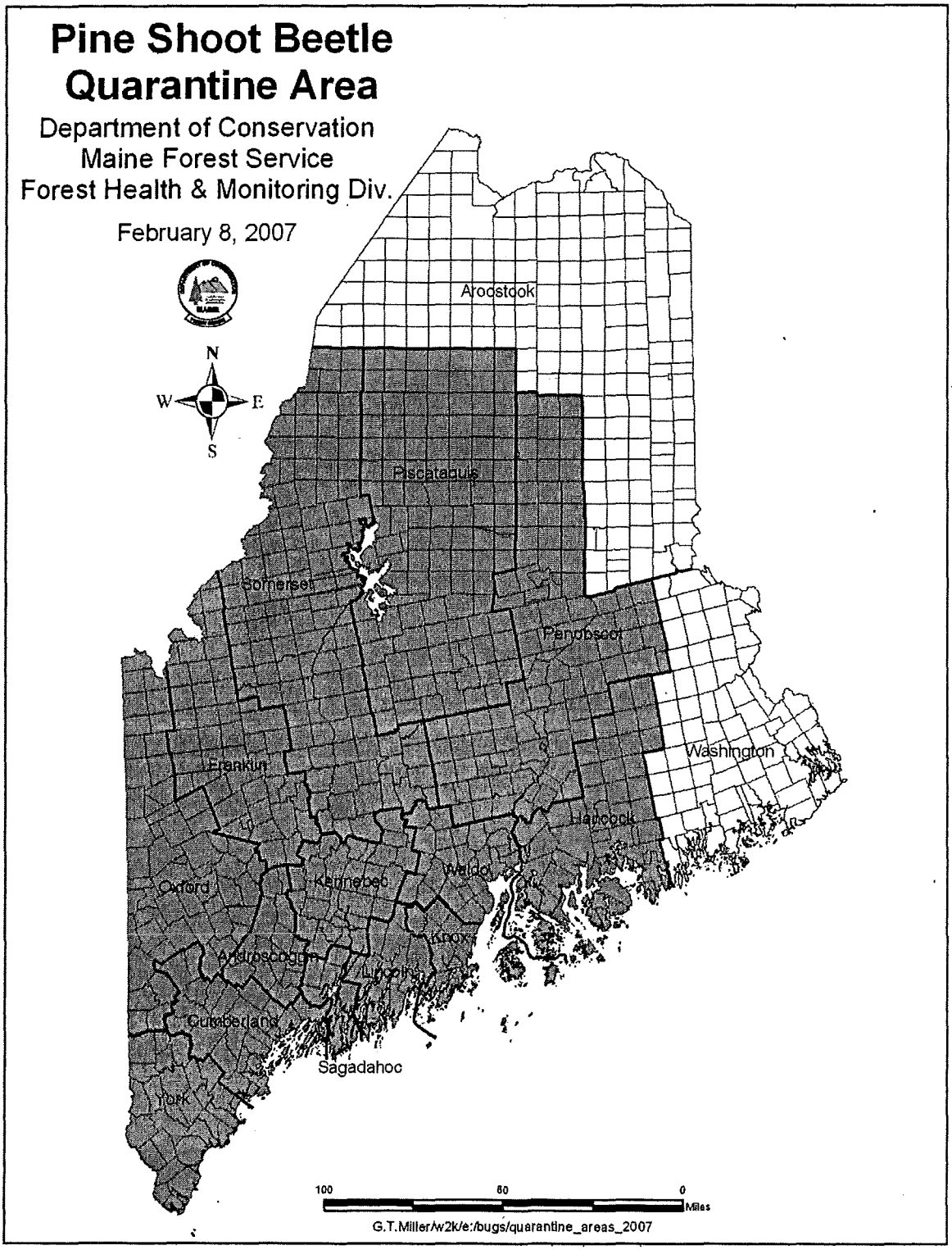
West Virginia: Barbour, Berkeley, Boone, Braxton, Fayette, Grant, Greenbrier, Hampshire, Hardy, Jefferson, Kanawha, McDowell, Mercer, Mineral, Monongalia, Monroe, Morgan, Nicholas, Pendleton, Pocahontas, Preston, Raleigh, Randolph, Summers, Tucker, Upshur, Webster, Wyoming

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)

APPENDICES

Appendix 1

Exotic Bark Beetle and Woodborer Survey 2008

This is the fourth year that the Maine Forest Service (MFS) has been trapping bark beetles and woodborers as part of a nation wide effort to monitor and detect new introductions of beetles into North America.

Methods

Twenty sites in Maine are selected for monitoring in central and southern Maine each year (Table 1.) The workload is shared between the Maine Department of Agriculture and Rural Resources and the MFS. Personnel from APHIS-PPQ in Hermon monitor another set of traps in northern and eastern Maine and all data is shared. We also collaborate with the USDA Forest Service (USFS) and other states and provinces.

The trapping period is the approximate adult activity period from early April through the end of September in Maine. Traps are placed in the field as soon as the adult activity period begins.

Table 1. Exotic Bark Beetle and Woodborer Survey Sites

			Year surveyed			
Town	**County**	**Criteria[1]**	**2004**	**2005**	**2006**	**2007**
Auburn	Androscoggin	SWPM/plant material	x	x	x	x
Auburn	Androscoggin	SWPM/transportation	x	x	x	x
Auburn	Androscoggin	SWPM/industrial		x		
Augusta	Kennebec	SWPM/industrial	x	x	x	
Bath	Sagadahoc	Urban debris			x	x
Biddeford	York	SWPM/industrial	x	x	x	
Easton	Aroostook	SWPM/industrial	x			
Freeport	Cumberland	SWPM/industrial				x
Gardiner	Kennebec	SWPM/industrial	x			
Gorham	Cumberland	SWPM/industrial				x
Lewiston	Androscoggin	SWPM/industrial	x			
Lewiston	Androscoggin	SWPM/industrial	x	x	x	
Lewiston	Androscoggin	SWPM/pallets	x	x	x	
Lewiston	Androscoggin	SWPM/industrial				x
Limestone	Aroostook	SWPM/industrial		x	x	x
Livermore Falls	Androscoggin	SWPM/industrial				x
Manchester	Kennebec	Wood products			x	
Old Orchard Beach	York	Campground				x
Oxford	Oxford	Treated cargo	x	x	x	x
Poland	Androscoggin	Bark/mulch producer				x
Portland	Cumberland	Urban debris		x	x	x
Portland	Cumberland	SWPM/industrial		x	x	x
Portland	Cumberland	SWPM/industrial	x			
Portland	Cumberland	Port of Entry	x	x	x	
Presque Isle	Aroostook	Urban debris	x	x	x	x
Saco	York	SWPM/industrial	x	x		
Saco	York	SWPM/industrial				x
Saco	York	SWPM/industrial	x			
Sanford	York	Sawmill/lumberyard				x
Sanford	York	SWPM/industrial	x	x	x	
Scarborough	Cumberland	Urban forest	x	x	x	
Scarborough	Cumberland	SWPM/pallets	x			

Sidney	Kennebec	SWPM/pallets	x	x		
South Portland	Cumberland	SWPM/industrial				x
South Portland	Cumberland	SWPM/industrial	x	x	x	
Union	Knox	Urban debris			x	x
Waterville	Kennebec	SWPM/transportation	x	x		
Waterville	Kennebec	Urban debris		x	x	
Waterville	Kennebec	SWPM/transportation				x
Wells	York	Campground				x
York	York	Nursery			x	

[1]SWPM=Solid wood packing material.

Three 12-funnel Lindgren traps are placed at each site. Each trap is baited with one of the three lures or lure combinations.

- The ethanol lure is a general attractant for woodboring insects in deciduous hosts.
- Alpha-pinene and ethanol lures together are general attractants for woodboring insects in coniferous hosts.
- The three-component exotic bark beetle lure baited trap is more specific for conifer-feeding exotic bark beetles e.g. *Ips typographus, Ips sexdentatus, Hylurgus ligniperda* and *Orthotomicus erosus*.

The bark beetles and woodborer species targeted by this survey are:

Table 2. Target Exotic Insect List

Common Name (s)	Scientific Name	Concern
Asian longhorned beetle (ALB)	*Anoplophora glabripennis*	in NY, NJ
Bamboo longhorned beetle	*Chlorophorous annularis*	
Brown spruce longhorned beetle	*Tetropium fuscum*	in Nova Scotia
Chinese longhorned beetle	*Hesperophanes campestris*	
Emerald ash borer (EAB)	*Agrilus planipennis*	in IN, IL, OH, ON
European spruce bark beetle	*Ips typographus*	
Japanese pine sawyer	*Monochamus alternatus*	
Lesser Japanese cedar longhorned beetle	*Callidiellum rufipenne*	in CT
Lesser pine shoot beetle	*Tomicus minor*	
Pine shoot beetle (PSB)	*Tomicus piniperda*	Found in western ME
Red-haired bark beetle	*Hylurgus ligniperda*	
Rough shouldered longhorned beetle	*Anoplophora chinensis*	
Six-toothed bark beetle	*Ips sexdentatus*	
Spruce engraver	*Pityogenes chalcographus*	
No common name	*Hylurgops palliatus*	
No common name	*Tetropium castaneum*	
No common name	*Trypodendron domesticus*	
No common name	*Xyloborus spp.*	
No common name	*Xylotrechus spp.*	

All bark beetle and wood borers were identified to genus and most to species. Suspect or unusual specimens were sent to taxonomic experts.

Results

Over the past four years 41,000 beetles have been screened and identified in monitoring for invasive pest species (Table 3.) We have developed expertise in taxonomic identifications in two people at the MFS Insect and Disease Lab as well as one person at the Department of Agriculture. In addition, there is now a network of taxonomists that we have met across North America that can aid us when unusual specimens come in. We have greatly improved our insect reference collection and have increased our knowledge of

what beetles live in Maine and when and where they occur. This will all allow us to more easily detect unwanted woodborers and bark beetles if (when) they appear.

Table 3. Exotic woodborer and bark beetle survey results

Year	Target Species Found	Number of Beetles identified	Curculionidae Species (Bark & Ambrosia beetles)	Cerambycidae Species (Longhorned beetles)	Buprestidae Species (Flatheaded woodborers)	New State Records
2004	0	7,400	43	26	9	7
2005	0	8,900	54	52	16	1
2006	0	8,000	51	34	11	4
2007	0	17,607	57	57	13	1

The new species State Records in 2006 came from a bark/mulch producer and a sawmill/lumber yard trapped under the USDA-Forest Service Exotic Detection Rapid Response program. Three of the four species are exotic species only recently found in the United States and of limited distribution. Therefore it was determined that in 2007 those sites should continue to be monitored. The three exotic species were not picked up again in 2007 but another exotic species State Record was found at one of these locations. This points to the importance of monitoring for exotic insects and also indicates what type facilities should be targeted. The species found to date are not on the USDA-APHIS/PPQ target list but still may present a problem for the Maine forest ecosystem. We do not know at this time.

The number of specimens processed in 2007 doubled, good thing we have good identifiers working for us! This is due to a change in the type of facilities being targeted for monitoring. Bark processors, sawmills, urban debris collection sites and campground provide better habitat for bark beetles and woodborers then do industrial locations - even in Maine.

Lindgren funnel traps catch other arthropods besides bark beetles and woodborers. The material is also checked for Sirex Woodwasp, another invasive species that the MFS is concerned about coming into Maine. Adult spiders are separated out and sent to Dr. Dan Jennings who is working on a Spiders of Maine project. All of the beetle "by-catch" not part of the study is passed on to two Maine Entomological Society members. They process the material, keep what interests them and sometimes find new or interesting species that they then return to the Maine Forest Service. Sorting the material for use in multiple projects takes a relatively small amount of time compared to the time and effort invested in the sampling and identification. We are already doing the sampling and someone else does the additional identifications, therefore it is cost effective to share the material collected.

This project has allowed us to build our expertise in indentifying native insects so that we can more readily identify exotic species when they come into Maine. We have improved our reference collection, built up our taxonomic resources, trained personnel, gained experience and are networking with other groups to maximize our resources.

Appendix 2.
Trapping Results for Siberian Silk Moth in Maine, 2007

Colleen Teerling
Maine Forest Service
Forest Health & Management Division

Introduction

The Siberian Silk Moth, *Dendrolimus superans sibericus,* (Lepidoptera: Lasocampidae) is a non-native insect pest of conifers. It has not yet been found in North America, but is considered a high risk for possible introduction. The 2006 survey was designed to detect the presence or absence of Siberian Silk Moth using two approaches - pheromone traps and light traps.

Methods

Both pheromone traps and light traps were used to monitor for the presence of Siberian silk moth (SSM) in Maine. Modified milk carton traps using SSM-specific lures were places in 50 locations along the central coast and in southern and central-western Maine (Table 1). A DDVP killing strip was placed in the bottom of each trap. Traps were hung in red or white pine stands approximately 6 feet above ground. Traps were set out in mid June, and retrieved in October.

The FHM Division's existing network of 25 light traps (Table 2) is located in forested locations throughout Maine. All insects caught were screened for Siberian Silk Moth. For ten light traps in southern and coastal Maine, the season was extended to mid August (two additional weeks) to ensure that the moth flight period was completely bracketed. Light traps were run nightly, with catch preserved and periodically sent to the MFS for screening.

Results

Siberian Silk Moth was not trapped in Maine in 2007.

Table 1. Siberian Silk Moth Pheromone Traps in Maine 2007

County	Town	Latitude N	Longitude W
Androscoggin	Auburn	44.64333	-69.35391
Cumberland	Baldwin	43.82282	-70.77312
Cumberland	Bridgeton	44.13091	-70.70416
Cumberland	Cumberland	43.78898	-70.24482
Cumberland	Scarborough	43.59419	-70.43195
Cumberland	Windham	43.77238	-70.40406
Franklin	Avon	44.83550	-70.26776
Franklin	Freeman Twp	44.92829	-70.20544
Franklin	New Gloucester	43.96017	-70.33452
Franklin	Phillips	44.81503	-70.34480
Franklin	Wilton	43.60634	-70.20783
Hancock	Blue Hill	44.41280	-68.57619
Hancock	Brooklin	44.32098	-68.57637
Hancock	Bucksport	44.56861	-68.77186
Hancock	Penobscot	44.45034	-70.70297
Hancock	Surry	44.49585	-68.48261
Kennebec	Augusta	44.30638	-69.76604
Kennebec	Readfield	44.37526	-69.93454
Kennebec	Vienna	44.58445	-70.02664
Kennebec	Winslow	44.55400	-69.60120
Knox	Hope	44.22317	-69.22821
Knox	Union	44.21309	-69.24809
Knox	West Rockport	44.18847	-69.14636
Lincoln	Whitefield	44.24600	-69.55900
Oxford	Bethel	44.41505	-70.78236
Oxford	Byron	44.76584	-70.64870
Oxford	Denmark	43.95184	-70.79344
Oxford	Fryburg	43.98473	-70.94431
Oxford	Mexico	44.58300	-70.59530
Oxford	Sumner	44.36309	-70.38409
Sagadahoc	Bowdoinham	44.01732	-69.90245
Waldo	Belmont	44.40834	-69.09943
Waldo	Burnham	44.64295	-69.35401
Waldo	Knox	44.52489	-69.24799
Waldo	Liberty	44.39824	-69.34643
Waldo	Searsport	44.43389	-68.94489
York	Alfred	43.43587	-70.68318
York	Kennebunk	43.40352	-70.58670
York	Limerick	43.65749	-70.83639
York	North Berwick	43.29418	-70.75709
York	Sanford	43.42816	-70.64960
York	Shapleigh	43.51685	-70.85448
York	Shapleigh	43.59405	-70.87951
York	Wells	43.32186	-70.65558

Table 2. MFS Light Trap Locations 2007

County	Town	Start Date	End Date
AROOSTOOK	Allagash	07/03/2006	07/31/2006
AROOSTOOK	Ashland	07/03/2006	07/31/2006
AROOSTOOK	Crystal	07/03/2006	07/31/2006
AROOSTOOK	Haynesville	06/17/2006	07/31/2006
AROOSTOOK	New Sweden	07/03/2006	07/31/2006
AROOSTOOK	T15 R15 WELS - St. Pamphile	06/17/2006	07/31/2006
FRANKLIN	Kingfield	07/03/2006	07/31/2006
FRANKLIN	Rangeley	06/17/2006	07/31/2006
HANCOCK	Mount Desert	07/03/2006	07/31/2006
HANCOCK	Sedgwick	06/17/2006	08/15/2006
KENNEBEC	Mount Vernon	06/17/2006	08/15/2006
KNOX	Hope	06/17/2006	08/15/2006
OXFORD	Norway	06/17/2006	08/15/2006
PENOBSCOT	Exeter	06/17/2006	08/15/2006
PENOBSCOT	Greenbush	06/17/2006	07/31/2006
PENOBSCOT	Millinocket	06/17/2006	07/31/2006
PISCATAQUIS	Bowerbank	06/17/2006	08/15/2006
PISCATAQUIS	T3 R11 WELS - Frost Pond	06/17/2006	07/31/2006
SAGADAHOC	Topsham	06/17/2006	08/15/2006
SOMERSET	Big Six Twp - St. Aurelie	07/03/2006	07/31/2006
SOMERSET	Jackman	07/03/2006	07/31/2006
WASHINGTON	Calais	06/17/2006	08/15/2006
WASHINGTON	Topsfield	06/17/2006	07/31/2006
YORK	Biddeford	06/17/2006	08/15/2006
YORK	South Berwick	06/17/2006	08/15/2006

Appendix 3.
Trapping Results for *Sirex noctilio* (Hymenoptera: Siricidae) in Maine, 2007

Colleen Teerling
Maine Forest Service
Forest Health & Management Division

Introduction

Sirex noctilio Fabricius is a non-native wood-boring wasp with the potential to cause significant mortality in pines. Although it has been found in New York, Pennsylvania and Vermont, it has not yet been detected in Maine.

Methods

Twenty 12-unit Lindgren funnel traps were placed in southern and west central Maine in overstocked and/or declining pine stands consisting primarily of hard pines (Table 1). One trap per site was suspended from a tree with the collecting cup (containing propylene glycol) approximately six feet above the ground. Traps were set out during the week of June18-22, and removed during the last half of October. Traps were baited with alpha-pinene (70%)/beta-pinene (30%) lures, which were replaced every four weeks. Collections were made every two weeks, and all Siricids identified.

Results

No *Sirex noctilio* were trapped in Maine during 2007.

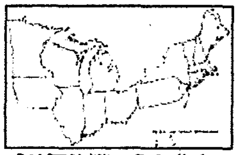
Table 1. *Sirex* Traps in Maine, 2007

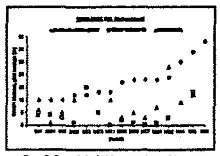
County	Town	Latitude N.	Longitude W.
Androscoggin	Auburn	44.64333	-69.35391
Cumberland	New Gloucester	43.96017	-70.33452
Franklin	Avon	44.83550	-70.26776
Franklin	Freeman Twp	44.92829	-70.20544
Franklin	Kingfield	44.94776	-70.17499
Franklin	Phillips	44.81503	-70.34480
Kennebec	Augusta	44.30638	-69.76604
Kennebec	Readfield	44.37526	-69.93454
Kennebec	Vienna	44.58445	-70.02664
Knox	Hope	44.22317	-69.22821
Knox	Rockport	44.18847	-69.14636
Knox	Union	44.21309	-69.24809
Lincoln	Whitefield	44.24600	-69.55900
Oxford	Byron	44.76584	-70.64870
Oxford	Fryeburg	43.98473	-70.94431
Sagadahoc	Bowdoinham	44.01732	-69.90245
Waldo	Burnham	44.64295	-69.35400
York	Alfred	43.43587	-70.68318
York	Sanford	43.42816	-70.64960

Field observations of northern white-cedar (*Thuja occidentalis*) crown dieback in Maine and Michigan (*NE-EM-07-01*)

KaDonna Randolph[1], Bill Ostrofsky[2], Jim Steinman[3], Manfred Mielke[3], and William Bechtold[1]
[1]US Forest Service, Southern Research Station [2]Maine Forest Service [3]US Forest Service, Northeastern Area State & Private Forestry

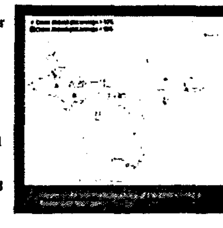
Background – As part of the 2006 National Forest Health Monitoring (FHM) report [1], spatial clusters of plots with crown dieback of 10 percent or more were discovered among several of the plot-level averages of northern white-cedar in Maine and northern Michigan (Figure 1). These elevated averages for northern white-cedar were not necessarily accompanied by elevated averages among the hardwoods and other softwoods on the plots (Figure 2). Such levels of dieback were of concern because unlike hardwood trees, conifers often do not exhibit crown dieback unless the tree is under serious stress. Aside from stem decay, northern white-cedar is a species relatively free from serious injury by insect and disease pathogens; therefore, the reasons for the elevated levels of dieback were unclear.





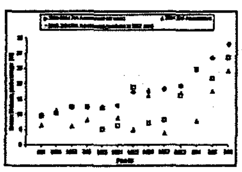
Methods – A two-year Evaluation Monitoring (EM) study of northern white-cedar has been implemented to further evaluate these findings. The first stage of this study was accomplished during the summer of 2007 in which we visited the plots identified in the FHM report as having an average cedar crown dieback greater than 10 percent. These averages were based on assessments made by the Forest Inventory and Analysis Program (FIA) between 2000 and 2004. In addition, we also visited a small number of plots that had an average NWC crown dieback less than 10 percent for comparison.

In total, 18 FIA plots were visited (Figure 3). These EM assessments occurred 4 to 7 years after the FIA assessment on which the FHM report was based. Plot visits in Maine were made between June 18 and June 28. Plot visits were made in Michigan between July 9 and July 19. Tree status (live/dead), crown conditions, and diameter at breast height (dbh) were recorded for the cedar trees during each plot visit. Additional observations were made about individual-tree damages and stand-level growing conditions.



FIELD OBSERVATIONS

Crown Conditions – Overall, northern white-cedar crown conditions ranged from very good to very poor. Average crown dieback based on the northern white-cedars was lower in 2007 than at the previous FIA assessment for 12 of the 13 plots (Figure 4). However, this does not necessarily indicate improved tree condition. When FIA assessment plot averages are recalculated to include only the trees that survived to 2007, average crown conditions improved on only 8 of the 13 plots. Field notes indicate that 15.6 percent of the survivor trees on the plots with improved dieback averages had dead tops or dead branches with no fine twigs, neither of which qualify as "recent dieback" according to FIA protocols.

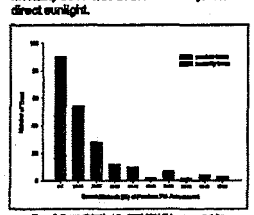


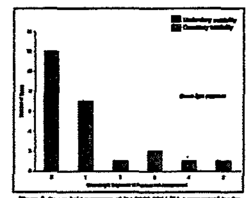
Northern white-cedar is an ecologically and economically important species that ranges across the northern part of the United States from Maine to Minnesota and covers a similar east-west range in southern Canada. It also may be found at other scattered locations throughout the Eastern US[2].

Range of northern white-cedar in North America.

Northern white-cedar grows in a wide range of soil conditions, from peat swamps and bogs to dry upland sites, and is a favored shelter and browse in winter deeryards[3]. It ranked fifth among all species in average annual removal of growing stock volume on Maine timberland between 1999 and 2003 according to the 2003 *Forests of Maine* report[4].

Mortality – Northern white-cedar mortality occurred on 10 of the 13 plots with an elevated crown dieback average (11.1 percent of the trees died). The mortality trees ranged between 5.1-in. and 13.1-in. dbh and two-thirds had a crown dieback rating of 20 percent or more at the previous FIA assessment (Figure 5). Half of the mortality trees were in the understory with little or no exposure to sunlight. The remaining mortality trees were in the overstory (Figure 6). In contrast, mortality occurred on 2 of the 5 "good" plots (4 out of 121 trees died); only one of the mortality trees was in the overstory. The others were in the understory with no exposure to direct sunlight.





Bole and Root Conditions – Pistol-butted trees were prominent among the northern white-cedar, particularly in Maine. Wind events were the apparent cause of many of the leaning and fallen trees; however, leaning trees were common even in areas not obviously disturbed by wind. Nearly 11 percent of the trees assessed were noted as leaning or fallen. Because of the pistol-butting or lean, many trees had exposed roots. The ability of northern white-cedar trees to survive with substantial portions of dead cambium[2] was apparent. Strips of dead cambium starting at the base of the tree and tapering up the bole, often in a spiral fashion, were present on many trees. Brown cubicle rot identified as that caused by the fungus *Postia sericiomollis* was observed and was often accompanied by large holes created by woodpeckers or sapsuckers.

Site Conditions – The plots were located on one of five physiographic types: flatwoods, bays and wet pocosins (MI only), rolling uplands (ME only), moist slopes and coves, and swamps/bogs (ME only). The flatwood sites included moist sites with high hummocks and flowing water underneath as well as drier sites with a less undulating forest floor. The rolling upland and moist slope-cove sites were relatively drier with rocky soil. The bay-wet pocosin and swamp-bog sites contained low hummocks with standing or flowing water beneath. Harvesting, both recent and in years past, was evident on the plots visited as were disturbances caused by wind and flooding. A shallow water table was evident for many of the plots and water stood at depths of 0.1-ft to 0.6-ft at the previous FIA assessment.

Outcomes – The field visits were successful in verifying the elevated levels of northern white-cedar crown dieback on the selected plots; however, no single cause for the high levels of crown dieback was identified. There seemed to be a variety factors contributing to the dieback including tree age, weather events, soil conditions, and past harvesting practices.

The profusion of leaning trees observed during the field visits identified a gap in the FIA data collection protocols: no measurement of lean angle is recorded for live trees. Describing the lean angle of live trees provides additional information to help explain unusual conditions in the tree crown condition indicator; for assessing damage after harvesting, hurricanes, tornadoes, floods, and snow or ice storms; and for projecting the trees' future status (i.e., leaning trees may be more susceptible to premature mortality, more likely to fall during storm events, etc.). As a result of our observations we are working through the FIA change management system to add a simple measurement of lean angle for all live trees.

The field visits were helpful in identifying variables to include in the second stage of this project which will be a statistical analysis describing the change in northern white-cedar crown dieback across its range in the northern US over an approximate ten-year period. These variables include: the FIA measurements of disturbances, treatments, physiographic class, dbh, percent rotten or missing cull, and damages, as well as auxiliary information about temperature and precipitation.

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MFS 03/08