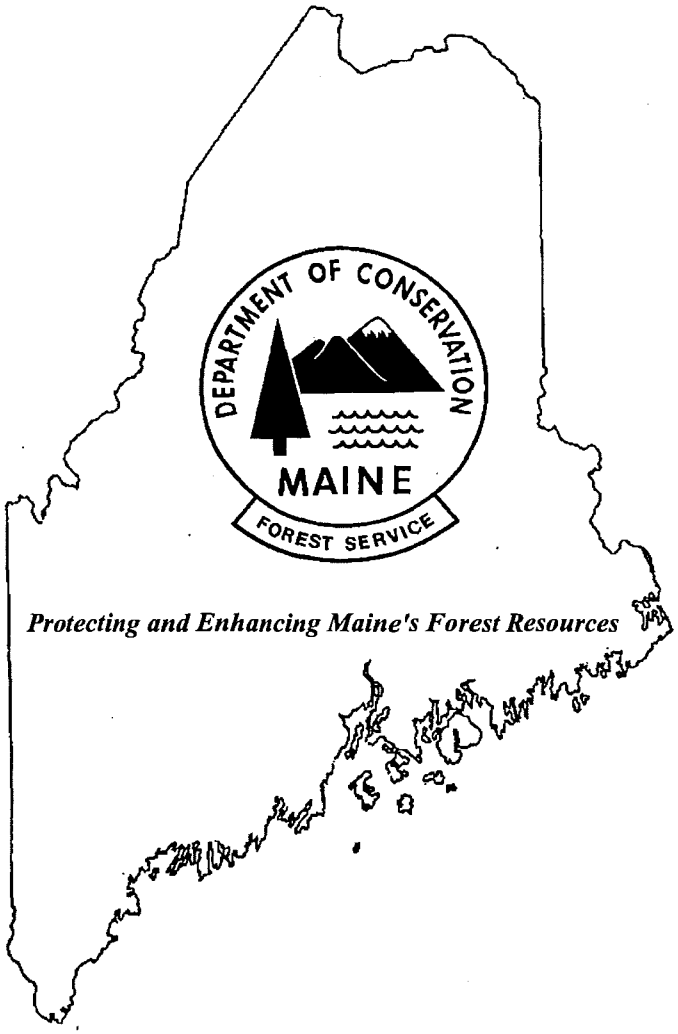
Forest & Shade Tree Insect & Disease Conditions for Maine

A Summary of the 2001 Situation



Forest Health
& Monitoring Division
Summary Report No. 17
September 2002

Maine Forest Service
MAINE DEPARTMENT OF CONSERVATION
Augusta, Maine

MAINE

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Reflects staffing for the 2001 season

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Acknowledgements

This summary has been compiled and edited by Richard Dearborn and Clark Granger from input received from the staff of the Forest Health and Monitoring Division (**FH&M**). The editors would like to especially thank Charlene Donahue who not only submitted items for inclusion, but who was again an invaluable resource for much of the electronic preparation set up. Dick Bradbury, Ken Laustsen, Don Ouellette and Henry Trial, Jr. also submitted information on a variety of projects and pests. State Entomologist, Dave Struble, wrote administrative entries and proofread the final draft. Wayne Searles continued his work on the White Pine Blister Rust Program and assisted in Hemlock Woolly Adelgid field activities. Entomology Technicians Skip Cram, Mike Skinner and Grayln Smith assisted on a number of field projects throughout the season as well. Project Entomology Technician, Kimberly Foss set up and carried out a mosquito surveillance project in the Portland area. Government interns Jessica Barbay and Rachael Strattard assisted on a variety of field and lab based projects.

Our new secretary, Marlene Athearn, had the job of trying to decipher our handwriting so that an understandable product could be made available for our clients. We hope that we did not make it too difficult for her.

As always our thanks go to many other administrative and field staff in the Maine Department of Conservation who facilitate much of our work and to cooperators associated with the USDA-Forest Health Protection, USDA-APHIS, Maine Department of Agriculture, University of Maine at Orono, and cooperators in other New England States and Maritime Provinces of Canada. Thanks too should go to our cooperators in other state agencies such as DEP and DHS and also to staff of the Lyme Disease Lab at the Maine Medical Center in Portland. And most of all our thanks go to you our clients; arborists, Christmas tree growers, foresters, landscapers, nurserymen, etc. for your support in keeping us apprised of what you see in the course of your work.

Suggestions for Quick Access to Particular Items

This season's report is set up in roughly the same format as we have used for the past several years. The Table of Contents along with the "Highlights" section and the Index should again provide most of the help you need in narrowing down your search for items of particular interest. Cross referencing within the text is used in the case of complex problems. We have again provided our very brief narrative highlights (p.) and accompanying **one-point assessment table** (Table 1, p.) for damage level trends for quick review for many of our common problems. You should still scan the entire report to pick up new items of interest as well. No photo gallery has been included in this issue.

Keep in mind the following when scanning for particular problems:

- **Quarantine related issues** are discussed in Comments from the State Entomologist (p.) and under appropriate pests within the text. An overview of all state **quarantines**begins on page 59.
- **Insect problems** associated with both trees and shrubs in forest, plantation, shade tree and ornamental situations are broken down into only two categories. All **softwood (conifer) insect pests** are grouped in Section A (p 15). All **hardwood insect pests** are in Section B (p. 27).
- **Miscellaneous insects and other arthropods of medical, nuisance or curiosity significance** have their own section (p.) which also includes an expanded series of tables showing the variety of **public assistance** requests received by FH&M beginning on page 45.
- **Tree diseases and injuries** are listed alphabetically in a separate section beginning on page. We encourage you to refer to the color photo gallery in last years (2000) report as well.

For additional information you should check the publications sections (pp. 8 & 62) Of this report or visit our website at:

<http://www.state.me.us/doc/mfs/idmhome.htm>

FOREST & SHADE TREE INSECT & DISEASE CONDITIONS FOR MAINE - A SUMMARY OF THE 2001 SITUATION

Comments From The State Entomologist

My comments in last year's annual pest conditions summary, after showcasing some of the Division's many accomplishments, focused primarily on aspects of the threat of exotic/invasive forest pests. The big story was hemlock woolly adelgid (HWA) and the various individual and cooperative efforts to address the problem.

In many ways, the story remained unchanged for 2001: HWA was a major concern and we specifically crafted an HWA public awareness campaign to educate and enlist the aid of the general public in detecting this pest. We responded aggressively to any reports of possible populations; treating any sites where HWA was detected, and then removing all infested host material. We continued general survey and detection efforts for this pest across the southern quarter of Maine and conducted intensified monitoring in the areas around sites where HWA was detected and eradicated. We are also engaged in cooperative work with the Connecticut Agricultural Experiment Station, exploring survival and control potential for *Pseudoscymnus* lady beetles which show promise to ameliorate the impact of this pest.

Our HWA intervention efforts were recognized by the Administration as exemplary. Staff of the MFS and Maine Dept. of Agriculture were awarded the well deserved "Governor's Special Teamwork Award" for their cooperative efforts in successfully addressing the situation. With the assistance and cooperation that we have received from the public, the media, industry and sister agencies in the federal government we can say with some pride that all known HWA-infested hemlocks in Maine have been destroyed! Despite all this effort and success HWA remains a real, major threat, and we ask that you stay vigilant.

Other accomplishments include:

Successfully completing another year of Forest Inventory data collection, analysis and reporting. In recognition of our accomplishment, the Division received the FIA Director's "Award for Excellence". Our dependability and demonstrated capacity also led to ancillary cooperative support from the USFS to conduct an accelerated assessment of the growth rates of Maine's forests. Without the successful track record, we would not have received this level of support in our efforts to address this important information need.

No aerial browntail moth control projects were conducted in 2001; however, there were two municipal ground based projects (Brunswick - 200 acres and Portland - 50 acres). We also continued to investigate new management strategies, working with the University of Southhampton (UK) and Exosect Ltd. to evaluate an innovative pheromone dispersal/mating disruption method. Although the initial tests did not reduce the BTM populations sufficiently to reduce human health nuisance noticeably, the results did suggest some long term benefit might be achieved in areas where BTM populations were lower. Further tests are planned for 2002.

A less heartening story of current and probable future FH&M division activities involved pine shoot beetle (PSB). The single PSB recovered in 2000 from Adamstown in northern Oxford Co. has been followed in 2001 by another in a trap at the same site and another in Rangeley which, although it is immediately adjacent, is in northern Franklin Co.

The initial response by the MFS and Me Dept. of Agriculture was to enact a quarantine of northern Oxford Co. to minimize the risk of artificial spread of this pest. With the confirmation of the problem in northern Franklin Co., a similar quarantine is currently being enacted there as well. Concurrently, the USDA APHIS has established interim rules quarantining the entirety of Oxford Co., and we anticipate a possible similar move for all of Franklin Co.

The disparity between the area recognized as infested by the federal vs. state agencies does present problems. APHIS continues to seek a "whole county" approach while we favor and strongly advocate for a split county

approach, which reduces the area regulated to north of the Appalachian Trail. We view the Maine state approach as more targeted and superior in limiting the amount of pine producing woodland and dependent industry suffering unrestricted exposure to this pest. Although the state and the USDA are trying to reach a mutually agreeable solution, this effort is hampered by a reluctance by APHIS to recognize the state quarantine and the local perception that the USDA regulations are more stringent for local mills than for our international/Canadian competitors.

Despite this handicap, we continue to work with regional counterparts to develop a regional strategy for managing pine shoot beetle. Although this quarantined pest does not appear to pose a threat to the region's pine forests, with the long range movement of logs and bark products, it is critical that we have procedures in place to assure that Maine products can be handled in such a way so that we can safely and competitively market to potential customers.

Other situations that bear watching:

- Last year's detection surveys for historically significant pests such as spruce budworm and hemlock looper indicate that these native species may be poised to reemerge from their recent endemic status. In the case of spruce budworm, populations, although up over levels of the recent past, are still barely detectable. With looper, however, there is noticeable localized damage - heavy in spots - that is triggering local control plans.
- The record-breaking drought of the past year has not yet abated. Even though the recent rains have helped, soil moisture deficits will continue well into the growing season. Our recent experience with white pine decline syndrome in southwestern Maine, triggered by the drought of 1995, suggests that we may be facing even more widespread crown dieback and decline, and localized tree mortality across a broad band of the state. The impacts of this drought will extend well beyond direct effects, and be exhibited in increased vulnerability to other, normally innocuous, stress agents.

On the legislative front, the initiatives I reported last year (to place a moratorium on use of pesticides for forestry; and a legislative bill to exempt certain Ribes varieties from regulation under our quarantine statutes) both failed to gain support. Those of us concerned about the availability of pest management tool can breathe a sigh of relief, even if only temporarily. Another positive note: there was a bill passed this past legislative session to clarify the authority of the Maine Forest Service to condemn forest trees infested with quarantined pests. While we hope to never need to use this power, it could prove to be a most valuable tool.

As always, I repeat that this annual summary is not an exhaustive summary of Division activities and accomplishments. And although we try to acknowledge you, our client/cooperators, the few words written here do not begin to convey the extent of our reliance or express our appreciation for your contribution. Without you we would not be able to effectively gather information regarding pest and forest conditions; nor could we as effectively disperse it out to the larger public.

These 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

Like much of Maine state government, the FHM Division has benefited from a heavy proportion of the staff with extensive experience and institutional memory. The down side to that experience is that many of the staff are approaching a time when they can retire. During this past year three of our employees with over 100 years of state service and experience retired..

New Personnel

Marlene Athearn transferred in May from the State Entomologist's Office to the Insect and Disease Laboratory to provide administrative support for our staff. In addition to functioning as laboratory secretary and receptionist, Marlene works to electronically catalog our survey records to enhance their accessibility, processes the gypsy moth permits necessary to expedite movement of wood and regulated articles to or through non-infested areas of the state, and helps to prepare many of our papers and reports for publication.

Retirements

Clark Granger retired as plant pathologist for the Forest Health and Monitoring Division on August 31, 2001 after 33 years of service. Since joining our staff in 1968, Dr. Granger has served the Maine Forest Service in many capacities. While he began and ended his career with Entomology (Forest Health Monitoring) Division, he also worked as a member of both Community Forestry and Management Divisions.

He served as Director of the Division of Community Forestry from 1978-1981. During that period he established the Pine Tree State Arboretum, becoming its first President and Executive Director. He also served as Chair of the State Arborist Examining Board.

He was appointed State Entomologist in 1981 and served in that capacity until 1985. He has been Director of the Insect and Disease Laboratory since 1988, and is a veteran of several spruce budwormspray projects.

Dr. Granger supervised the State Forest Nursery at Greenbush from 1979 to 1987, where he placed considerable emphasis on the production of superior strains of forest and Christmas tree planting stock.

Throughout his career he has maintained close contact with the various stakeholder groups served by the Maine Forest Service, holding memberships in many. He has served several terms on the Board of Directors of the Maine Farm Bureau, the Agricultural Council of Maine, the Maine Christmas Tree Association, and the Maine Chapter of The American Chestnut Foundation. He is also a Certified Tree Farmer, a member of the Small Woodland Owners Association of Maine, and a member of the Maine Landscape and Nursery Association, where he has been awarded the title of Maine Certified Nursery Professional.

Clark continues to work with us in an acting capacity while we search for a replacement. The loss of his expertise gained through many years of education and experience makes the choice of his replacement very difficult.

Betty Barry, Secretary and long the voice of the Entomology Laboratory, retired at the end of March after thirty five years of state service (over twenty three with FH&M). Betty started work with FH&M in January of 1978 but had actually worked for the State since November of 1965 when she went to work for the Department of Personnel. She also worked for the Real Estate Commission, DEP and briefly in the private sector for Maranacook Community School. Betty's ability to decipher our writing and maintain a cheerful attitude in the front office will be missed.

Everett "Skip" Cram, a Senior Entomology Technician working out of Medway, retired in September after more than thirty-five years of State Service (roughly twenty five with FH&M). Skip started out seasonally in Fire Control in 1966. Over the years he worked as a seasonal Park Ranger and for DOT. Skip started his association with FH&M at the spruce budworm lab during the winter of 1979-80. He became an Insect Ranger on budworm starting in 1983. Skip was a "Jack of all Trades" and was happiest when he was creating, building or repairing something. He is a great woodsman as well and knows the Maine woods as well as anyone. We wish him well.

Cooperative MFS/USFS Projects

Forest Inventory & Analysis (FIA) – Panel #3 Synopsis of the 2001 Measurement and Analysis Effort

The 118th Maine Legislature authorized the Maine Forest Service to participate with the USDA Forest Service to implement an annual forest inventory (PL 1997C.720). The annualized design consists of five panels, corresponding to the number of years in the inventory cycle. Each year's panel is evenly and systematically distributed across the entire state and no member of a particular year's panel has an immediate neighbor that is visited in the same year. The fieldwork for Panel #1 began in April 1999 and was completed in December 1999 with the measurement of 680 plots. Panel #2 measurements began in March 2000 and the 754 plots were completed in December.

Training and Field Measurement – Panel #3's measurements was accomplished 100% by Maine Forest Service crews, numbering up to 8 crews, dispersed statewide during the summer months. Plot measurement actually began in mid-February and continued at a low weekly production rate until the re-calibration training of veteran staff was conducted in mid-April. The complete complement of crews was hired, trained and began full measurement production in late May. In June, additional certification of crews in special measurements for the National FHM program and training in the use of personal data recorders was conducted. Overall weekly production for the entire panel was 3.43 plots per crew, a 7% increase over the 2000 production average.

The measurement of 673 plots was completed by November 21st, 3 to 4 weeks earlier than the two previous years.

The USDA Forest Service conducted 100% of the audits assessing the quality control and assurance of the measurements taken by MFS crews. MFS crews rated well above the required satisfactory compliance score of 85%.

Data Analysis and Reporting – Maine continued to serve as the test ground for data validation, manipulation, and report generation, now using 2 years of data. The Northeastern Research Station provided the initial dataset on March 30th and the necessary iterative debugging process began and continued throughout the summer, until both the USDA FS and the MFS were comfortable that all apparent problems had been suitably addressed and resolved.

On September 6, 2001 both the USDA Forest Service FIA – Northeastern Research Station and the DOC/MFS - Forest Health and Monitoring Division, released the joint publication "Second Annual Inventory Report on Maine's Forests." Both the report and the accompanying tables and charts can be viewed or downloaded at the following address: **http://www.state.me.us/doc/mfs/pubs/htm**

National Forest Health Monitoring Program (NFHM)

Measurement of the National Forest Monitoring detection grid continued in 2001 as part of the annualized FIA (Forest Inventory & Analysis) assessment of Maine. Maine is one of three states in the northeast with an annualized forest inventory, the others being Pennsylvania and Ohio. As an annualized FIA state, FHM and FIA plots in Maine are divided into 5 subsets or "panels" that are measured on a five year rotation. Some annualized states retain a 7 year (panel) plot rotation. FHM and FIA plots share the same sample footprint. FHM plots, now called phase 3 FIA plots, are considered a subset of the larger set of FIA plots (phase 2 plots). Approximately 10 new FHM plots will be added annually to the original four FHM panels (about 35 annually) to expand the former four year FHM rotation to the new five year FIA rotation. The fifth FHM panel will be composed of all new plots. This will keep annual FHM panel size at approximately 45. The third panel measured in 2001 contained 42 forested phase 3 plots. Thirty-one of these plots were on the original FHM plot list and 11 were newly established.

During the 2001 assessment period, FIA crews did all mensuration, damage, and crown measurements formerly done by separate FHM crews. As in 2000, FHM specialists made soils, lichen, and ozone evaluations on designated phase 3 plots. A new variable, Downed Woody Debris (DWD) was assessed operationally on phase 3 plots in 2001. The DWD variable is designed to assess the quantity and composition of dead plant material on the ground. Data from this variable contributes to the assessment of wildlife habitats, forest structural diversity, fire fuel loading, carbon sequestration, and water and nutrient cycling. The current DWD method requires extensive measurements and the addition of a second crew person to the FHM portion of the plot assessment. In many cases, the FHM crew visited phase 3 plots with the FIA crew.

FHM methods and procedures continue to be widely employed in several aspects of Forest Health & Monitoring evaluations. FHM crown variables, especially crown transparency, are being used in the assessment and monitoring of white pine decline in southern Maine. The crown dieback and tree damage variables have been integral parts of the earlier assessments of declines in American beech and brown ash.

The use of FHM data as baseline values and indicators of change became even more broad in 2001. Transparency and crown dieback were recently cited as "indicators of forest health" in the Maine Forest Service's " 2001 Biennial Report on the State of the Forest and Progress Report on Forest Sustainability Standards" (see p. 8). Also in that report, FHM soils data have been specifically identified as the basis for developing an "Erosion Potential Prediction" under Sustainability Criterion 1: Soil Productivity. Initial work involves using the FHM data and the US Forest Service's Disturbed WEPP (Water Erosion Prediction Project) model to determine the extent or potential for soil erosion and compaction, and predict runoff and sediment yield differences between harvested and unharvested sites.

Conifer Seed Orchard Insect Study - 2001

The Conifer Seed Orchard study is now in its third consecutive year at the Unity Seed Orchard owned by Plum Creek. Work in 2001 focused on cone maggots (*Strobilomyia* sp.) primarily in the hybrid larch (*Larix*) as that was the only portion of the orchard where there would be cone harvesting in 2001. However, white spruce (*Picea glauca*), black spruce (*Picea mariana*) and native tamarack (*Larix laricina*) were monitored for *Strobilomyia* as well, and the jack pine *(Pinus banksiana*) were visually checked for any significant problems.

The sequential sampling system developed in Canada again worked well in predicting cone damage from *Strobilomyia*. Two species of *Strobilomyia* are known to infest *Larix* and they have similar life cycles. Adults of *S. laricis* emerge first but they stay in the egg stage for a longer period of time than *S. viaria*. Eggs of *S. laricis* were beginning to hatch when those of *S. viaria* were being laid. This provides a small window for a single treatment when *S. laricis* larvae have not yet damaged the seed but *S. viaria* eggs will still hatch while chemical treatment is still effective. Economic threshold levels of both species were exceeded by May 28, 2001 and cone bearing larch trees were sprayed with dimethoate on May 29.

A post treatment cone sample was taken June 11 and cones were dissected. No treated cone samples had maggots in them but 50% of the unsprayed cones were infested with one to five *Strobilomyia* eggs or larvae in each of the infested cones. Samples of native tamarack cones were taken at the same time and 90% of these cones were infested with multiple larvae per cone. Many cones had 10 or more larvae in each cone. Chalcids and cecidomiids were also found in these native cones.

Hybrid trees set a good crop of cones in 2001 whereas the native stand had very few cones. Cone maggots were able to build up in the native stand. There were many cones in 2000 which were heavily infested with maggots, so that in 2001 the cone maggots crowded into the few available cones.

The black spruce had 32% of the cones infested with *Strobilomyia* on May 30. A limited check on June 19 did not show any damage from cone maggots. The black spruce has not had a problem with the *Strobilomyia* in the past.

Bark beetle attack was noted on a number of the hybrid trees and four of the native larch trees. The attack was light at this time but could increase rapidly especially in these trees that are somewhat stressed.

Coneworms (Diarychia sp) were a problem in the hybrid larch cones in 2001. Samples taken in August showed 12% of the cones, both treated and untreated, had been infested with coneworm. This indicates that the dimethoate sprayed in May to control the cone maggots was not effective at the time of coneworm attack. A light trap was set up to monitor coneworm adults but did not provide the data needed to anticipate the infestation.

The hybrid larch again had spruce gall adelgids (*Adelges lariciatus*) on foliage and in cones but they did not appear to affect the trees or cones. Gypsy moth (*Lymantria dispar)* larvae were found in low numbers in the hybrid trees as

well. Larch casebearer (*Coleophora laricella*) numbers were low again in the native larch and no action was necessary in 2001.

Yellowheaded spruce sawfly (*Pikonema alaskensis*) damage was light to moderate on a few white spruce and trace amounts on black spruce. The white spruce also had low numbers of eastern spruce gall adelgids (*Adelges abietis*). There are some clones that appear to be more susceptible to this insect then the others. Shoot blight *Sirococcus sp.* was again visible on a few white spruce trees.

Jack pine had the same insects as the past two years with pitch midge (*Cecidomyia resinicola*) present especially at the site of male cones and trace amounts of larval pitch nodules of the northern pitch twig moth (*Petrova albicapitana*).

Miscellaneous Cooperative Projects

Evaluation of the potential of the exotic predator, *Pseudoscymnus tsugae* (Coleoptera:Coccinellidae) for biological control of balsam woolly adelgid, *Adelges piceae*, in eastern North America and for advance implementation of biological control of hemlock woolly adelgid, *Adelges tsugae*, in northern forests.

In the past four decades, native balsam fir, (*Abies balsamea*) and Fraser fir, (*Abies fraseri*) in eastern North America have been under severe attack in their southern range by the balsam woolly adelgid (*Adelges piceae*). Since the introduction of this pest from Europe in the early 1900s it has been a somewhat chronic pest in Maine. Previous biological control attempts have failed to produce lasting impacts on *A. piceae* populations. Recent trends in climatic moderation in northern forests of New England have also been accompanied by a slow but steady increase in intensity of coastal infestations of *A. piceae* in Maine.

A promising new predator (*Pseudoscymnus tsugae*) from Japan is currently being released in 10 eastern states from Massachusetts to North Carolina in an effort to combat devastating infestations of hemlock woolly adelgid (*Adelges tsugae),* a serious pest on eastern hemlock, (*Tsuga canadensis*) and Carolina hemlock, (*Tsuga caroliniana*).

In 2001 a cooperative project funded by the National Biological Control Institute was initiated by the Maine Forest Service and the Connecticut Agricultural Experiment Station to: (a) investigate the potential of *P. tsugae* for biological control of *A. piceae,* on balsam and Fraser firs in New England and (b) determine the suitability of *A. piceae* as an alternate prey species for establishment of *P. tsugae* in Maine to precede the advance of its primary prey, *A. tsugae.* Data collected in this study should provide the basis for development of a novel strategy for implementation of a biological control agent in advance of its primary prey.

Stands of mature balsam fir heavily infested with the woolly trunk phase of *A. piceae* were located in Sebec, Maine and sites involving Fraser fir were selected in Norfolk, Connecticut. Fabric cages were designed, constructed and installed on six trees at each site. The cages enclosed four feet of the tree bole starting approximately one foot off the ground. *Pseudoscymnus tsugae* beetles were released into the cages in July when adelgid populations were active. Development of the beetles was followed over the summer and fall. Larvae and prepupae were observed at both sites and beetles were seen well into the fall. The study is continuing and overwintering survival of these predatory beetles will be monitored. Small cup cages and laboratory feeding studies were conducted as well.

Preliminary results indicate that these beetles may adapt to feeding on balsam woolly adelgids as well as hemlock woolly adelgid providing another tool in the arsenal against these destructive insects. Additional studies will continue in 2002.

Sampling of Terrestrial Arthropod Populations in Association with Forest Patch Cuts

This is an ongoing study in cooperation with the Shifting Mosaic program of the Manomet Center for Conservation Studies. In 2001 the focus was shifted from T3 R8 WELS to Kibby township. Pitfall traps were deployed in forests, clearcuts and buffer areas in three forest types; hardwood, softwood and mixwood. Government interns, Rachael Strattard and Jessica Barbay monitored the traps for nine weeks from mid June to mid August. Trap catches

were processed with the primary focus on the study of ground beetles (*Coleoptera: Carabidae*) and carrion beetles (*Coleoptera: Silphidae*). Numbers of rove beetles (*Coleoptera: Staphylinidae*) and camel crickets (*Orthoptera: Gryllacrididae*) were also recorded. Preliminary assessments show the greatest numbers of beetles and diversity of genera in the forested plots with the clearcuts having the fewest specimens. This work will continue in 2002, again with the aid of Government interns.

Maine Mosquito Surveillance Project - 2001

The FH&M Division cooperated with a number of other State agencies in 2001 in a coordinated effort to define the potential risk from mosquitoes as vectors of West Nile Virus (WNV) in Maine.

Although concerns regarding lyme disease in the 1980's fostered increased monitoring of arthropod vectors of human diseases, in particular ticks, the traditional view of mosquitoes had been largely that they represented nuisance pests. However, rising concerns over the West Nile Virus (WNV) in 2000 led to increased attention to the potential role of mosquitoes as disease vectors in Maine. Although early lists of mosquito species for Maine were published by; Lathrop (1939), Bean (1946), and McDaniel (1975), these were relatively incomplete and primarily faunistic lists with little if any information on distribution and seasonality. In 2000 with WNV on our doorstep, preliminary investigations were begun to better define the bionomics and distribution of Maine's mosquito populations. Efforts during the first field season produced very sketchy results due to lack of funds, traps and dedicated personnel to conduct the work. With the availability of CDC funding support in 2001 a more organized effort was begun in southern Maine to determine the distribution of potential WNV mosquito vectors in relation to human populations and infected birds. At the same time the State Health and Environmental Testing Laboratory (HETL) facilities were expanded in Augusta to provide greater testing capabilities within the state for disease organisms in mosquitoes as well as in humans and birds.

The 2001 mosquito monitoring effort was divided into three components to utilize available personnel in the most efficient manner:

- Coastal southwestern Maine was covered by researchers at the Maine Medical Center Research Institute in Portland;
- Portland urban mosquito population studies and preliminary studies in Kennebec Co. were conducted by personnel of the Maine Forest Service's Insect & Disease Lab in Augusta (Foss and Dearborn); and
- Mosquito surveys in the Bangor area were carried out by personnel at the Pest Mgmt.Office (ME Coop. Ext. Serv.) in Orono assisted by the ME National Guard.

Overall support for the field monitoring efforts was provided to assure that results would be consistent and comparable:

- Training and support in mosquito identification was provided by Dr. John F. Burger of the University of New Hampshire at Durham, NH
- Testing of selected mosquito pools for WNV was carried out by the State HETL in Augusta.
- Overall coordination of the monitoring program was by the State Forest Entomologist from the Maine Dept. of Conservation, Forest Service in Augusta.
- Each component (unit) submitted their own report at the end of the season.

Bean, J. L. 1946. A preliminary list of the mosquitoes of Maine (Culicidae:Diptera). Can. Ent. 78:25-28.

Foss, K.A and R.G. Dearborn. 2001 (Nov.). Preliminary faunistic survey of mosquito species (Diptera:Culicidae) with a focus on population densities and potential breeding sites in greater Portland, Maine. Me. DOC/MFS/ID&M Tech. Rpt. No. 42. 35 pp. Revised May 2002 with 3 additional pages of larval data.

Lathrop, F.H. 1939. Mosquitoes collected in Maine. Me. Agr. Expt. Sta. Bull. 397:828-829.

McDaniel, I. N. 1975. A list of Maine mosquitoes including notes on their importance as pests of man. Mosquito News. 35(2):232-233.

Publications & Websites

A file of publications is maintained at the Insect & Disease Laboratory in Augusta on a variety of forest resource related topics. This file contains publications of our own plus many from other sources as well. This file is upgraded and new fact sheets are prepared as needed on a wide variety of the more common tree pest problems. Our Technical Report series, now numbering 42, is listed on page 62 and copies of most are still available. Extended conditions summary reports, such as this one, have been issued annually since 1987 (for the 1986 season). A limited number of sets of these summaries is still available.

Information on a variety of topics of current importance is also available electronically on our website at <http://www.state.me.us/doc/mfs/idmhome.htm>.

In addition to published reports, our staff continues to give talks to a variety of groups including schools and provides items of interest to the news media and various association newsletters as well.

- The following items were either published or supported by our staff during 2001.

Anonymous 2000 (July). White Pine Decline Soil Investigations: A report to the ME Dept. Of Conservation Forest Health & Monitoring Division by S. W. Cole Engineering, Inc. 37 Liberty Drive, Bangor, ME 04401. Ref. #00-0335D. 11 pp. plus 46 pp. of figures, tables and photos.

Forest Health & Monitoring Division. 2001 (March). Forest & Shade Tree-Insect & Disease Conditions for Maine - A Summary of the 2000 Situation. MFS, FH&M Div. Summary Report No. 15. 66 pp. Compiled and edited by R.G. Dearborn and C.A. Granger.

____ 2001. Forest & Shade Tree-Insect & Disease Conditions for Maine. 2 regular seasonal issues, April 2 and June 8. Compiled and edited by R.G. Dearborn and C.A. Granger.

____ 2001 (May). Mosquitoes in Maine: Focus on Protection and Control. A trifold prepared for the Mosquito Surveillance Project.

Forest Policy & Management Div. 2001 (October). The 2001 Biennial Report of the State of the Forest and Progress Report on Forest Sustainability Standards. Report to the Joint Standing Committee of the 120th Legislature on Agriculture, Conservation and Forestry. MEDOC/MFS/FP&M. 37 pp.

Foss, Kimberly A. 2001 (October) Variations in Ground Beetle (Coleoptera:Carabidae) Populations Across Specific Ecological Habitats for the Stetson Brook Watershed in Lewiston, Maine. MEDOC/MFS/FH&M Div.Tech.Rpt.#41. 20 pp. + i - ii.

Foss, Kimberly A. and R.G. Dearborn 2001 (November) Preliminary Faunistic Survey of Mosquito Species (Diptera: Culicidae) with a Focus on Population Densities and Potential Breeding sites in Greater Portland, Maine. MEDOC/MFS/FH&MDiv.Tech.Rpt.#42. 35 pp. Revised May 2002 including 3 additional pages of larval data.

Fries, M., W. Livingston, S. Howell, C. Granger, H. Trial, and D. Struble. 2001 White pine (*Pinus strobus)* decline and mortality associated with shallow rooting-depth potential. Proceedings 3rd North American Forest Ecology Workshop in Duluth, Minnesota, June, 2001 (abstract).

Fries, M., Livingston, S. Howell, C. Granger, H. Trial, and D. Struble. 2002. White pine (*Pinus strobus*) decline and mortality associated with shallow rooting-depth potential. Proceedings of the 6th International Conference on Dendroecology, Quebec City, Quebec, August, 2002 (Abstract submitted).

Griffith, D. M. And K. M. Laustsen. 2001. Second Annual Inventory Report on Maine's Forests. USDA/FS/NRS and MEDOC/MFS/FH&M. 23 pp. plus app.

Houston, David R. 2001. Effect of harvesting regime on beech root sprouts and seedlings in a north-central Maine forest long affected by beech bark disease. Res. Pap. NE-717. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 20 p.

NEFA - 2001 (March). The Economic Importance of Maine's Forests. A report from the North East State Foresters Association. 8 pp. Also Available on the web at: **http://www.nefa.conknet.com**

- Other selected publications of possible interest to our readers:

Hagen, J. M. (Compiler). 2001 (October). Forest Structure: A Multi-layered Conversation. Manomet Center for Conservation Studies (Brunswick, ME). Forest Ecosystem Information Exchange Program and Abstracts. 78 pp.

McClure, M. S., S. M. Salom and K. S. Shields. 2001 (March). Hemlock Woolly Adelgid. USDA/FS. FHTET - 2001 - 03. 14 pp.

NEFA - 2001 (March). The Economic Importance of the Northeast's Forests. A report from the North East State Foresters Association: 8 pp. Also Available on the web at: **http://www.nefa.conknet.com**

- Websites of interest:

Forest Health & Monitoring Division - Insect Collection Database - Has links to other sites such as the Maine Carabid Beetle Project: **http://www.state.me.us/doc/mfs/idmcoll/collcover.htm**

Maine Medical Center Research Institute - Lyme Disease Research Lab: **http://zappa.mmcri.mmc.org/research/lyme/lymemain.htm**

UMO - Folger Library - Maine Nature News -Has seasonal black fly reports for Maine and other items of interest: **www.mainenature.org**. Prepared by Frank Wihbey.

University of Maine at Orono - Insect Collection Database: **http://www.umesci.maine.edu/biology** - then click on "facilities," then "insect collection".

University of Georgia (The Bugwood Network) - **http://www.forestryimages.org/** a great selection of choices are available at this site.

Forest and Shade Tree Insect and Disease Conditions for Maine

2001 at a Glance

The 2001 season was an unusually active one for FH&M staff as they continued to follow the drought and its effects while battling entomological and political issues associated with the expansion of both traditional and introduced pests. By the end of the season it was evident that the drought might continue into the foreseeable future while its full impact on forest resources is still being assessed. The milder winters of late seem to have made their existence felt as well, benefiting populations of some of the more exotic pest species such as the browntail moth and hemlock woolly adelgid. Surprisingly our forests remained generally green in spite of the drought and the fall 2001 foliage show was great!

Basically beech and white pine continued to exhibit a good deal of unthriftiness and stands affected by the 1998 ice storm still look rough. Defoliation of deciduous trees by larvae of three introduced insects; browntail moth, gypsy moth and satin moth and softwoods by two native species; hemlock looper and larch sawfly exceeded expectations for the season. Defoliation by most other pests remained either low, chronic or local in nature. Spruce budworm populations (adults only) showed a slight resurgence but still remain low. Although Christmas tree growers still had to spray for control of certain insect pests, populations of others were lower than in 2000. With continued drought and mild winters, further surprises could loom on the horizon!

The Asian longhorned beetle, Asian gypsy moth, brown spruce longhorn beetle, Japanese (cedar) longhorned beetle and red pine scale have still not been found in Maine. The pine shoot beetle was first found (1 specimen) in a trap in Adamstown near the NH border in 2000. Two more beetles were trapped in 2001, one at a new site in Rangeley. The hemlock woolly adelgid (HWA), which was brought in on infested nursery stock during or before 1999, continues to draw concern as well. Although still found on some outplanted hemlock, the HWA has not become established on native trees. We urge our readers to be especially alert and watch for these pests in Maine. Report any suspected infestations to the Insect & Disease Lab. Quarantine related issues continue to be a subject for discussion.

Table 1 provides a one-point assessment source for trend levels for most of the common problems encountered in Maine in 2001.

Table 1. Damage level (*) trends for 2001 (compared to 2000 levels)

Alder Flea Beetle/Leaf Beetle	→	locally high	Larch Casebearer	→	heavy E- spotty elsewhere
Annosus Root Rot	→	moderate	Larch Sawfly	↗	locally high >50,000 A.
Apple Scab	↘		Large Aspen Tortrix	→	low endemic
Arborvitae Leafminer	→	spotty	Late Spring Frost	↗	moderate
Ash Anthracnose	↘	low	Locust Leafminer	↗	moderate to severe
Ash Leaf and Twig Rust	↗	defoliation in S coastal areas	Maple Leafcutter	→	light defoliation, <500 A.
Balsam Fir Sawfly	→	low endemic	Mountain Ash Sawfly	→	high, local
Balsam Gall Midge	↘	moderate	Oak Leaf Blister	↗	
Balsam Shootboring Sawfly	↘	off year	Oak Leaftier/Skeletonizer	→	spotty
Balsam Twig Aphid	↗	moderate	Oystershell Scale	↗	spotty, central
Balsam Woolly Adelgid	↗	locally high	Pear Thrips	→	low and spotty
Beech Bark Disease	→	high	Pine Leaf Adelgid	→	white pine - light
Birch Casebearer	→	spotty	Pine Needle Rust	→	low
Birch Leafminer	→	spotty	Pine Shoot Beetle	↗	two reports (beetle)
Bronze Birch Borer	↗	spotty	Pine Spittlebug	→	spotty
Brown Ash Decline	↘	trees improving	Pine Tip Moths (various)	→	spotty
Browntail Moth	↗	5,978A.	Porcupine Damage	→	locally high
Bruce Spanworm	→	low endemic	Red-topped Fir	→	common S central
Bud Abortion (balsam fir)	→	low	Rhabdocline Needle Cast	→	moderate to high
Butternut Canker	→	15 counties	Road Salt Spray	↗	moderate
Cone Buds (balsam fir)	↓	low	Saddled Prominent	→	low/endemic
Coral Spot Nectria Canker	↗	moderate	Saratoga Spittlebug	→	low
Cristulariella Leaf Spot	→	very low or absent	Satin Moth	↑	central, high 12,900 A.
Dogwood Sawflies	↗	high but spotty	Scleroderris Canker	→	low
Drought	↑	severe	Spider Mites	→	high, local
Dutch Elm Disease	→	moderate	Spring Frost Damage	→	moderate
Eastern Dwarf Mistletoe	↗	heavy mortality Deer Isle area	Spruce Beetle	→	high central coast
Eastern Larch Beetle	↗	heaviest Wash. & Hanc. Cty.	Spruce Budmoth	→	low and local
Eastern Tent Caterpillar	↗	spotty	Spruce Budworm	↗	moth # increasing
European Larch Canker	→	static	Spruce Galls (various)	↗	high local
Fall Cankerworm	→	low endemic	Striped Alder Sawfly	→	spotty
Fall Webworm	→	high SW >10,000 A.	Ticks (two species)	↗	spreading inland
Forest Tent Caterpillar	→	low endemic	Variable Oakleaf Caterpillar	→	low/endemic
Gypsy Moth	↑	heavy SW 29,365 A.	Viburnum Leaf Beetle	↑	heavy southern half of ME
Hemlock Borer	→	spotty	Walking Stick	→	low
Hemlock Looper	↑	26,807A severe defoliation E	White Pine Blister Rust	→	low
Hemlock Woolly Adelgid	↑	15 sites in 3 southern counties	White Pine Decline	→	high S- 1995 drought related
Horse Chestnut Leaf Blotch	→	moderate	White Pine Weevil	→	high locally severe
Ice/Snow Damage	→	damage still evident	Willow Flea Weevil	→	moderate statewide
Introduced Pine Sawfly	→	spotty and low	Winter Browning	↗	moderate
Jack Pine Sawfly	↘	light E coastal	Yellowheaded Spruce Sawfly	↗	heavy, open areas

* Damage levels: ↗- up slightly; ↘- down slightly; ↑- up sharply; ↓- down sharply; →- stable at level indicated
- Especially notable in 2001

Light Trap Survey

The Maine Forest Service has operated a system of light traps for detecting and monitoring lepidopterous forest pests since 1943. During the 2001 trapping season, twenty two (22) Rothamstead (incandescent) and Green River (black light) type light traps were operated at established sites throughout the state. All traps were operated by contracted operators except the one at Ste. Pamphile, which is a trap cooperatively operated by Seven Islands Land Company. The trap operators at Shin Pond and Blue Hill retired and did not run traps in 2001. A new trapping site in Jackman was chosen to replace the trap formerly in Dennistown. The Jackman trap was operated by Marcia Van Camp, a biology teacher at the local high school and is located on the south side of route 6 & 15 a few miles east of Jackman. Below is a summary of types of traps and operating periods for each of the trap sites (Table 2). Light trap locations are depicted in Figure 1.

Table 2. Location, trap type, and period of operation of light traps, 2001 light trapsurvey

Location	Trap Type	Operation Dates	Location	Trap Type	Operation Dates
Allagash	Rothamstead	Jul 1-Jul 30 (30 nights)	Haynesville	Rothamstead	Jun 17-Jul 31 (45 nights)
			Jackman	Rothamstead	July 1-July 20 (30 nights)
Ashland	Rothamstead	Jul 1-Jul 30 (30 nights)	Kingfield	Rothamstead	Jul 1-Jul 30 (30 nights)
Bar Harbor	black light	Not operated	Millinocket	Rothamstead	Jun 17-Jul 31/Aug 17-Sep 30 (90 nights)
Biddeford	Rothamstead	Jun 17-Jul 31 (45 nights)	Mt. Vernon	black light	May 18-Jul 31/Aug 17-Sep 30 (120 nights)
Blue Hill	Rothamstead	Not operated	No. Bridgton	Rothamstead	May 18-Jul 31 (75 nights)
Brunswick	Rothamstead	Jun 17-Jul 31 (45 nights)	Rangeley	Rothamstead	Jun 17-Jul 31 (45 nights)
Calais	black light	Jun 17-Jul 31/Aug 17-Sep 30 (90 nights)	Shin Pond	Rothamstead	Not operated
Chesuncook	black light	Jun 17-Jul 31/Aug 17-Sep 30 (90 nights)	So. Berwick	Rothamstead	May 18-Jul 31 (75 nights)
			St. Aurelie	Rothamstead	Jul 1-Jul 30 (30 nights)
Elliotsville	Rothamstead	Not operated	St Pamphile *	Rothamstead	Jul 3-Aug 31 (60 nights)
Exeter	Rothamstead	Jun 17-Jul 31 (45 nights)	Steuben	black light	Jun 17-Jul 31/Aug 17-Sep 30 (90 nights)
Greenbush	Rothamstead	Jun 17-Jul 31/Aug 17-Sep 30 (90 nights)	Topsfield	Rothamstead	Jun 17-Jul 31/Aug 17-Sep 30 (90 nights)
Guerette	Rothamstead	Jul 1-Jul 30 (30 nights)	Washington	Rothamstead	May 18-Jul 31 (75 nights)

* Intermittent operation

The trapping periods target potential forest pests for each specific site and forest type. Traps used to monitor spruce-fir insects were operated for thirty (30) days from July 1 to July 30; traps monitoring hardwood or hardwood-softwood insect pests were operated forty five (45) days from June 17 to July 31; traps monitoring the **spring-flying hemlock looper**, *Lambdina athasaria* and other early hardwood or hardwood-softwood insect pests were operated seventy five (75) days from May 18 to July 31; traps monitoring the **fall-flying hemlock looper**, *Lambdina fiscellaria* were operated 45 days from August 17 to September 30.

With the exception of Mt. Vernon & Steuben, all trap catches were processed at the I&DM laboratory during the season as they were received. The Steuben trap catches were processed at Steuben by Michael Roberts, the trap operator. The Mt.. Vernon catches were processed by Richard Dearborn. Trap catches of most of the major pests being monitored are summarized in Table 3. Further results of the light trap survey are included in summaries of various pests discussed in the body of this report.

Table 3. Comparison summary of light trap survey collections of forest pest species, 2001

	Species								
Location	*Choristoneura conflictana*	*Choristoneura fumiferana*	*Dryocampa rubicunda*	*Heterocampa guttivata*	*Leucoma salicis*	*Lochmaeus manteo*	*Lymantria dispar*	*Malacosoma disstria*	*Symmerista spp.*
Allagash	0	4	0	0	0	0	0	7	0
Arundel*	-	-	-	-	-	-	-	-	-
Ashland	0	0	1	1	0	2	0	18	0
Bar Harbor	-	-	-	-	-	-	-	-	-
Biddeford	0	3	4	4	0	4	9	14	1
Blue Hill	-	-	-	-	-	-	-	-	-
Brunswick	7	17	13	0	1	2	3	19	0
Calais	0	10	10	0	0	0	0	20	11
Chesuncook	0	1	0	0	2	74	0	1	10
Dennistown	-	-	-	-	-	-	-	-	-
Elliotsville	-	-	-	-	-	-	-	-	-
Exeter	0	10	2	1	0	1	0	0	8
Greenbush	0	1	27	0	0	4	0	25	1
Guerette	0	5	0	0	2	3	0	0	0
Haynesville	0	1	4	0	8	3	0	23	2
Jackman	0	0	3	0	0	2	1	16	1
Kingfield	0	0	0	0	0	2	1	4	0
Millinocket	0	1	6	3	2	4	5	29	27
Mt. Vernon	12	16	10	24	0	5	27	151	33
No. Bridgton	0	2	4	0	0	0	0	32	6
Rangeley	0	2	0	0	1	2	0	0	0
Shin Pond	-	-	-	-	-	-	-	-	-
South	0	1	107	0	0	8	18	84	14
Ste. Aurelie	0	0	0	0	0	0	0	2	0
Ste. Pamphile	0	0	0	0	6	0	0	28	0
Steuben	0	3	13	0	0	0	6	2	0
Topsfield	0	0	5	0	0	0	0	0	1
Washington	0	85	27	0	0	12	0	21	22
Total Moths	**19**	**162**	**236**	**33**	**22**	**128**	**64**	**496**	**137**

* Intermittent/incomplete operation

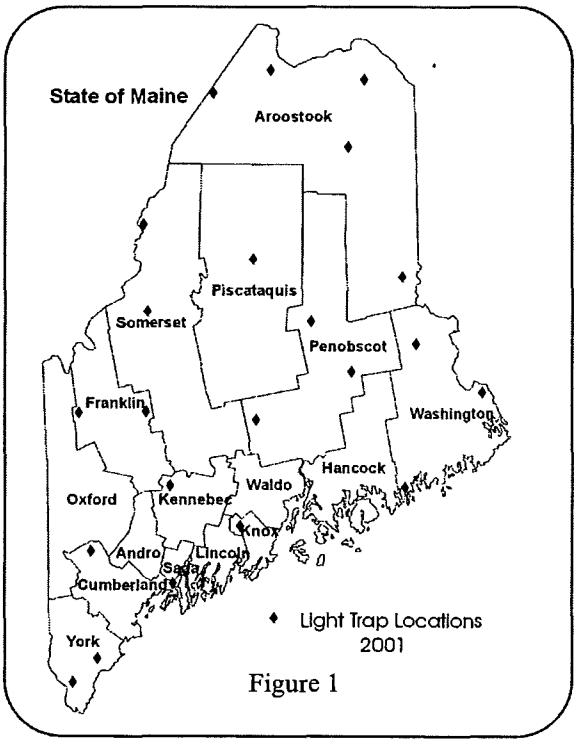
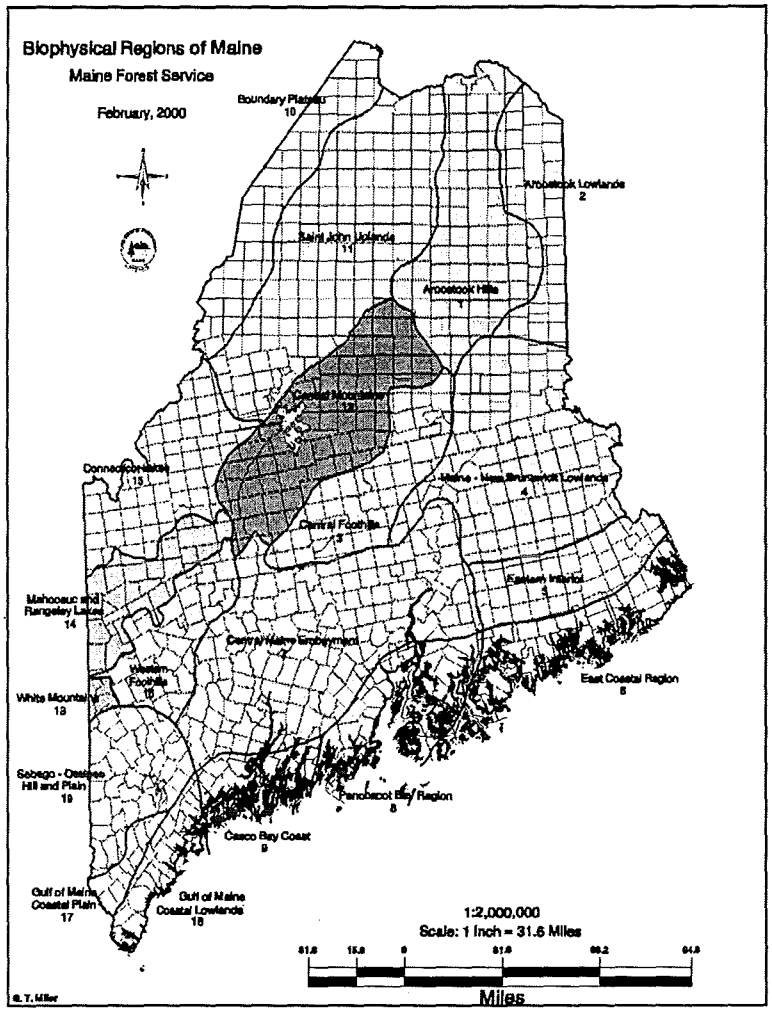


Figure 1



Phenology

Tracking insect and disease development and trying to correlate this to host development and climatic events is at best a juggling game. Over the years we have kept records on a variety of items and now with computerization of many of our records some association may become evident. Although survey procedures are changing, there is increasing interest in assigning quantifiable impact assessment to climatic events. The drought of 1995 continues to leave its mark on some stands, especially white pine on sandy sites. The severe ice storm events of January 1998 also have had an impact that will take years to evolve as well. Drought-like conditions in many areas of the state in July and August of 1999 followed by excess moisture in September and October and a much milder than normal period through December may also prove to be significant weather events. In 2000 weather conditions were less striking but there were definite extremes of moisture or lack thereof. Continued mild weather during the winter of 2000/2001 followed by widespread drought during the summer of 2001 followed by a mild early winter period have caused large drops in the water table. Surprisingly, surface moisture has been sufficient to keep vegetation green in most cases. This may change, however, if the drought continues. And more relationships between different events are sure to evolve.

In keeping with past practices we continue to use a biophysical region system in breaking the state into logical compartments. Since Janet McMahon first developed a system of regions specifically for Maine in 1990 there have been a number of modifications. The integration of her system with the national system proposed by Keys and Carpenter in 1995 resulted in the plan now set forth by the Maine State Planning Office (McMahon, Janet 1998 (July). An Ecological Reserves System Inventory. Augusta, Me. Me. State Planning Office. 122 pp.). This is the system shown in Figure 2. All records in FH&M's Collections and Historical databases can be queried using this regional system.

INSECT Problems Associated With Trees in 2001

(A) Softwood Insect Pests

Adelgids (various) - These insects are often incorrectly referred to as aphids and they are closely related. Adelgids are generally considered more serious tree pests than aphids, however, and are more difficult to control as well. More than ten species of adelgids occur in Maine. Four of these; the **balsam woolly adelgid, eastern spruce gall adelgid, hemlock woolly adelgid** and the **pine bark adelgid** complete their entire life cycle on a single host. Most if not all of the others require two conifer hosts with a species of spruce being the gall bearing host. Among this second group it is the **Cooley spruce gall adelgid** and the **pine leaf adelgid** which generate the most concern, primarily in regard to damage to the non spruce host. See species entries for details.

Aphids (especially *Cinara* spp.) - These very gregarious, usually dark, aphids are locally abundant nearly every year. Hosts most often affected are balsam fir, spruces and eastern white pine. While the aphids themselves can be a nuisance it is the associated sooty mold fungus that causes the greatest concern. Damage is primarily aesthetic.

Arborvitae Leafminer (a complex of four species) - Populations remained fairly stable in 2001 except for locally high numbers and associated heavy damage in central and eastern Maine. The heaviest infestations in Hancock, Kennebec, Penobscot, Waldo and Washington counties continue to exhibit varying degrees of mortality ranging from 5-25% in some forest stands.

Severe damage also occurs on commercial arborvitae varieties, especially some columnar forms, which may be so severely damaged that only a green crown of foliage is left. In some of such situations native arborvitae nearby show only spotty damage.

Balsam Fir Sawfly (*Neodiprion abietis*) - Populations remain very low.

Balsam Gall Midge (*Paradiplosis tumifex*) - Population levels of this pest dropped significantly in 2001 in Maine with a corresponding drop in the number of Christmas tree growers reporting control projects. This pest had been very abundant in the previous three years and many growers had to resort to the use of pesticides to control this midge throughout that time period. While the midge is still locally abundant, balsam tips of suitable quality for wreath production should not be impacted by the current population in most areas. Balsam gall midge has little or no impact on forest trees but may cause very significant damage to the Christmas tree and wreath industries in this State.

Balsam Shoot Boring Sawfly *(Pleroneura brunneicornis)* - No formal survey of balsam shoot boring sawfly was done in 2001; however, the consensus of field staff indicated that the damage resulting from this pest was very light and populations generally low on balsam and Fraser fir in commercial Christmas tree farms. This is generally considered an off year for this pest.

Balsam Twig Aphid (*Mindarus abietinus*) - Light to moderate populations of this pest could be found over much of Maine in 2001 with levels high enough to warrant treatment on many Christmas tree farms. Populations appear to be increasing as indicated by much more widespread damage within forest stands across central and eastern portions of the State in 2001. Damage resulting from this pest did not negatively impact the availability of top quality balsam tips available for wreath production.

Balsam Woolly Adelgid (*Adelges abietis*)- Balsam woolly adelgid populations remain a chronic problem on balsam fir in many stands in southern and central Maine. In coastal areas and more locally inland and even more rarely in Christmas tree plantations it is the gout phase that seems to predominate. Some forest stands along the coast show extreme gouting with fir trees losing their apical dominance and eventually dying. In recent years, however, the woolly trunk phase has reappeared as well and seems to be causing more rapid mortality locally in a few forest stands. A project to evaluate the survival and reproduction of *Pseudoscymnus tsugae*

(a hemlock woolly adelgid predator) on balsam woolly adelgids was undertaken in 2001. Results to date are promising and the overwintering success of *P. tsugae* will be followed in 2002.

Bark Beetles (various) - Bark beetle populations tend to fluctuate greatly in response to the availability of susceptible host trees. During 2001 we again encountered a variety of species from isolated situations and in preliminary bark beetle surveys for the **pine shoot beetle**, which has now been found in Maine. Species most often found in association with declining red and white pine were the **pine engraver** and **Pityogenes hopkinsi.** The **eastern larch beetle** and **spruce beetle** continued to infest stressed larch and spruce trees respectively. No new reports of activity of the **northern cedar bark beetle** (*Phloeosinus canadensis*) on arborvitae or **Ips latidens on hemlock** were received but we still expect possible increases due to increased stress of these hosts. A variety of other bark beetles were also noted in 2001.

Brown Spruce Longhorn Beetle (*Tetropium fuscum*) - This European import, a relative of two native species, which has been implicated in widespread mortality of healthy, mature red spruce near Halifax, Nova Scotia remains confined to that area. The species has not yet been found in Maine.

Cone maggots - (*Strobilomyia* sp.) - Cone maggots have been an ongoing problem in Maine seed orchards. A project in one orchard has utilized a sequential sampling system developed in Canada to predict cone maggot damage and to time the treatment of these insects. This system has proved successful for the past two years in a high value hybrid larch stand. The same method was used to follow the development of cone maggot populations in untreated white and black spruce and native larchstands.

Conifer Sawflies (various) - Conifer sawfly populations remained generally low in 2001. The **larch sawfly** and **yellowheaded spruce sawfly** were the only species causing notable defoliation while most of the remaining 15 or so species were down in numbers and damage.

Cooley Spruce Gall Adelgid (*Adelges cooleyi*) - Galls of this species are fairly common on Colorado blue spruce around home grounds almost every year. Damage to its alternate host, Douglas fir, especially in Christmas tree plantings, continues to be a problem as well. See also Rhabdocline and Swiss Needlecasts (55).

Eastern Larch Beetle (*Dendroctonus simplex*) - This opportunist continues to move into stressed stands of tamarack across the state causing an increasing number of pockets of mortality. Once established this bark beetle seems to become more aggressive and may kill healthier trees before running its course. At this point acreage estimates would be difficult to develop. Drought-like conditions in mid summer of both 2000 and 2001 along with locally moderate to heavy defoliation by larch casebearer, larch sawfly an a variety of foliage, and/or tip blights has placed continued stress on some larch already growing on poor sites. This is especially true in central and eastern Maine. As a result, the eastern larch beetle will likely be around and causing local mortality for the foreseeable future.

Eastern Spruce Gall Adelgid (*Adelges abietis*) - This is a perennial and often severe problem in Maine and annually causes heavy gall production and shoot mortality, especially on white and Norway spruce in plantations and ornamental situations. Trees seem to exhibit varying degrees of susceptibility to this adelgid. The most susceptible trees may not die but growth will be greatly retarded and annual treatment is necessary to maintain high aesthetic value. It may be best in the case of highly susceptible trees to simply remove and/or replace them.

European Pine Shoot Moth (*Rhyacionia buoliana*) - Populations of this species and resulting damage, especially in red pine, remain chronic in coastal areas from Rockland to Wells. No new areas were reported in 2001.

Fir Coneworm (*Dioryctria abietivorella*) - Damage by this species was spotty and generally light in 2001.

Hemlock Borer (*Melanophila fulvoguttata*) - The hemlock borer and **Armillaria root rot** continue to take out stressed hemlock locally but there was little change in the incidence of these secondary hemlock problems in 2001. This could change with increased hemlock looper populations especially in conjunction with other

stressors such as drought. Declining hemlock are also frequently infested with **carpenter ants** which are simply opportunists taking advantage of ideal nesting sites in the sapwood and heartwood.

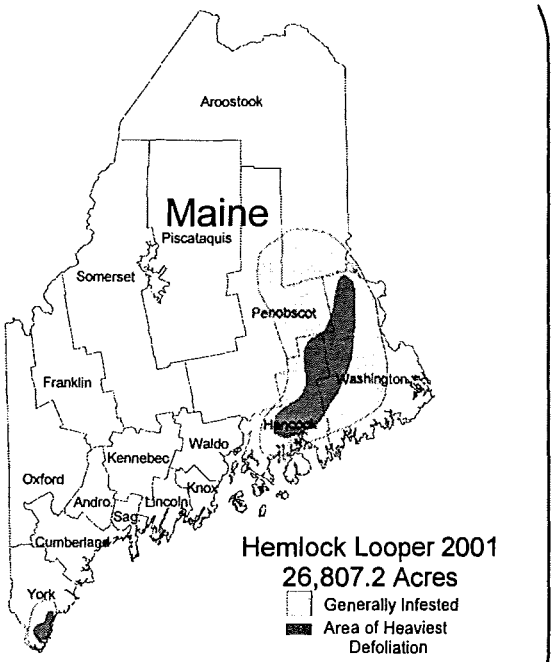


Figure 3

Hemlock Looper (Fall-flying) (*Lambdina fiscellaria*) - The heavy moth activity noted in the fall of 2000 produced significant larval populations and defoliation in many portions of southern, central and eastern Maine in 2001. During late summer aerial survey flights, 26,807 acres of heavy to severe hemlock looper defoliation were mapped (Figure 3). This was the heaviest defoliation since 1993 (Table 4). Hemlock looper caused light and moderate feeding on additional 150,000 acres that was detected during ground surveys. The hemlock looper feeds on old foliage first and often causes visible damage on intermediate and surpressed trees and regeneration before defoliation "breaks through" the crowns of dominant and codominant trees and is visible from the air. Because of these feeding characteristics, it is not possible to see and map looper damage from the air when larval populations are moderate or less. These lower levels of looper defoliation are highly visible from the ground. Also, much higher larval population levels are needed to produce damage on the new growth of balsam fir and white spruce than on hemlock. A fir stand can have nearly all of the old needles consumed by looper and this defoliation is still not visible from the air.

The most heavily defoliated areas in 2001 included stands in York near Agamenticus Mountain, the Machias Lakes area and Baskahegan Lake in Washington county, and Eastbrook and Spectacle Pond in Hancock county. Nearly the entire mapped defoliation area was directly adjacent to a lake or pond. This association is certainly due, in part, to the occurrence of hemlock stands near water but is also probably related to the behavior of looper moths. Climatic conditions near lakes may also have a role.

Table 4. Total acres defoliated by hemlock looper in Maine by year from 1988 to 2001

Year	Acres Defoliated	Year	Acres Defoliated
1988	<100	1993	42,100
1989	450	1994	<100
1990	20,000	1995-1999	0
1991	225,000	2000	>100
1992	218,000	2001	26,807

The return of significant hemlock looper defoliation so soon after the recent outbreak would have been a surprise except for looper moth monitoring efforts in 1999 and 2000 that suggested an upward trend of looper populations. High moth catches in the light trap survey (Table 5) in 2000, high numbers in spruce budworm and Gypsy moth pheromone traps in southern and eastern Maine in 2000 pointed upwards. This along with observations of high moth activity by FH&M staff and cooperators keyed in an increased larval survey effort in 2001. FH&M staff made a total of 323 hemlock looper larval counts throughout the area where moth activity was recorded. Counts were made using a branch beating method and began in late May and continued through much of the larval development period. Five hemlock or fir branches were checked

at each sample location and the counts reported as the mean number of larvae per branch. Counts ranged from 0 to 57 larvae. Significant larval counts (10 or more per branch) were recorded from York, Penobscot, Hancock, Washington, Aroostook, and Lincoln counties. The highest levels were found in northern Hancock, southern York, east central Penobscot, southeastern Aroostook, and several portions of Washington counties. Many high areas were the same areas attacked during the last outbreak.

During the late stages of larval development in late July, FH&M staff reported numerous, apparently diseased larvae. These diseased larvae were especially common in the areas of highest population. Also noted during the larval period were significant numbers of other loopers in some areas. The most commonly seen "other" larvae were those of the **false hemlock looper** (*Nepytia canosaria*). In some areas, false hemlock looper made up half of the total larval count. The **chainspotted geometer** was also fairly common.

Defoliation intensity in most of the mapped area was 50 to 70% of all hemlock foliage (old and new needles). Some of the most severely damaged stands experienced 70 to 100% defoliation but this was a small portion (10%) of the defoliated area. During the last outbreak nearly all trees that were less than 70% defoliated survived. Trees that were 90% defoliated often died or lost tops. Shallow, rocky, and dry sites did contribute significantly to tree mortality during the last outbreak and the 2001 drought may have a significant impact on future tree survival.

Early in the season the FH&M staff felt that the 2001 population was the start of a new outbreak of similar proportions to the 1989 to 1993 outbreak but now that conclusion is in doubt. In addition to the occurrence of "sick" larvae late in larval development there was a sharp reduction in moth activity in 2001 in our light trap survey compared to the fall of 2000 (Table 5). Hemlock looper moths were also not reported in nearly the numbers seen in 2000 in the field and the catch in budworm and Gypsy moth pheromone traps was less than 10% of the 2000 catch.

Areas defoliated in 2001 will be visited in late May and June of 2002 to confirm the trend of the hemlock looper. As of now significant populations and resulting defoliation are possible in 2002 but a significant increase in the outbreak area is in doubt. No winter surveys are planned.

Table 5. Total number of fall-flying hemlock looper *(Lambdina fiscellaria)* moths collected at light, 1991-1995 and 2000-2001

	Year						
Location	**1991**	**1992**	**1993**	**1994**	**1995**	**2000**	**2001**
Calais	5,402	1,416	43	6	6	755	220
Chesuncook	46	16	13	145	92	255	**70
Greenbush	51	6	1	1	0	66	27
Millinocket	-	-	-	-	-	1,247	266
Mt. Vernon	32	34	5	1	3	13	22
Steuben	387	29	4	26	3	1,517	18
Topsfield	142	85	13	13	1	2	-
Total Moths	**6,060**	**1,586**	**74**	**192**	**105**	**3,855**	**623**

** did not operate trap from September 9-16

Hemlock Looper Spring-flying (*Lambdina athasaria*) - No moths of this species were seen or collected in the light trap survey in 2001 (Table 6). **Hemlock needleminer** (*Coleotechnites* spp.) activity in southwestern Maine hemlock stands also remained light and spotty in 2001.

Table 6. Total number of spring-flying hemlock looper *(Lambdina athasaria)* moths collected at light, 1993-2001

Location	Year								
	1993	1994	1995	1996	1997	1998	1999	2000	2001
Arundel	-	10	0	7	1	1	1	-	-
Biddeford									0
Mount Vernon	7	11	5	4	3	2	0	8	0
North Bridgton	34	49	152	272	320	106	38	72	0
South Berwick	0	6	0	2	3	2	12	2	0
Washington	0	0	6	0	0	2	0	2	0
Total Number of Moths	**41**	**76**	**2,158**	**2,281**	**2,324**	**113**	**51**	**84**	**0**
Total Number of Traps	**4**	**5**	**5**	**5**	**5**	**5**	**5**	**4**	**5**

Hemlock Woolly Adelgid (*Adelges tsugae*) - A statewide detection effort was launched against the hemlock woolly adelgid (HWA) in Maine using media releases; PSA's and spring monitoring surveys following up on nursery stock outplanted from CT in 1999. The HWA was identified at 10 ornamental outplanting sites in central, coastal and southern Maine in Penobscot, Hancock, Knox, Lincoln, Sagadahoc, and York counties in 2000. In 2001, this pest was detected and again treated for eradication in 15 sites in York, Penobscot and Waldo counties. Treated sites will be monitored for a period of 5 years. At this time the HWA is not established in Maine on native hemlocks. Quarantine information can be found on page 60.

Introduced Pine Sawfly (*Diprion similis*) - Populations of this species remained generally light and spotty across southern Maine in 2001 and very low elsewhere.

Jack Pine Budworm (*Choristoneura pinus*) - Low but evident moth activity occurred in traps at both Mt. Vernon and Steuben in 2001. No larvae or feeding were noted.

Jack Pine Sawfly (*Neodiprion pratti banksianae*) - Populations of this species remained a chronic problem in 2001 as they have for several years. Spotty defoliation of mature jack pine occurred in coastal areas of Hancock and Washington counties from Mt. Desert to Steuben. Most of the infested trees were again on rocky, poor growing sites and stunted. These trees frequently had other problems as well such as the **northern pitch twig moth** (p. 20) and **pine-pine gall rust** (p. 54).

Japanese (Cedar) Longhorned Beetle (*Callidiellum rufipenne*) - This introduced cedar longhorn beetle is native to Japan, Korea, Taiwan, and eastern China and was first found in the United States in Milford, Connecticut in 1998 in the branch of a live arborvitae, *Thuja occidentalis*. Arborvitae/cedar trap logs have since been used by states in the northeast to detect this exotic pest. Trap logs are placed in natural cedar stands, garden centers, and cedar processing yards. Five groups of two logs were used at each of the sites in 2000. No trapping was done by FH&M staff in Maine in 2001. The beetle has still not been found in Maine.

Larch Casebearer (*Coleophora laricella*) - Defoliation of larch early in the season by this species was again common in 2001 as it has been since 1994. While "scorching" of infested trees was spotty, yellowing of foliage by lower numbers of larvae was widespread. The most notable damage again occurred in Hancock and Washington counties where casebearer feeding mixed with that of other defoliators resulted in very thin larch.

Larch Sawfly (*Pristiphora erichsonii*) - Larch stands from Aroostook, SE Piscataquis, Central and Southern Penobscot down into much of Hancock and Washington counties have exhibited larch sawfly defoliation to varying degrees since the current outbreak began in 1995. In addition, spotty defoliation has been observed elsewhere across the state. While it has been difficult to get a fix on acreage figures due to the spotty nature of the primarily plantation oriented problem, defoliation did seem to increase in 2001 to an estimated 50,000 acres placing another layer of stress on an already stressed resource.

Larch Stressors - During 2001, larch stands that had already been weakened by severe water table fluctuations in recent years were subjected to a season that had the lowest rainfall in the history of Maine weather records (107 years). The combination of this severe drought and continued pressure from other problems such as eastern larch beetle, larch casebearer, larch sawfly and shoot blight greatly worsened general larch health and added to areas of larch mortality.

Approximately 6,350 acres of seriously defoliated, discolored, and dead larch were mapped. In addition to this mapped acreage, scattered individual larch and small clusters of stressed or dead trees were seen throughout eastern and northeastern Maine (a gross area of over 1.4 million acres). Nearly all stands mapped in 2001 contained examples of all of the stressors listed but the most common and most visible agent in mapped area was larch sawfly.

Northern Pine Weevil (*Pissodes approximatus*) - The northern pine weevil occurs throughout the state on a variety of pines and spruces. Normally considered a secondary problem, it can become more aggressive when numbers build following logging or storm damage. In recent years a series of **droughts** and other stressors have predisposed stands of red and white pine to weevil and bark beetle attack. Like bark beetles such as the **pine engraver** and ***Pityogenes hopkinsi***, the northern pine weevil is an opportunist which is always ready to take advantage of a stressed stand. No new infestations were reported in 2001.

Northern Pitch Twig Moth (*Petrova* = *Retinia albicapitana*) - "Gobs" of pitch containing larvae or pupae of this species were still very common and unsightly on twigs and branches of jack pine especially in Hancock and Washington counties. Most of these pitch masses were at the base of small branches or around buds. Damage by this insect is usually limited to minor twig and branch mortality and the unsightly pitch masses. This species has a two year life cycle and occurs statewide to some degree on jack pine. In plantations in west central Maine it is the **jack pine resin midge** (*Cecidomyia resinicola*) which causes much of the resinosis (see Summary Rpt. #10 p. 15).

Pales Weevil (*Hylobius pales*) - No pales weevil activity was reported in 2001.

Pine Bark Adelgid (*Pineus strobi*) - This continues to be a local problem especially on stressed urban trees.

Pine Engraver (*Ips pini*) - This widespread species breeds in all species of pine and spruce in Maine and, being an opportunist, will take advantage of stressed trees. Heavy populations can successfully invade healthy trees. Pine engraver populations were still active but spotty in 2001.

Pine False Webworm (*Acantholyda erythrocephala*) - This introduced species, which has been very destructive to white and red pines over thousands of acres in upstate New York, has still not appeared in Maine, at least at destructive levels.

Pine Gall Weevil (*Podapion gallicola*) - This insect continues to show up wherever red pine is found. It is seldom a serious problem, however, branches of some trees may have sufficient numbers of galls to cause branch mortality.

Pine Leaf Adelgid (*Pineus pinifoliae*) - Populations and damage were generally light and spotty in 2001. Although odd years are normally the gall years on spruce, we seem to be seeing more galls every year on black spruce as well as high numbers of individuals on the alternate host, eastern white pine.

Pine Needleminer (*Exoteleia pinifoliella*) - This species is primarily a pest of jack and pitch pine in Maine. Damage has been locally heavy in southwestern Maine in the past, but populations have remained generally low. Population increases were however noted locally in some areas of Cumberland and York counties in 2000 and continued to remain moderate in 2001.

Pine Needle Scale (*Chionaspis pinifoliae*) - This species is a perennial pest on a wide variety of conifers. Populations always seem heaviest on Scotch and mugo pine in Maine and thus the problem is more oriented to urban and occasionally plantation situations. High populations were noted locally in 2001 as expected.

Pine Root Collar Weevil (*Hylobius radicis*) - No reports of activity by this species were received in 2001. It so far remains a relatively rare problem associated with Austrian, red and Scotch pine nursery stock in southwestern Maine.

Pine Shoot Beetle (*Tomicus piniperda*) - One specimen of this beetle (PSB) was collected for the first time in Maine in Adamstown during the spring 2000 trapping survey conducted in central and southern counties. Two beetles were trapped during the survey conducted in 2001. One was collected at the same trap site in northern Oxford county; the other was trapped at a Rangeley trap site and identified in December. No infested trees or damage were found during ground surveys performed in 2000 and 2001. Oxford county was placed under an interim PSB quarantine rule in July 2001 by USDA APHIS PPQ. Federal quarantine rules were being finalized in December 2001. A state PSB quarantine prepared by the Maine Department of Agriculture also went into effect in November 2001. The state quarantine rules designate the northern portion of Oxford county north of the Appalachian trail as the PSB regulated zone and will be modified to include the area of northern Franklin county and to also parallel final federal quarantine rules (see quarantines p. 60)

Pine Spittlebug (*Aphrophora parallela*) - Spittle masses containing the pale yellow and black nymphs of this species were again abundant on a variety of conifers in 2001. Populations changed little from 1997 levels and were locally heavy on mugo, Scotch and eastern white pine.

Pine Tip Moth(s) (? *Rhyacionia* spp.) - Pitch pine in one area of Scarborough were found to be heavily infested with larvae of one or more species of tip moth in 2000. The infestation was severe enough to cause some branch mortality. We still have not determined the nature of the problem.

Pitch Mass Borer (*Synanthedon pini*) - Large globs of pitch, containing reddish brown frass and wood chips, covering larval workings of this clearwing moth were evident but not a problem in 2001. This species seems to be most common on the boles of large, usually stressed, white pine and Colorado blue and Norway spruce.

Red Pine Scale (*Matsucoccus resinosae*) - We have not yet found this species in Maine although it has been reported from Massachusetts. This serious pest of red pine could move into Maine stands with increasing movement of logs and nursery stock so we will be watchingout for it.

Red-topped Fir (caused by larval activities of the whitespotted sawyer beetle, *Monochamus scutellatus*) - Balsam fir along Interstate 95 from Clinton to Carmel and in adjacent areas still show active populations of this woodborer and resultant damage.

Red Turpentine Beetle (*Dendroctonus valens*) - This continues to be a low-key and very local problem affecting red pine in Maine.

Saratoga Spittlebug (*Aphrophora saratogensis*) - No new infested areas were reported in 2001. Very limited areas are currently impacted by this pest in Maine.

Spruce Beetle (*Dendroctonus rufipennis*) - The condition of many of Maine's coastal spruce stands continued their gradual decline in 2001. The most immediate cause of spruce stand deterioration continues to be spruce beetle. Underlying causes of poor stand quality, in most cases, are tree overmaturity, a total lack of stand management, and location (sites where tree longevity is severely limited by shallow, rocky soils.) The current spruce beetle infestation remains confined predominantly to the central Maine coast, especially Penobscot Bay (Figure 4). The area infested by spruce beetle did not increase in 2001 and the intensity of

attack in infested stands continued a decline as first noted in 2000. As of November 2001 several Penobscot Bay stands had lost more than 50% of all their red and white spruce over 15" in diameter.

Severe drought conditions experienced in 2001 may contribute to a resurgence in spruce beetle attack in 2002. Dry conditions in 1999 and 2001 have placed considerable added stress on large coastal spruce that have not been attacked by spruce beetle to date. Also, many beetle damaged stands experienced severe blow-down during 2001.

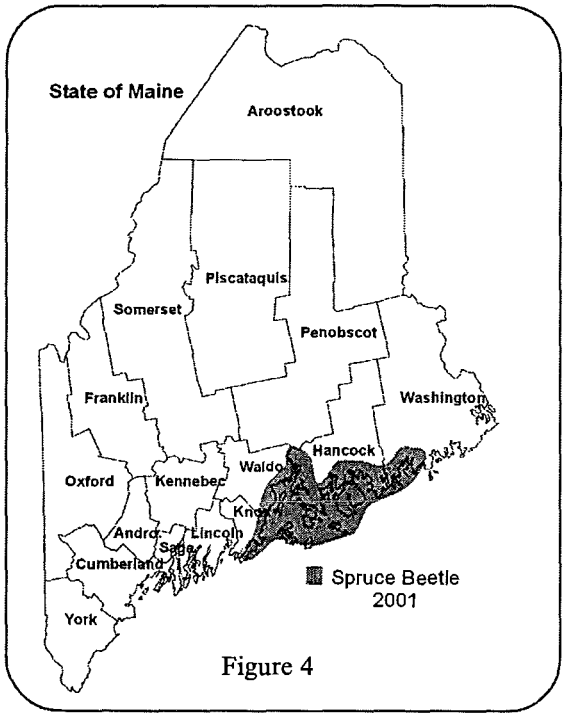


Figure 4

Spruce Budmoth (*Zeiraphera canadensis*) - This chronic problem affecting white spruce varies in intensity from year to year. No noticeable defoliation was observed in 2001 although larvae could be found in low numbers throughout the state.

Spruce Bud Scale (*Physokermes piceae*) - This scale often remains inconspicuous until populations reach high levels and sooty mold and discoloration of growing tips draw attention to the problem. Populations continue to remain locally high on plantation spruce throughout the state.

Spruce Budworm (*Choristoneura fumiferana*) - Monitoring of low level spruce budworm populations continued in 2001. Monitoring included field observations, a statewide light trap network, and pheromone baited traps that are highly attractive to budworm moths.

Field observations were made by FH&M staff in 2001 but, no larvae were found and no defoliation was detected. Light traps were operated through the budworm flight period at 22 locations statewide. Spruce budworm moth catch in the statewide network of light traps was the highest since 1989 (Table 7). Budworm moths were caught in 16 of the 22 light trap locations in 2001 compared to catches in 10 of 25 in 1999 and 15 of 25 traps in 1998 (Table 7). The number of budworm caught per trap increased from 3.4 in 1998 and 1.7 in 1999 to 7.4 in 2001, making the 2001 catch the highest since 1989 (Table 8).

In 2001, 38 pheromone trap locations, the same number of sites as in 2000, were evaluated for spruce budworm moth activity. Moth catch in pheromone baited traps increased noticeably in 2001. Levels were higher than 1998 levels which had been the peak since the collapse of the last outbreak (Table 9). Budworm moths were caught in 93% of the traps deployed in 2001 compared to 92% positive traps in 1998, 48% in 1999 and 71% in 2000. In 2001, moth catch per trap was five or more in 10 locations compared to only 6 locations in 2000 and only 1 location in 1999. The highest 2001 catches per trap were 19 in Coburn Gore and 18 in Holeb. The lower catch in 1999, that may have been caused by low pheromone potency, ended a three year trend toward increased moth catch but the strong increases in 2000 and 2002 suggest a return to the increasing activity trend.

In 2001, as in 2000 and 1999, one industrial forest landowner cooperated with FH&M budworm survey effort by placement and retrieval of pheromone traps in additional locations in northern Maine. Moth catch in these additional locations had counts similar to traps placed by MFS staff. This additional survey effort, in north portions of the state, added valuable data to the MFS survey.

Table 7. Total number of spruce budworm(*Choristoneura fumiferana)* moths collected at light

	Year								
Location	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Allagash	7	0	2	0	0	0	0	0	4
Arundel		0	3	2	0	2	0*	-*	-
Ashland	0	0	0	0	1	2	0	0	0
Bar Harbor					0		0	-*	-
Biddeford								0	3
Blue Hill	4	0	0	0	8	0	1	0	-
Brunswick	0	0	1	0	3	6	2	0	17
Calais	0	0	0	0	3	1	0	0	10
Chesuncook	1	0	0	0	2	2	0	0	1
Dennistown	0	0	1	0	0	1	0	-*	-
Elliotsville	2	0	1	0	8	5	0	-*	-
Exeter	21	16	6	3	4	38	19	0	10
Greenbush	1	0	0	0	0	0	0	0	1
Guerette	0	0	0	0	4	0	0	0	5
Haynesville	0	2	0	2	1	2	0	0	1
Jackman									0
Kingfield	2	2	0	1	1	0	1	0	0
Millinocket	0	0	4	9	11	1	1	0	1
Mt. Vernon	2	1	2	12	2	0	1	8	16
No. Bridgton	0	0	2	0	5	4	3	0	2
Rangeley	8	0	1	0	8	6	1	0	2
Shin Pond		0	0	3	1	0	0	0	-
South Berwick	2	0	0	0	0	1	2	0	1
Ste. Aurelie	0	0	0	0	0	6	0	0	0
Ste. Pamphile					0	0	0	0	0
Steuben	0	5	0	3	2	0	0	0	3
Topsfield	0	0	1	12	0	0		0	0
Washington	0	0	0	1	5	9	13	0	85
Total Number of Moths	**50**	**26**	**24**	**48**	**69**	**86**	**44**	**8**	**162**
Total Number of Traps	**23**	**24**	**24**	**24**	**26**	**25**	**25**	**23**	**22**

* Intermittent/incomplete operation

Table 8. Spruce budworm seasonal light trap summary - 1963-2001

Year	Total # of	# of Traps	Average # of Moths/Trap
2001	162	22	7.4
2000*	8	23	0.3
1999	42	25	1.7
1998	86	25	3.4
1997	69	26	2.6
1996	48	24	2
1995	24	24	1
1994	26	24	1.1
1993	52	23	2.3
1992	16	23	0.7
1991	21	23	0.9
1990	107	24	4.4
1989	731	22	30.7
1988	209	20	10.4
1987	464	20	23.2
1986	1,365	20	68
1985	13,233	20	661
1984	17,983	20	895
1983	144,673	18	8,037
1982	49,200	20	2,460
1981	39,724	20	1,986
1980	100,537	19	5,291
1979	95,811	16	5,988
1978	220,264	17	12,957
1977	24,212	15	1,614
1976	22,308	16	1,394
1975	149,874	23	6,516
1974	158,784	24	6,616
1973	39,069	24	1,628
1972	15,959	24	665
1971	20,653	25	826
1970	1,076	24	45
1969	5,415	27	201
1968	948	24	39.5
1967	120	26	4.6
1966	51	24	2
1965	83	24	3.5
1964	159	25	6
1963	133	24	5.5
1962	258	23	11.2
1961	763	17	44.9

* Suspected miscount

Table 9. Spruce Budworm Pheromone Trap Catch in Maine - 1994 to 2001

Location	*Year*								*Location*	*Year*							
	1994	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*		*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*
Allagash	<1	<1	1	1	<1	<1	<1	2	Jonesboro	<1	<1	<1	1	<1	<1	<1	1
Calais *	<1	<1	<1	1	<1	<1	<1	<1	NE Carry		<1	<1		2	1	1	2
Chesuncook	<1	<1	<1	1	3	1	2	<1	Princeton		<1	<1	1	1	3	1	1
Clayton Lake	<1	<1	<1	<1	2	<1	1	2	Steuben *	2	2	<1	<1	2	1	1	2
Coburn Gore	<1	1	1	3	11	2	3	19	St. Pamphile	1	1	<1	<1	4	<1	4	3
Connor	<1	<1	2	<1	1	<1	3	2	Topsfield *	<1	<1	<1	<1	1	1	2	1
Daaquam	<1	<1	1	<1	1	<1	<1	1	Waltham	4	<1	<1	1	4	1	1	3
Dennistown *	<1	1	2	5	14	3	8	12	Smith Pond *	<1	<1	<1	5	3		3	
Dickey Brook*	<1	<1	1	<1	1		2	3	St Frances Lk.	<1	2	3	3	8	<1	<1	3
Duck Lake	<1	<1	<1		1			1	Oxbow	<1	<1	1	2	6	<1	4	2
Franklin	37	4	<1	3	11	1	1	7	Ragmuff			4	1	18	2	2	3
Garfield	<1	<1	2	<1	6	<1	3	4	Rangeley	2	<1	3			1	5	7
Greenbush *	<1	<1	<1	5	10			11	Ste. Aurelie *	<1	1	12	9	24	<1	5	12
Haynesville *	<1	<1	<1	3	7		4	6	Matagamon***	1	1	2	1	6	<1	3	4
NEW TRAPS IN 1997																	
Dallas Twp.				2	6	1	3	6	Magalloway				3	3	1	8	3
Edmonds				<1	1	<1	<1	4	Parkertown				9	5	2	14	2
Grafton				<1	4				Perry				1	1	<1	<1	3
Holeb				7	8	8	8	18	Round Pond				2	3	<1	2	1
T11R9				<1	3	<1	1	1	T5R16				1		<1	3	8
Big 20				<1	<1	<1	1	2	T5R20				5	5	<1	3	4
Baker Lk.				1	1	<1	1	<1									

Spruce Spider Mite (*Oligonychus ununguis*) - Mites, and in particular the spruce spider mite, are present to some degree on most conifers every year and the characteristic mottling often detracts aesthetically from otherwise lush green foliage. Populations remained generally chronic in 2001 or up somewhat and were locally heavy enough to warrant control on some ornamental conifers and in some balsam fir Christmas tree plantings.

Taxus Mealybug (probably *Dysmicoccus wistariae*) - Mealybugs on *Taxus* (yew) have not been uncommon in Maine over the years but this has normally been seen as an ornamental or nursery problem. As a result of the **hemlock woolly adelgid** surveys in 2000 we recognized that we didn't realize how much *Taxus* there was out there! We received a number of reports during the season from homeowners who thought that this mealybug was HWA even though the hosts were off. Similar reports were received in 2001.

Western Conifer Seed Bug (*Leptoglossus occidentalis*) - This species has now spread across much of the state since we first observed it in 1994. The relatively large (3/4"+ long) and attractive adults are camouflaged brownish in color and seldom seen out-of-doors, however, they become easily seen (and smelled) after they enter homes to spend the winter.

The western conifer seed bug can destroy a fairly high number of seeds within developing cones. Although their food (seeds) range is wide, they seem to like pines and Douglas-fir and are especially abundant in homes in or near pine stands. We are not sure as to whether or not this insect will feed on balsam fir, larch or spruce. So far no significant seed damage has been reported.

Whitemarked Tussock (*Orgyia leucostigma*) - No reports of this species were received in 2001.

White Pine Weevil (*Pissodes strobi*) - The white pine weevil remains undoubtedly the most economically damaging pest of white pine in Maine, rivaled only by white pine blister rust (p. 57). This weevil is a chronic problem in most areas and seriously limits growth of good straight white pine unless controlled. Young trees (three to 30 feet in height) normally bear the highest incidence of attack. Although weevil populations remain fairly stable at high levels; annually visible new damage to high value stock fluctuates, due in part to limited availability or improper use of effective, registered pesticides. Corrective pruning will help in the case of ornamental white pine as well as Colorado blue and Norway spruce.

Whitespotted Sawyer Beetle (*Monochamus scutellatus*) - Whitespotted sawyer beetles are very common in Maine but their presence has caused increased anxiety in recent years due to their appearance which is similar to that of the **Asian longhorned beetle** (p. 27). Once you see the two together, however, they are distinct. Larvae of the whitespotted sawyer are one of the familiar species of roundheaded borers so common in stressed and dying or recently sut softwood trees. While all softwoods are subject to attack, eastern white pine and balsam fir (see **red-topped fir** p. 21) seem to be favorites.

Yellowheaded Spruce Sawfly (Pikonema alaskensis) - There were scattered reports of a slight resurgence of yellowheaded spruce sawfly (YHSS) defoliation in 2001. The heaviest defoliation was observed on ornamentals and individual open-grown roadside trees across much of the State. Defoliation in plantations was generally light and no control projects were undertaken. This was the last year of a five year project to measure the long term effect of YHSS defoliation. A report on that work should be completed in 2002.

(B) Hardwood Insect Pests

NOTE: This section includes all insect pests of deciduous trees and shrubs in forest, ornamental and urban settings

Alder Insects - Browning of alder was widespread and obvious but spotty in 2001. The most common defoliator was again the **alder flea beetle** (*Altica ambiens alni*). Associated species which were often associated with the browning as well were the **alder leaf beetle** (*Chrysomela mainensis mainensis*) and **Alder sawfly** (*Arge* sp.).

Aphids, Leafhoppers, Treehoppers and Scales (various) - The activities of these "suckers of sap," which are occasionally a problem as their overflow of honeydew drizzles down on cars, were again noticeable in 2001. Our only measure of abundance for these insects is based on the frequency of reports and these were spotty in number.

Ash Flowergall Mite (*Aceria fraxiniflora*) - White ash showing the characteristic bud proliferation resulting from the activities of this mite remained prevalent but spotty in 2001. Surveys are not done specifically for this pest but comments from staff and a variety of observers indicate that damage seems highest in Kennebec County. Some twig and branch mortality is associated with this activity. For a discussion of this phenomenon see our Summary Report #8 for 1993, p. 33.

Asian Longhorned Beetle (*Anoplophora glabripennis*) - This potentially serious woodboring pest of deciduous trees, especially maples, has still not been found in Maine. We continue to receive reports of suspected infestations but all have proven negative. Many of these reports concern sightings of our common softwood boring **whitespotted sawyer beetle** which somewhat resembles ALB adults.

We continue to keep public awareness of the potential seriousness of this problem at a high level to encourage early detection. Please notify the Insect and Disease Lab of any suspected infestations. Any beetles suspected of being this species should be retained for confirmation. A wallet-sized color photo card showing how to recognize and report this species is available.

Barklice or Psocids - "Herds" of these interesting "little cattle" are often very noticeable on the bark of various trees across much of Maine. Although colonies are usually more abundant and evident on hardwoods, they also occur on a variety of softwoods as well. The psocid species most commonly noticed in numbers on tree bark in Maine is *Cerastipsocus venosus*. Barklice feed on lichens and fungi on the tree bark and pose no threat to the trees themselves.

Beech Problems (various) - Beech throughout the state continues its hard struggle for existence and many stands again showed extensive wilting, discoloration, deformed foliage and twig dieback in 2001. This was especially true across central and eastern Maine where **beech bark disease** (p. 50) is heavy on trees on poor sites. These trees also often support populations of **oystershell scale** (p. 35). Drought continues to be second only to beech bark disease as a stressor of beech in Maine. A recent publication on beech management by Houston (p. 9) provides timely advice on the subject.

Beech Scale - See beech bark disease (p. 50).

Birch Casebearer (*Coleophora serratella*) - Birch casebearer populations remained low and spotty in 2001.

Birch Leafminer (*Profenusa thomsoni*) - This late June blotch miner starts its mines away from the leaf margin unlike *Messa nana* which starts its mines along the edge. Populations of both species were low and spotty in 2001.

Birch Skeletonizer (*Bucculatrix canadensisella*) - Populations of this species remained very low in 2001.

Bronze Birch Borer (*Agrilus anxius*) - Dead-topped birch resulting from boring activities of larvae of this insect continue to show up where stress of one kind or another exists. Birch on **drought**-prone sites, recently thinned woodlots and "abused" landscape situations are most susceptible. Once birch are infested with this borer there is little that can be done to prevent eventual tree mortality. Damage from this opportunist increased again in 2001and if the current drought continues further losses can be expected.

Browntail moth (*Euproctis chrysorrhoea)* - Data from the annual 2000/2001 winter survey indicated a continued reduction in the total area infested by the browntail moth (BTM) with very limited numbers of overwintering webs being located outside of the Casco Bay area (Cumberland county), in Hancock or York counties as they have in the past. The browntail moth populations in the northern portions of Casco Bay had shown some signs of a general decline in 2000 but they rebounded and intensified from Portland to Phippsburg (Sagadahoc county) in 2001. The annual defoliation survey done in June of 2001 delineated 5,978 acres of greater than 66% leaf loss (Figure 5). This is up from 1,537 acres in 2000 and 2,187 in 1999. It appears that the trend for 2002 could be a continued rise in populations in the Casco Bay region where control measures will likely be initiated over a much greater area than in 2001.

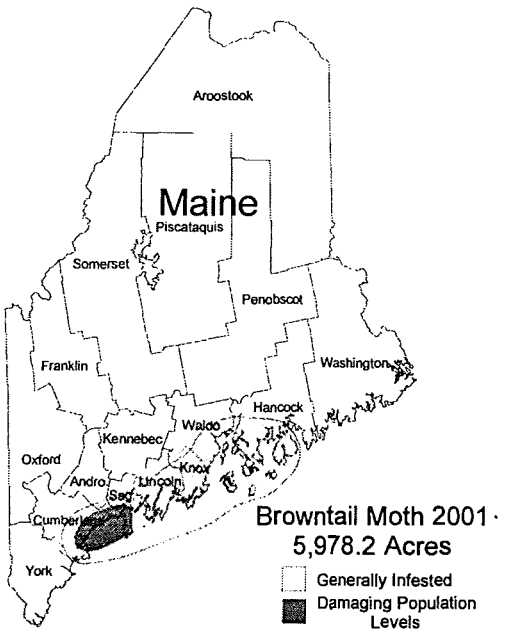


Figure 5

A municipal spray program treated approximately 200 acres on Merepoint in the Town of Brunswick using tebufenozide applied with a truck mounted mistblower at a rate of 0.125 lb. a.i. per ac. Portland also treated approximately 50 acres on Cliff Island with a combination of B.t.K. and MVPII.

Moths were sighted as far away as Lewiston during the peak flight period. Several were observed in lighted areas such as gas stations and may have been brought in on vehicles. In at least one case in Lewiston, two females were seen laying eggs on a gas pump! Moth numbers were up noticeably in the Brunswick light trap (Table 10).

Trials of the efficacy of a mating disruption technique were begun in June using Exosect traps. The Exosect trials were evaluated in December and found to provide little control in areas of high browntail population. Trials using this method in areas containing lower browntail population levels will be conducted in 2002.

The incidence of rash/dermatitis associated with the caterpillar hairs again played a role in limiting outside activity for a period in June and July. Contact with these hairs causes a skin rash similar to that caused by poison ivy. Most cases of rash reported in 2001 were relatively minor, albeit uncomfortable, but a few serious cases did occur. Most people in the heavily infested area are now alert to this and take steps to avoid exposure to the caterpillar hairs.

Table 10. Total number of browntail moths *(Euproctis chrysorrhoea)* collected at light

	Year								
Location	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Allagash	0	0	0	0	0	0	0		0
Arundel		0	0	0	0	0	0*	0	-
Ashland	0	0	0	0	0	0	0	0	0
Bar Harbor					0*		0	-*	-
Biddeford								0	0
Blue Hill	0	1	0	0	0	0	0	0	-
Brunswick	1	1	59	101	54	120	245	141	420
Calais	0	0	0	0	0	0	0	0	0
Chesuncook	0	0	0	0	0	0	0	0	0
Dennistown	0	0	0	0	0	0	0	-*	-
Elliotsville	0	0	0	0	0	0	0	-*	-
Exeter	0	0	0	0	0	0	0	0	0
Greenbush	0	0	0	0	0	0	0	0	0
Guerette	0	0	0	0	0	0	0	0	0
Haynesville	0	0	0	0	0	0	0	0	0
Jaclman									0
Kingfield	0	0	0	0	0	0	0	0	0
Millinocket	0	0	0	0	0	0	0	0	0
Mt. Vernon	0	0	0	0	0	0	0	0	0
No. Bridgton	0	0	0	0	0	0	0	0	0
Rangeley	0	0	0	0	0	0	0	0	0
Shin Pond		0	0	0	0	0	0	0	-
South Berwick	0	1	0	0	0	0	0	0	0
Ste. Aurelie	0	0	0	0	0	0	0	0	0
Ste. Pamphile					0	0*	0	0	0
Steuben	0	0	0	0	0	0	0	0	0
Topsfield	0	0	0	0	0*	0			0
Washington	0	0	0	0	0	0	0	0	0
Total Number of Moths	**1**	**3**	**59**	**101**	**54**	**120**	**245**	**141**	**420**
Total Number of Traps	**23**	**24**	**24**	**24**	**26**	**25**	**25**	**23**	**22**

* intermittent/incomplete operation

Bruce Spanworm (*Operophtera bruceata*) - Defoliation by this species remained very low in 2001. Moth numbers were also down in late fall (see **Hunter's moths** p. 33).

Butternut (?) Weevil (*Polydrusus ? sericeus*) - This very interesting little green weevil which was fairly common in 2000 seemed to all but disappear in 2001. See Summary Report #15 for 2000 (p. 27) for more on this species.

Chainspotted Geometer (*Cingilia catenaria)* - Larvae of this species are the colorful loopers which often showed up in samples of the hemlock looper this past (2001) season. The white, black-spotted moths were also more common than usual in many areas in the fall of 2001. Larvae of this species feed on a wide variety of deciduous and coniferous trees and shrubs and have more often been a pest on unsprayed blueberries than trees. However local outbreaks have occurred on trees in the past so this will be one to watch in 2002.

Cherry Scallop Shell (*Hydria prunivorata*) - This nesting or tent-making geometrid causes damage to cherry south of Maine but populations in Maine remain rather low and spotty.

Eastern Ash Bark Beetle (*Hylesinus aculeatus*) - This species is common statewide and profuse production of powdery sawdust from its workings can be seen in most firewood or on stressed and dying ash. Little change in numbers was noted in 2001. Damage by this species is minimal in Maine most seasons except occasionally in recently thinned stands.

Eastern Tent Caterpillar (*Malacosoma americana*) - Populations rose again slightly in 2001 but this species remains more of a nuisance than destructive. Tents are most common in May on roadside cherry and apple.

Elm Flea Beetle (*Altica carinata*) and Elm Leaf Beetle (*Pyrrhalta luteola*) - Defoliation of elm by either or both of these species was again noticeable locally in 2001.

European Chafer (*Rhizotrogus* (= *Amphimallon*) *majalis*) - Reports of swarming activity at dusk by what has now been confirmed as this species again occurred in southern Maine from Rockland to Kittery and as far inland as Waterville.

Fall Cankerworm (*Alsophila pometaria*) - Populations collapsed to endemic levels in 2001, however, some low level moth activity was seen statewide in the fall. See **Hunter's moths**(p. 31).

Fall Webworm (*Hyphantria cunea)* - Populations remained high again in 2001 but seemed to be spottier. The messy tents and defoliation were again more pronounced from mid July through August in Cumberland, York and southern Oxford counties where roughly 10,000 acres were affected. Defoliation elsewhere was local and spotty.

Forest Tent Caterpillar (*Malacosoma disstria*) - Populations were low and endemic in 2001 and no defoliation was observed. However, numbers of moths in our light trap survey rose noticeably in most traps (Table 11). Moth numbers tend to vacillate with little correlation to defoliation.

Table 11. Total number of forest tent caterpillar (*Malacosoma disstria)* moths collected at light

	Year								
Location	**1993**	**1994**	**1995**	**1996**		**1998**	**1999**	**2000**	**2001**
Allagash	78	64	27	8	4	0	6	0	7
Arundel		82	150	39	18	20	19*	-*	
Ashland	169	117	157	57	33	51	35	0	18
Bar Harbor					0*		12	-*	-
Biddeford							12	0	14
Blue Hill	47	221	62	17	4	2	14	0	-
Brunswick	9	35	32	33	6	8	4	0	19
Calais	279	52	28	3	1	3	5	0	20
Chesuncook	0	2	1	0	0	0	8	0	1
Dennistown	44	89	79	10	10	18	6	-*	-
Elliotsville	55	53	145	18	15	3	16	-*	-
Exeter	1	8	4	0	I	0	3	0	0
Greenbush	30	87	95	149	41	24	35	0	25
Guerette	12	32	18	4	5	14	4		0
Haynesville	45	176	64	9	6	2	11	7	23
Jackman									16
Kingfield	20	97	95	32	20	13	29	0	4
Millinocket	7	73	75	0	0	2	6	0	29
Mt. Vernon	39	187	192	46	28	23	37	120	151
No. Bridgton	297	223	102	51	9	5	3	0	32
Rangeley	48	57	11	3	2	1	7	0	0
Shin Pond		124	217	30	72	110	92	0	-
South Berwick	377	371	195	91	31	26	16	0	84
Ste. Aurelie	9	28	15	6	5	16	18	0	2
Ste. Pamphile					25*	37*	89	15	28
Steuben	2	169	11	7	2	4	1	1	2
Topsfield	102	178	40	14	0*	24		12	0
Washington	53	111	41	45	16	4	14	0	21
Total Number of Moths	**1,723**	**2,636**	**1,856**	**672**	**329**	**373**	**490**	**155**	**496**
Total Number of Traps	**23**	**24**	**24**	**24**	**26**	**25**	**25**	**23**	**22**

* Intermittent/incomplete operation

Greenstriped Mapleworm (*Dryocampa rubicunda*) - Larval populations of this species remained low in 2001 and no defoliation was reported. This species is primarily a feeder on red maple in Maine. Numbers of the familiar pink and yellow adults, the **rosy maple moth,** declined in our light trap survey (Table 12).

Table 12. Total number of greenstriped mapleworm (*Dryocampa rubicunda)* moths collected at

	Year								
Location	**1993**	**1994**	**1995**	**1996**		**1998**	**1999**	**2000**	**2001**
Allagash	2	0	0	0	0	0	0	0	0
Arundel		468	531	130	208	402	109*	-*	-
Ashland	1	0	0	0	0	0	0	0	1
Bar Harbor					-*		10	-*	-
Biddeford								13	4
Blue Hill	104	46	113	30	120	19	19	67	-
Brunswick.	4	27	20	8	10	4	2	12	13
Calais	13	29	240	19	79	41	24	16	10
Chesuncook	3	8	51	3	20	2	0	15	0
Dennistown	1	5	1	2	1	0	0	-*	-
Elliotsville	14	30	103	18	39	12	3	-*	-
Exeter	3	9	7	2	2	4	0	10	2
Greenbush	13	14	48	34	60	11	0	13	27
Guerette	0	0	0		0	0	0	0	0
Haynesville	8	12	34	5	23	24	0	6	4
Jackman									3
Kingfield	0	0	0	4	0	0	0	1	0
Millinocket	38	66	93	23	120	0	1	110	6
Mt. Vernon	5	11	32	16	3	18	19	11	10
No. Bridgton	2	6	24	20	8	10	15	21	4
Rangeley	1	0	0	0	0	0	0	0	0
Shin Pond		0	1	1	7	0	0	0	-
South Berwick	340	189	276	171	110	189	100	72	107
Ste. Aurelie	0	0	0	1	2	0	0	1	0
Ste. Pamphile					2	0	0	0	0
Steuben	22	33	56	11	36	27	7	32	13
Topsfield	31	37	133	24	0	1		12	5
Washington	90	101	181	34	24	30	38	17	27
Total Number of Moths	**695**	**1,091**	**1,944**	**556**	**874**	**794**	**347**	**429**	**236**
Total Number of Traps	**23**	**24**	**24**	**24**	**26**	**25**	**25**	**23**	**22**

* Intermittent /incomplete operation

Gypsy moth *(Lymantria dispar)* - This is the second year that gypsy moth populations increased in southern and central Maine, and larval feeding resulted in widespread defoliation of hardwoods in 2001. Feeding was very intense in portions of York and Cumberland counties with heavy defoliation of sapling and pole size white pine in many locations. This is expected to result in white pine mortality in several areas and may lead to a serious reduction in the pine composition of future stands at these sites. Aerial surveys done in July of 2001 delineated 29,365 acres of hardwood lands exhibiting defoliation in excess of 66% (Figure 6). This more than tenfold increase reflects a pattern typical of Maine's past gypsy moth outbreaks (Table 13) and, barring an epizootic, it is likely the area of defoliation in 2002 could exceed 200,000 acres. Egg mass levels increased in numbers in most plots in southern Maine while areas in central and eastern Maine continue to have only incidental egg masses. Maine was spared from an outbreak of the gypsy moth in the mid 1990's due to high larval mortality resulting from the fungus *Entomophaga maimaiga*

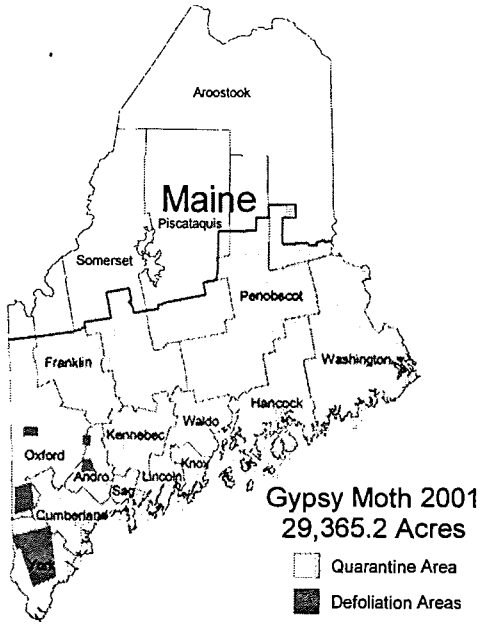


Figure 6

and late larval deaths caused by either this fungus or NPV were common in southern sites this season. The numbers of moths in our light traps remained low in 2001 (Table 14) which did not reflect the increased catches in pheromone traps.

The gypsy moth quarantine boundary (Figure 6) is checked and maintained annually by monitoring for advancing or emerging populations by means of a pheromone trapping survey. Survey materials for the regulatory survey are furnished by the USDA-APHIS-PPQ under a cooperative agreement. The survey is conducted with Delta and milk carton style pheromone traps baited with + Disparlure to catch male moths and detect significant expansion of populations in the transition zone, the infested area outside of the quarantine boundary. The traps are set out by FH&M entomology technicians and are primarily placed within two to three towns of the quarantine boundary at varying distances apart, usually 1 to 2 miles, along travel routes and at rest areas, campgrounds and similar high use areas. Traps are also placed at and around all mills and yards under gypsy moth compliance agreement. Intensified egg mass searches are conducted around trap sites that yield catches of 10 or more moths. See Quarantines (p. 59).

A total of 236 pheromone traps were placed in the transition zone and at mill sites with compliance agreements in 2001. While the number of male moths caught in traps have shown a sharp decline in areas around T1R11, TAR10, TAR11, Elliotsville, and other locations in the transition zone where catches had increased the last two years, overall catches in most areas of the transition zone have remained unchanged or only changed slightly. Aside from routine egg mass scouting performed during the trap placement and retrieval, no intensive egg mass surveys were performed in the fall of 2001.

Surveys to monitor gypsy moth populations in the regulated towns within 20 miles of the quarantine boundary were initiated in 1997 to reassess population levels in this area of the quarantine zone. A total of 108 gypsy moth pheromone traps were set out in the regulated zone in mid June, 2001. The number of male moths caught declined in many locations, especially in traps which traditionally yield high catches. (Table 14)

The **Asian gypsy moth** has still not been found in Maine.

Table 13. Total acres defoliated by gypsy moth in Maine by year from 1924 to 2001*

Year	Acres Defoliated	Year	Acres Defoliated	Year	Acres Defoliated	Year	Acres Defoliated
1924	0.71	1944	21,221	1964	<100	1984	4,881
1925	-	1945	210,881	1965	<100	1985	10,496
1926	1	1946	203,813	1966	30	1986	13,697
1927	4,985	1947	-	1967	825	1987	849
1928	5,575	1948	60	1968	777	1988	100
1929	15,187	1949	-	1969	460	1989	34,280
1930	55,174	1950	2	1970	1,080	1990	270,432
1931	20,938	1951	8,195	1971	820	1991	620,933
1932	42,298	1952	82,715	1972	40	1992	278,485
1933	19,718	1953	174,999	1973	490	1993	50,694
1934	60,403	1954	170,485	1974	860	1994	1,706.
1935	92,630	1955	10,810	1975	110	1995	0
1936	80,944	1956	7,285	1976	100	1996	100
1937	140,026	1957	120	1977	2,010	1997	<100
1938	120,432	1958	-	1978	4,120	1998	0
1939	202,193	1959	1,000	1979	23,350	1999	0
1940	204,041	1960	6,350	1980	223,810	2000	2,543
1941	122,386	1961	41,245	1981	655,841	2001	29,365
1942	850	1962	5,198	1982	578,220		
1943	10	1963	1,970	1983	26,353		

* Acreage figures used in this table for 1924 to 1960 were taken from USDA/APHIS/PPQ records. From 1960 to 1999 records are from FH&M files. The presence of a hyphen (-) generally indicates no detectable defoliation for the year.

Table 14. Total male gypsy moths *(Lymantria dispar)* collected at light

	Year								
Location	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Allagash	0	0	0	0	0	0	0	0	0
Arundel		0	1	0	0	0	0*	-*	-
Ashland	0	0	0	0	0	0	0	0	0
Bar Harbor					7		0	-*	-
Biddeford								0	9
Blue Hill	1	4	0	0	0	1	0	0	-
Brunswick	0	0	0	0	0	5	9	0	3
Calais	0	0	0	0	0	0	0	2	0
Chesuncook	0	0	0	0	0	0	0	0	0
Dennistown	0	0	0	0	0	0	0	-*	-
Elliotsville	0	0	0	0	0	0	0	-*	-
Exeter	0	0	0	1	0	1	1	0	0
Greenbush	0	0	0	0	0	2	0	0	0
Guerette	0	0	0	0	0	0	0	0	0
Haynesville	0	0	0	0	0	0	0	0	0
Jackman									1
Kingfield	0	0	0	0	0	0	9	0	1
Millinocket	1	7	0	2	0	1	3	0	5
Mt. Vernon	1	27	12	0	0	29	0	41	27
No. Bridgton	1	2	0	0	1	3	0	0	0
Rangeley	0	0	0	0	0	0	0	0	0
Shin Pond		0	0	0	0	0	0	0	-
South Berwick	153	4	23	1	0	27	9	4	18
Ste. Aurelie	0	0	0	0	0	0	1	0	0
Ste. Pamphile					0	0	0	0	0
Steuben	0	0	0	0	0	0	1	6	0
Topsfield	2	0	0	0	0	0			0
Washington	0	0	0	0	1	1	0	0	0
Total Number of Moths	**159**	**44**	**36**	**4**	**9**	**70**	**33**	**53**	**64**
Total Number of Traps	**23**	**24**	**24**	**24**	**26**	**25**	**25**	**23**	**22**

* Intermittent/incomplete operation

Hunter's Moths (adults of several species of cankerworms) - The adults of a number of species of loopers/cankerworms fly late in the season from September through November. Over the years these small (1-1.5" wingspan), frail, tan, day-flying (warmer nights too) moths have come to be known as hunter's moths because of the season. Basically three species, **Bruce spanworm, fall cankerworm** and **fall-flying hemlock looper** make up the group, however in 2001 another species, the **chainspotted geometer**, added to the mix. During this past season the hemlock looper moths again led off with periods of activity in September, although they were not as abundant as in the fall of 2000! As hemlock looper moth activity dropped by October, Bruce spanworm and fall cankerworm moth activity picked up through November. Moths of the chainspotted geometer could be found from September to early December at lights!

Lace Bugs (*Corythucha* spp.) - Lace bug populations again remained at nuisance levels in 2001 especially on birches and butternut. The tiny nymphs, and lacy adults accompanied by an assortment of cast skins and waste material (frass) gave a messy appearance to the undersurface of infested leaves. Heavy feeding caused foliage to become yellow and mottled by July.

Large Aspen Tortrix (*Choristoneura conflictana*) - Populations of the large aspen tortrix remained very low in 2001 and no damage was observed. Moth catches in our light trap survey were down as well (Table 15).

Linden Looper (*Erannis tiliaria*) - Low numbers of moths were seen in 2001 and no defoliation was reported.

Locust leafminer (*Odontota dorsalis*) - Locust leafminer populations and resultant defoliation remained moderate to extreme in 2001 and this pest has now moved throughout the state wherever its favored host, black locust, may be found. In addition, adult beetles seemed to show up on a variety of other shrubs in 2001 as

they ran out of greenery on the locust. Although some feeding was noted on other hosts no serious damage was observed. This was the first time we had noted this much activity on hosts other than locust.

Table 15. Total number of large aspen tortrix (*Choristoneura conflictana*) moths collected at light

	Year									
Location	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Allagash	0	5	0	0	1	1	0	0	0	0
Arundel			0	12	1	4	1	0*	-*	-
Ashland	0	0	0	0	3	0	0	0	0	0
Bar Harbor						0		0	-*	-
Biddeford									0	0
Blue Hill	14	2	1	5	2	27	0	0	0	-
Brunswick	3	0	0	0	2	31	0	0	0	7
Calais	2	0	0	0	0	10	0	0	0	0
Chesuncook	0	0	0	0	0	0	0	0	0	0
Dennistown	0	2	0	1	0	0	0	0	-*	-
Elliotsville	42	14	0	2	17	19	2	0	-*	-
Exeter	4	15	6	12	3	18	0	0	0	0
Greenbush	28	29	0	0	0	3	0	0	0	0
Guerette	0	0	2	0	0	0	0	0	0	0
Haynesville	3	0	0	0	0	0	3	0	0	0
Jackman										0
Kingfield	3	0	0	0	0	0	0	0	0	0
Millinocket	5	0	0	3	1	0	0	0	0	0
Mt. Vernon	2	2	0	5	2	8	6	0	2	12
No. Bridgton	2	0	0	2	0	14	1	0	0	0
Rangeley	47	92	0	13	14	44	36	0	0	0
Shin Pond			1	0	0	0	0	0	0	-
South Berwick	4	0	0	0	2	31	2	1	0	0
Ste. Aurelie	0	1	0	0	0	0	2	0	0	0
Ste. Pamphile						29	10	0	0	0
Steuben	2	1	0	0	0	2	1	0	0	0
Topsfield	15	1	0	0	4	0	3		0	0
Washington	14	0	0	2	6	5	1	3	0	0
Total Number of Moths	**190**	**164**	**10**	**57**	**58**	**246**	**68**	**4**	**2**	**19**
Total Number of Traps	**23**	**23**	**24**	**24**	**24**	**26**	**25**	**25**	**23**	**22**

* Intermittent/incomplete operation

Maple Clearwing Woodborers (Sesiidae) - Populations of the **maple callus borer** (*Synanthedon acerni*) on sugar maple and **red maple borer** (*S. acerrubri*) on red maple appeared to remain stable in 2001. No further surveys were conducted.

Maple Leafcutter (*Paraclemensia acerifoliella*) - Larval feeding discs were visible on sugar maple foliage over much the same area as in 1999 but defoliation appeared lighter and more diffused. Defoliated areas in 2001 remained limited to northern York County and locally in Franklin, Kennebec and Oxford counties and locally elsewhere including areas previously defoliated on Mt. Desert Island.

Other late season defoliators of sugar maple such as the **maple trumpet skeletonizer** (*Epinotia aceriella*) and **maple webworm** (*Tetralopha asperatella*) were present in all areas checked as well. Defoliation by these species was about the same as in 1999. Late season pests such as these usually are not a problem unless late refoliation occurs or if there are three or more successive years of high populations.

Maple Leafroller (*Sparganothis acerivorana*) - Populations of maple leafroller remained low in 2001 and no defoliation of its preferred Maine host, red maple, was observed.

Mountain Ash Sawfly (*Pristiphora geniculata*) - This introduced species is on our list of perennial problems affecting ornamental mountain ash. The 2001 season was no exception with the usual complaints in spite of the fact that control of the problem is easy to achieve. This sawfly is not a problem on native mountain ash in the wild.

Oak Insects (various) - Oak is a favorite food source for many insects of both a destructive and curiosity nature. These run the gauntlet from sucking insects (**aphids, leafhoppers, scales** and **tree hoppers**), which produce the stickum which coats cars, to a variety of foliage and twig **galls** to an equal variety of defoliators

including **walking sticks**. We saw continued moderate to high populations of the **leafrolling weevil** in 2001. The **oak leaftier (shredder)** (*Croesia semipurpurana*), **oak leafroller** (*Archips semiferana*), **oak trumpet skeletonizer** (*Epinotia timidella*) and the **oak webworm** (*Archips fervidana*) continued to turn up in calls as well and caused light but spotty defoliation throughout the range of oak in Maine in 2001. Populations of the **pinkstriped oakworm, redhumped oakworm** and the **variable oakleaf caterpillar** remained low in 2001.

Oak Leafrolling weevil (*Attelabus bipustulatus)* - Red oak foliage noticeably tattered by the leaf rolling activities of this weevil and the associated pellet-like rolls were a much more common sight across southern Maine in 2001 than, they had been for years and even elicited public curiosity. No serious damage was reported so this phenomenon served mainly as a curiosity. These small shiny black, red-spotted weevils cut and roll leaves into tiny, pellet-like rolls within which the larvae develop. These rolls usually drop to the soil but some, especially incomplete ones, may remain attached to the foliage.

Oak Leaftier (*Croesia semipurpurana)* - Defoliation by this and a variety of other oak feeders remained static in 2001 at 1999 and 2000 levels. Damage was light to moderate but very spotty. Highest populations were local and occurred primarily in Cumberland, Lincoln and Sagadahoc counties.

Oak Leaf Shot-hole Fly (*Japanagromyza viridula*) - No defoliation by this species was observed in 2001. Fly populations, emergence and bud expansion must be in sync for damage to occur.

Oak Sawflies - A variety of species were observed in 2001 but numbers were extremely low and individuals scattered.

Oak Skeletonizer (*Bucculatrix ainsliella*) - The intensity of second generation larval feeding by the oak skeletonizer continued its decline in 2001 from 1999 levels although the infested area was roughly the same (Figure 7). Most defoliation fell in the light category with less than 500 acres of spotty moderate to heavy defoliation mostly in Cumberland, Lincoln and Sagadahoc counties. Larvae in some areas were however numerous enough to prompt concern as they became unwelcome guests at many cookouts and other outdoor activities. The tiny, white, ribbed, rice-like cocoons spun up by these larvae added a questionably festive touch as they stuck to all objects beneath infested trees.

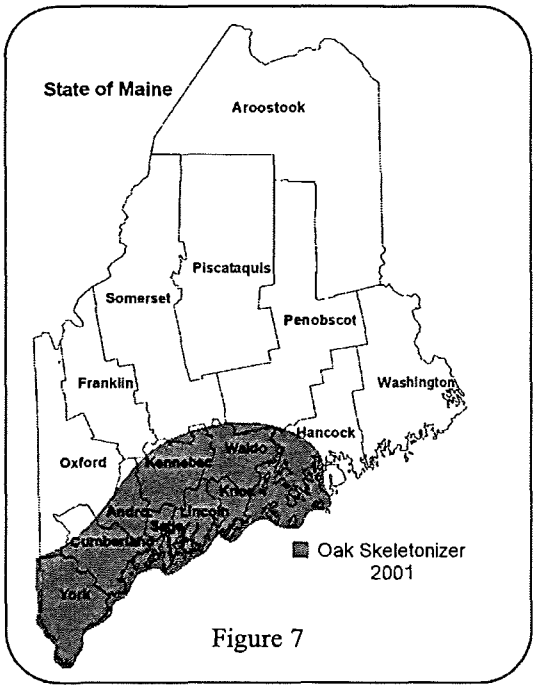


Figure 7

Oak Twig Pruner (*Anelaphus parallelus*) - Twig pruning by this species in 2001 remained fairly stable at 1997/98 levels.

Orangehumped Mapleworm (*Symmerista leucitys*) - Populations of this species were low again in 2001 and no defoliation was observed. Numbers of moths of *Symmerista* spp. dropped slightly in 2001 for the third consecutive year (Table 16).

Oystershell scale (*Lepidosaphes ulmi)* - This locally aggressive and destructive pest seems to remain chronic in beech stands across the state. Outbreaks seem to show up in different spots and with differing degrees of severity but it's always possible to find the scale and 2001 was no exception. The nature of this problem seems to generate much discussion as to how to evaluate its significance in the whole scheme of things. When branch mortality or worse shows up an evaluation is fairly easy but when the scale only serves as another stressor it is in question. Beech seems to have such a serious problem with **beech bark disease,**

drought, and a variety of other **stressors**, and **oystershell scale** just adds to the mix. Oystershell scale seems to be most common as a problem on beech in central and eastern Maine where site -related drought stress is also a common factor.

Table 16. Total number of *Symmerista* spp. moths collected at light

	Year								
Location	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Allagash	0	0	0	0	0	0	0	0	0
Arundel		4	3	3	3	0	0*	-*	-
Ashland	0	0	2	1	0	0	0	0	0
Bar Harbor					0*		2	-*	-
Biddeford								0	1
Blue Hill	6	32	33	7	1	1	0	2	-
Brunswick	1	5	17	3	0	0	1	1	0
Calais	0	0	41	13	3	10	3	3	11
Chesuncook	1	2	20	3	7	2	1	14	10
Dennistown	0	0	0	0	0	0	0	-*	-
Elliotsville	4	1	50	2	5	1	3	-*	-
Exeter	1	3	15	7	1	0	5	8	8
Greenbush	0	0	10	3	1	0	1	2	1
Guerette	0	0	0	0	0	0	0	1	0
Haynesville	0	0	2	1	0	3	2	0	2
Jackman									1
Kingfield	0	0	5	0	0	0	0	5	0
Millinocket	0	0	4	0	0	1	2	10	27
Mt. Vernon	4	23	141	42	9	22	32	65	33
No. Bridgton	21	12	73	7	10	2	7	11	6
Rangeley	0	0	2	3	0	0	0	0	0
Shin Pond		0	26	1	1	0	1	5	-
South Berwick	4	1	5	3	6	13	33	36	14
Ste. Aurelie	0	3	0	0	0	0	0	0	0
Ste. Pamphile					0*	0	0*	0	0
Steuben	0	3	13	7	7	2	0	0	0
Topsfield	0	13	152	11	0*	0		0	1
Washington	10	44	322	12	0	5	28	28	22
Total Number of Moths	**52**	**146**	**936**	**129**	**54**	**62**	**121**	**191**	**137**
Total Number of Traps	**23**	**24**	**24**	**24**	**26**	**25**	**25**	**23**	**22**

* Intermittent/incomplete operation

Peach Bark Beetle (*Phloeotribus liminaris*) – This serious pest of stone fruits (*Prunus* spp.) has not yet been recorded from Maine even though it has caused serious losses of black cherry as close as New York. Although the economic value of most of Maine's black cherry resource is much reduced from that of New York, we don't need another stressor to cherry here. Black cherry in Maine has also been suffering from a number of problems including ,but not limited to, **black knot** (p. 50) and drought.

Pear Thrips (*Taeniothrips inconsequens*) - Populations remained low and spotty on **sugar maple** in 2001. No damage observed.

Pigeon Horntail (*Tremex columba*) - This colorful wood wasp and its very large and striking parasites (*Megarhyssa* spp.) continue to draw attention. The horntails infest sugar maple and are followed by the large wasp parasites which are drawn to the woodboring larvae. The pigeon horntail continues to be associated with decayed wood on older and/or stressed trees. Reports of activity in 2001 were very similar to 1999 and 2000. Many observers were more interested in the *Megarhyssa* (we have at least 3 species in Maine) parasites which could be seen assembling, mating and laying eggs by the dozens on a single tree bole.

Pinkstriped Oakworm (*Anisota virginiensis*) - Numbers of this species remained very low in 2001.

Redhumped Oakworm (*Symmerista albifrons* and *S. canicosta*) - Both of these species occur in southern Maine and due to similarities between the two in all stages, our surveys have not separated them. Numbers of

larvae have remained very low and scattered in recent years. The numbers of *Symmerista* spp. moths collected through our light trap surveys (Table 16) were low in 2001.

Saddled Prominent (*Heterocampa guttivitta*) - No larvae of this species or defoliation was observed in 2001. Moth catches also remained low (Table 17).

Table 17 . Total number of saddled prominent (*Heterocampa guttivitta*) moths collected at light

	Year								
Location	**1993**	**1994**	**1995**	**1996**		**1998**	**1999**	**2000**	**2001**
Allagash	3	1	1	0	0	0	0	0	0
Arundel		0	0	0	0	7	0*	-*	-
Ashland	0	1	0	0	1	1	0	0	1
Bar Harbor					0*		5	-*	-
Biddeford								0	4
Blue Hill	1	2	5	0	0	0	1	0	-
Brunswick	0	0	0	0	0	0	0	0	0
Calais	0	0	0	0	0	6	0	0	0
Chesuncook	13	10	37	18	13	18	8	3	0
Dennistown	0	0	2	0	0	0	0	-*	-
Elliotsville	4	0	0	3	0	2	0	-*	-
Exeter	0	0	1	1	0	5	2	0	1
Greenbush	1	4	0	0	1	0	0	0	0
Guerette	0	1	0	0	0	0	0	0	0
Haynesville	1	1	1	0	0	0	0	0	0
Jackman									0
Kingfield	0	2	0	1	0	0	0	1	0
Millinocket	5	2	7	12	2	1	0	1	3
Mt. Vernon	1	1	13	6	2	23	18	26	24
No. Bridgton	9	2	0	0	0	0	0	0	0
Rangeley	0	0	1	2	0	0	3	0	0
Shin Pond		1	1	0	0	0	0	0	-
South Berwick	3	0	1	0	0	12	4	0	0
Ste. Aurelie	0	0	0	2	0	0	0	0	0
Ste. Pamphile					0	0	0*	0	0
Steuben	28	1	3	12	3	4	0	1	0
Topsfield	4	0	7	0	0*	0		0	0
Washington	1	0	0	0	0	1	4	0	0
Total Number of Moths	**74**	**29**	**80**	**57**	**22**	**80**	**45**	**32**	**33**
Total Number of Traps	**23**	**24**	**24**	**24**	**26**	**25**	**25**	**23**	**22**

* Intermittent/incomplete operation

Satin moth (*Leucoma salicis*) - Defoliation of both quaking and bigtooth aspen by this species increased again in 2001 for the fourth consecutive year. The infestation continued its expansion from previously infested areas in central Penobscot and Piscataquis counties (Figure 8) and went from 150 acres of moderate to heavy defoliation in 1998 to 12,900 acres in 2001 (Table 18). Defoliation elsewhere across the state was limited to scattered individual trees. The continued defoliation coupled with minimal rainfall has resulted in top mortality in some of the infested stands. Numbers of moths in the light traps continued to remain low (Table 19) further indicating that the infestation in central Maine remains local.

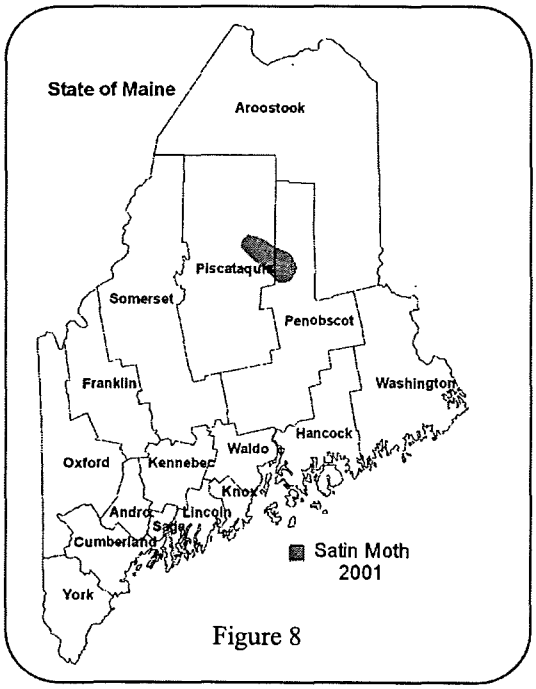


Figure 8

Table 18. Total acres of woodland aspen defoliated by satin moth in Maine by year from 1945 to 2001

Year	Acres Defoliated	Year	Acres Defoliated	Year	Acres Defoliated
1945	>50*	1972	<500*	1990	<50*
1946	<50*	1973	<6,000*	1991	-
1947	-	1974	<1,000*	1992	2,600
1948	-	1975-1981	-	1993	1,430
1949	-	1982	1,172	1994	1,600
1950	>100*	1983	5,967	1995	2,260
1951-1966	-	1984	1,258	1996	-*
1967	<1,000*	1985	<100*	1997	-*
1968	<10,000*	1986	-	1998	150
1969	30,000*	1987	-	1999	3,767
1970	40,000*	1988	<50*	2000	5,337
1971	9,250	1989	<50*	2001	12,900

* These figures are either best guess or based on ground surveys. Where no figure is given it may be due to lack of data.

Table 19. Total number of satin moth (*Leucoma salicis*) moths collected at light

	Year								
Location	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Allagash	2	0	0	2	0	0	0	11	0
Arundel		0	0	0	2	0	0*	-*	-
Ashland	3	5	1	0	0	0	0	9	0
Bar Harbor					0*		0	-*	-
Biddeford								0	0
Blue Hill	0	9	2	0	0	0	0	0	-
Brunswick	2	0	0	0	1	1	0	0	1
Calais	0	3	2	0	2	1	0	1	0
Chesuncook	1	0	0	0	0	2	0	7	2
Dennistown	5	1	0	0	0	0	0	-*	-
Elliotsville	2	0	0	0	0	0	0	-*	-
Exeter	0	0	0	0	0	0	0	0	0
Greenbush	0	1	1	1	3	0	1	0	0
Guerette	16	7	9	0	1	0	4	4	2
Haynesville	18	5	1	0	0	2	0	0	8
Jackman									0
Kingfield	0	0	0	1	0	0	0	0	0
Millinocket	3	4	0	1	0	1	0	6	2
Mt. Vernon	0	0	0	0	0	0	0	0	0
No. Bridgton	0	0	0	0	0	0	0	0	0
Rangeley	0	0	0	0	0	0	0	1	1
Shin Pond		14	0	4	2	3	0	21	-
South Berwick	1	0	0	0	0	0	0	1	0
Ste. Aurelie	0	0	0	0	0	0	0	0	0
Ste. Pamphile					0	1	18	1	6
Steuben	2	8	5	0	1	1	0	0	0
Topsfield	3	18	12	1	0*	0*		2	0
Washington	0	0	0	0	0	0	0	0	0
Total Number of Moths	**58**	**75**	**33**	**10**	**12**	**12**	**23**	**64**	**22**
Total Number of Traps	**23**	**24**	**24**	**24**	**26**	**25**	**25**	**23**	**22**

* Intermittent/incomplete operation

Striped Alder Sawfly (*Hemichroa crocea*) - Populations of this species fell off strikingly in 2001 from the levels experienced in 2000. Few reports were received in 2001. Defoliation by striped alder sawfly occurs primarily on alder and birch.

Sugar Maple Borer (*Glycobius speciosus*) - Populations of the sugar maple borer seemed to remain stable in 2001 unlike those of the **pigeon horntail**. Sugar maple borer seems to prefer stressed but still fairly sound trees to breed in.

Tussocks (various) - Tussocks are those fuzzy, variably-colored, caterpillars which often show up as defoliators of a variety of trees and shrubs. In most situations defoliation is light and the caterpillars are more of a curiosity. Occasionally, however, populations boom and defoliation becomes noticeable. Defoliation aside, it is the associated medical aspects of the problem of which is of most concern. The hairs of some species can *physically* cause skin irritation although unlike those of **browntail moth** (not a tussock) which

chemically cause a **rash** as well. **"Caterpillar rash"** or **"tussockosis"** is especially a problem during periods of hot weather. The **hickory tussock** (*Lophocampa caryae*), **rusty tussock** (*Orgyia antiqua*), **pale tussock** (*Halysidota tessellaris*), **spotted tussock** (*Lophocampa maculata*) and **whitemarked tussock** are most common. Numbers of hickory, pale and spotted tussocks were noticeable but stable in 2001 and although defoliation was negligible, human encounters (children) caused some anxious moments. Unfortunately these tussocks feed on a wide variety of trees and shrubs and seem to occur everywhere. When they do some such as the white and black hickory tussock really show up against the green foliage as does the black and lemon-yellow, spotted tussock. As a result children pick them up and cuddle (!) them and "voila" a rash occurs. One youngster in 2000 even put the fuzzy hairball-like cocoon of one in their mouth! We want to encourage youngsters not to be afraid of insects but they should limit their familiarity with fuzzy caterpillars to the friendly black and orange **banded woollybear** (p. 41) which is least likely to cause any rash.

Uglynest Caterpillar (*Archips cerasivorana*) - Populations and damage remained low and spotty in 2001.

Variable Oakleaf Caterpillar (*Lochmaeus manteo*) - Populations of this insect remained at low and endemic levels in 2001as they have since 1995. No defoliation was observed in 2001. Numbers of moths from the light trap survey rose slightly in 2001 however (Table 20).

Viburnum Leaf Beetle (*Pyrrhalta viburni*) - This species now occurs nearly statewide. It has spread rapidly since its introduction into southwestern Maine in the early 1990's. Larval feeding continued to decimate many viburnum hedges and roadside plantings throughout southern Maine in 2001. Increasing numbers of these beetles can now be found statewide. Damaging populations will follow and can occur on native viburnums in openings in wooded areas several miles from planted stock as well.

Mortality of heavily infested shrubs is fairly common. To add to the problem we now suspect that one or more of the **clearwing (moth) borers** (Sesiidae) are beginning to impact some plantings. The two species we are looking at are *Synanthedon fatifera* and *S. viburni*.

Table 20. Total number of variable oakleaf caterpillar *(Lochmaeus manteo)* moths collected at light

	Year								
Location	**1993**	**1994**	**1995**	**1996**		**1998**	**1999**	**2000**	**2001**
Allagash	0	0	0	0	0	0	0	0	0
Arundel		0	1	0	0	7	6*	-*	-
Ashland	0	1	14	0	0	3	0	0	2
Bar Harbor					3*		4	-*	-
Biddeford								0	4
Blue Hill	0	9	30	9	0	5	15	0	-
Brunswick	0	0	3	0	0	0	2	0	2
Calais	0	0	3	0	0	2	4	0	0
Chesuncook	0	10	62	27	2	2	18	0	74
Dennistown	0	0	5	0	0	0	0	-*	-
Elliotsville	5	0	57	3	1	1	15	-*	-
Exeter	0	0	6	4	3	0	10	0	1
Greenbush	0	7	11	4	14	17	3	0	4
Guerette	0	3	1	1	2	0	0	0	3
Haynesville	6	39	14	7	4	5	0	0	3
Jackman									2
Kingfield	0	7	7	3	4	3	9	0	2
Millinocket	85	148	185	18	86	23	12	0	4
Mt. Vernon	2	12	1	0	5	13	1	9	5
No. Bridgton	0	3	0	0	1	3	1	0	0
Rangeley	0	0	4	0	0	0	0	0	2
Shin Pond		2	15	4	20	5	12	0	-
South Berwick	8	0	4	0	0	6	34	0	8
Ste. Aurelie	2	1	0	0	0	1	0	0	0
Ste. Pamphile					0*	2*	0	0	0
Steuben	0	2	3	0	2	0	0	0	0
Topsfield	83	235	50	3	0*	11		0	0
Washington	0	2	17	2	4	8	26	0	12
Total Number of Moths	**191**	**481**	**493**	**85**	**148**	**115**	**172**	**9**	**128**
Total Number of Traps	**23**	**24**	**24**	**24**	**26**	**25**	**25**	**23**	**22**

* Intermittent/incomplete operation

Walking stick (*Diapheromera femorata)* - No outbreaks of this species were reported in 2001 however reports of low level activity did seem to increase across southern Maine at least as far north as Waterville and as far east as Rockland.

Willow Insects (various) - Willow, especially black and weeping, browned up as expected in 2001. Much of the damage which was still striking by August was caused by the mining **willow flea weevil** (*Rhynchaenus rufipes*) and the **imported willow leaf beetle** (*Plagiodera versicolora*). ***Chrysomela*** spp. larvae were also involved in some areas.

MISCELLANEOUS Insects and other Arthropods of Medical, Nuisance or Curiosity Significance in 2001

Ants (various) - There never seems to be a shortage of ants and 2001 was no exception. **Carpenter ants** (*Camponotus* spp.) were again a common structural concern but in woodland situations these creatures serve in the important process of wood breakdown. Those pesky little mound forming **lawn ants** (several species) were also common and resisted many homeowner efforts at control.

For those who thought we might have true **fire ants** in Maine - we don't! But we do have a couple of species which are aggressive and pack a potent sting. One of our more widespread stinging species in Maine is one of the **acrobat ants**, *Crematogaster lineolata* which often occurs in rough areas around gardens, in fields or the edge of woods. An introduced (from Europe) species, ***Myrmica rubra***, inhabits coastal areas from Kittery to Eastport. This species is very aggressive and has a powerful sting and unfortunately appears to prefer nurseries and more open areas which have been landscaped and thus often comes in contact with human activities. Highest populations seem to occur at Boothbay Harbor and on Mount Desert Island and some spread has been noted over the past few years.

Another species which may also occur in coastal areas and which may seem to sting is ***Formica integra***. Rather than sting, this species bites and then injects formic acid into the wound producing a burning sensation. *Formica integra* is a close relative of our infamous **Allegheny mound builder ant** *(Formica exsectoides)* which can be a serious problem in plantations and forest regeneration areas where these ants will actually kill small trees to keep an area open to the sun

Ant flights involving the **cornfield ant** (*Lasius alienus*) were very local in 2001.

A new ant species, the **ghost ant** (*Tapinoma melanocephalum*) has recently been introduced into Maine. This species was found in greenhouse settings in southwestern Maine in 1999. The species is tropical so is likely to remain a nuisance in heated structures where it seems to prefer wood mulch, decaying wood and some potting mixes. Check as you bring home greenhouse materials.

Banded Woollybear (*Pyrrharctia isabella*) Winter Weather Prediction Survey - Those familiar, fuzzy, red-banded, black caterpillars which children love to play with were fairly hard to find in 2001. A series of popular articles on predicting winter weather from the width of the red or middle band (the wider the red band the milder the winter) prompted one reporter in Augusta to start gathering information for local stories in 1997 and has continued to do so since then.

Folklore has it that when the red makes up more than one third of the color, the upcoming winter will be milder. When the black makes up more than two thirds, the winter will be more severe. A one-third red and two-thirds black is considered an indication of a normal winter. The woollybears predicted a mild winter in 1997 and an even milder winter in 1998 and 2000 which was actually borne out. 1999 was more questionable. To see how accurate the forecast would be this winter we again decided to pit the woollybears against the various farmers almanacs and the woolly bears have predicted a more traditional winter for 2001/02 - you be the judge.

Normal = 4.33 red segments on average based on 13 segments per caterpillar
1997/98 = 4.73 red segments on average - mild winter predicted

1998/99 = 5.05 red segments on average - milder winter predicted

1999/00 = 4.3 red segments on average - slightly colder than normal winter predicted

2000/01 = 5.14 red segments on average - milder than normal winter predicted

2001/02 = 3.79 red segments on average - traditional winter weather predicted

Boxelder Bug (*Boisea trivittata*) - This colorful red and black true bug was found in high numbers again in 2001 in traditionally infested areas of York County, especially Sanford. High numbers were also seen in Augusta (Kennebec County) and low numbers as far north and east as the Bangor area. This species feeds primarily on the developing foliage and seeds of boxelder which is of relatively low importance in Maine and the hosts survive any way. It is the massing and movement of the boxelder bug in the fall that draws the most attention. In this process numbers can be enormous. This species hibernates in litter and in buildings and may easily be confused with the **small milkweed bug** (*Lygaeus kalmii*) adults of which have a similar appearance and habit of entering homes to hibernate.

Dogwood Sawflies (*Macremphytus tarsatus* and *M. testaceus*) - Dogwood, especially gray and red osier, are often stripped of their foliage by the larvae of one or more sawflies and populations seemed to be down somewhat in 2001. The larvae are basically yellow with (*M. tarsatus*) or without (*M. testaceus*) black spots at maturity. Early larval stages are covered with a white, waxy bloom. Larvae wander in search of a place to pupate. At this stage they may even bore into relatively soft wood (siding, decking, etc.) as much as one inch to find a protected place to change (pupate) and spend the winter.

Euonymus Caterpillar (*Yponomeuta cagnagella*) - No defoliation was observed in 2001.

Fall Insects - As most homeowners prepare for the coming winter on warm fall days, many insects do the same. Some of the common ones which we encountered annually are **ants, banded woollybears, bumble bees, boxelder bugs, cluster flies, hunter's moths, multicolored Asian lady beetle, paper wasps, tussocks, western conifer seed bugs, woolly alder aphids** and **yellow jackets.**

Garden (or Snailcase) Bagworm (*Apterona helix*) - No new infestations have been found outside of Sanford. Our only infestation of this small introduced European bagworm continues to be in Sanford. As the females are wingless, the only means of spread is by movement of infested items. Watch for this one and report any suspected sightings. For more information see Summary Report #13 p. 36.

Japanese Beetle (*Popillia japonica*) - Populations of this species again seemed to be much more local in 2001 and heaviest in non-traditional areas where they have only occurred for the past two or three years. Numbers still appeared to be highest west of the Penobscot River from Old Town south.

Lily Leaf Beetle (*Liliocerus lilii*) - The activities of this introduced leaf beetle continued to extend their range in and around the Augusta, Gardiner and Lewiston areas in 2001 in addition to locations in Cumberland (Bridgton, Gorham and Portland) and York (Ogunquit, Wells and York) counties. The adults are striking red beetles with a black head and legs and the larvae are slimy and ugly. Damage to lilies can be severe. Movement most likely occurs as lilies are moved from place to place.

Medical Entomology - Maine state government still does not have a designated medical entomologist position. As a result, our FH&M staff receive requests for advice and assistance in dealing with an array of insect and other arthropod related problems. Included in these requests are questions relating directly to such things as **bedbugs, bird mites, black flies, bot flies, deer flies, fleas, horse flies, lice, mosquitoes, no-see-ums, spiders, stinging insects** and **ticks**. Also included are insect/arthropod vector related disease problems such as **eastern equine encephalitis, heartworm** and **lyme disease** and a series of **allergies, rashes** and **reactions**. The actual numbers of requests are not high except for those associated with ticks and lyme disease but individual concern is often great. Disease questions per se are referred to medical professionals. In addition to these problems, the outbreak of the mosquito transmitted **West Nile Virus** (WNV) in the New York city area in 1999 prompted concerns and many questions in Maine as well. In 2000 FH&M and Maine Medical Center staff conducted some preliminary mosquito surveys and a much expanded survey in 2001 (see Mosquitio survey (p. 7)). The **vector borne disease group/lyme disease working group** with which we are associated, continues to keep abreast of the situation and field questions. The West Nile Virus was found in Maine in birds in 2001 for the first time but not yet in humans.

Biting Flies (black flies, deer flies, mosquitoes and no-see-ums) - Comments about biting fly activity in 2001 again ranged from "wow-no bugs" to "I can't stand it". Overall we found biting fly activity remained

low in 2001 for the third consecutive year, most likely due to drought. The exception being along the coast where salt marsh mosquitoes are a perennial problem. There were hot spots especially with locally high numbers of **no-see-ums** in wetter areas of northern and western Maine. **Deer fly/horse fly** populations were up in some areas as well. The highest populations of upland mosquitoes occurred in the vicinity of swamp land and the Penobscot River. **Black fly** populations picked up through September as usual. The infamous **salt marsh greenhead fly** (*Tabanus nigrovittatus*) and its cohorts again plagued bathers along the coast south and west of Penobscot Bay from mid July through mid August.

Mosquito surveys were conducted in Maine in 2001 (see p. 7) involving a combination of; trapping (CDC-CO2 Light traps and gravid traps), larval dipping and egg raft sampling (*Culex* spp. only). Nearly 20,000 mosquitoes were identified to species in this program and a portion of these were tested for West Nile Virus. Five new records for Maine were added to the 36 listed by Ivan McDaniel in 1975 (Mosquito News 35(2):232-23) bringing the total to 41 including several records for the introduced vector species, *Ochlerotatus japonicus*. In addition to the routine seasonal mosquito surveys, a rapid response protocol was initiated to investigate mosquito populations in the vicinity where birds infected with the West Nile Virus were found in September and October.

Rashes related to insects were again of concern in 2001 in response to activities of the **browntail moth** (p. 28) in the Casco Bay area (Cumberland County) and with increased frequency of **tussocks** (p. 38) elsewhere.

Spiders - Questions and concerns over spiders continued to draw attention in 2001 as they do nearly every year. Nothing unusual was reported.

Stinging insect populations in Maine seemed similar in 2001 to other years at least in southern Maine. Numbers of **bald-faced hornets, bumble bees, honey bees** and **yellow jackets** were still low while some **ground nesting solitary bees** and **paper wasps** (*Polistes* spp.) seemed to fare better. Several reports in the Waterville/Winslow area, however, involved very large nests of what appears to be a relatively uncommon bumblebee, *Bombus impatiens*. Each nest appeared to maintain roughly 100 individuals. These bees varied in size and were very aggressive and ready to sting unlike the friendly and unaggressive bees we've all come to know and love. **Paper wasps** were still probably the number one problem species as far as stinging species go as they occur in greatest numbers around buildings especially as they seek hibernation sites in the fall. In addition to our native *Polistes fuscatus* we have begun to see the extension in range of an introduced species *Polistes dominulus* from York and Cumberland counties to Kennebec and Knox county. The dark *P. fuscatus* makes rather small nests of less than 30 cell which are not reused. *P. dominulus* somewhat resembles a slender yellowjacket and makes much larger nests of up to 100 cells. They seem to like building their nests between windows or in window frames and may merge new and old nests. Colonies of those interesting greenish, fuzzy, **ground nesting bees** (*Agapostemon* sp.) were again reported from southern Maine in 2001. The large beneficial **great golden digger wasp** (*Sphex ichneumoneus*) was again common and active in 2001. While fruit and vegetable growers remain concerned about a noticeable reduction in pollinators, campers and picnickers welcome the relatively low numbers of yellow jackets.

Ticks (Ixodidae) - The number of requests for tick identification received at the Insect and Disease Lab went from 396 in 1999 to 631 in 2000, to 525 in 2001. Although tick numbers dropped noticeably in 2001, 376 or 72% of the submissions involved the lyme or deer tick (Ixodes scapularis). This is the highest percent of submissons yet for this species. It appears from submitted ticks that the lyme tick populations are continuing to extend eastward and inland. Our data will again be pooled with that of the Maine Medical Center Lyme Disease Research Laboratory for use by the lyme disease working group.

The highest numbers and greatest diversity of ticks occur in southern Maine (Figure 9). Thirteen species of hard ticks (Ixodidae) have been found in Maine. The two most common ticks other than the lyme tick were the **woodchuck tick** (*Ixodes cookei*) and the **American dog tick** (*Dermacentor variabilis*). Of these the American dog tick was by far the most abundant in the field in 2001 but our clients appear to be more sure of the identification of this species and tend to report it to us less frequently. Populations of this species

continued to spread slowly north and east as well. With the recent advent of several human cases of Powasson Virus in Maine, there are rising concerns about its more common vector *I. cookei.* Larvae of the **moose** or **winter tick** (*Dermacentor albipictus*) were again common in November and December as far north as Fort Kent.

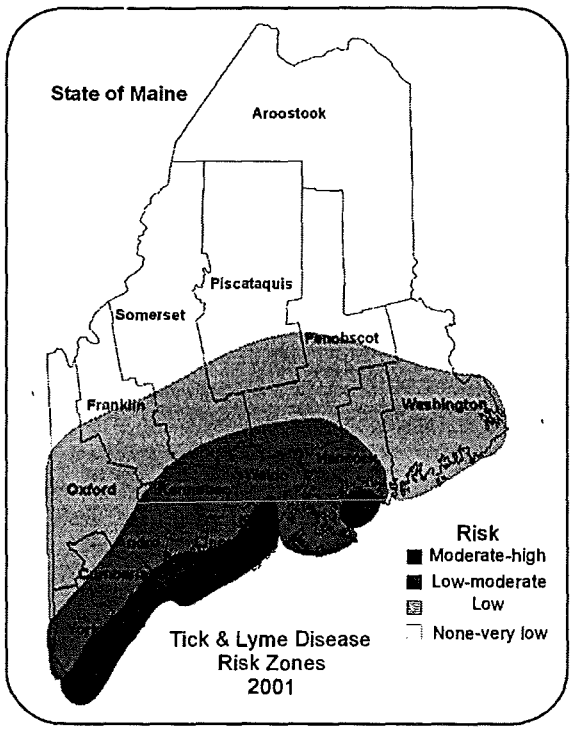


Figure 9

Lyme disease in Maine - The incidence and risk of acquiring lyme disease in Maine is still relatively low but climbing overall. The area of greatest risk continues to fall along the coast west of the Schoodic Peninsula (Figure 9). Lyme disease is a complex issue in Maine made even more complex due to the nature of the area and intensity of risk here. Expanding media coverage nationally after the West Nile Virus has further confused the significance of lyme disease. In 1986 a lyme disease working group was established to follow the progression of the then relatively new and local problem within the state and to try and set levels of risk based on vector populations. As results became available they were provided through a variety of publicity channels. Although we now have a fairly good handle on the lyme disease problem, there are still questions associated with individual interpretation of the significance of what is known of disease ecology, dramatic variability in the distribution of infected deer ticks, human mobility, testing protocols and simple problems of clinical diagnosis and reportability. Fortunately, the same group working on the lyme disease problem is also involved in the West Nile Virus/Mosquito study and Powasson Virus Assessment. This makes sorting out levels of risk much easier and more accurate.

From 1986 through 2001 (the latest year for which a total is available), a total of nearly 600 Maine residents have been diagnosed with lyme disease with close to 500 of these cases believed to have been Maine acquired. There were 98 cases reported in 2001 alone of which 87 were Maine acquired.

As a point of information ,Glaxo Smith Kline withdrew their Lymerix vaccine for Lyme disease from the market on February 26, 2002 citing insufficient demand for the product.

Multicolored Asian Lady Beetle (*Harmonia axyridis*) - The fall arrival of these pestiferous little lady beetles was not as striking in most traditional areas (not all, however) of southern Maine in 2001 as it has been. Areas to the north were a different story, however. All you had to do this past fall was to mention that you were an entomologist in any store or camp from Greenville to Medway and north to Fort Kent and you would unloose a very colorful diatribe on those ß~@*?+# lady beetles. Reports of screens in woods camps being literally covered with the beetles were exceedingly common. Many attributed this to the long mild fall and possibly elevated number of aphids. Who knows?"

Powder Post Beetles - Powder post beetles remain an ongoing structural problem in Maine as they attempt to reduce building timbers to organic soil. We annually deal with a few stubborn infestations made more complex due to the unheated nature of some vacation homes and the use of firewood. ***Ptilinus ruficornis*** and ***Hadrobregmus carinatus*** seem to be our most common species. Control is difficult due to the lack of effective registered pesticides.

Public Assistance - The Forest Health and Monitoring Division provides technical assistance to landowners, homeowners, foresters, and others seeking advice with insect and disease pests of trees, household pests, and human health pests. Division personnel also did presentations and were involved in workshops, news conferences, and other similar training activities to inform and educate the public about trees and tree pests.

During this past year (2001) the FH&M staff handled a total of 4,427 requests for assistance which includes all inquiries, sample diagnoses, insect identifications and site visits. Approximately 800 more requests were received in 2001 than in 2000. The increase is due in part to the public response to the hemlock woolly adelgid quarantine alert. Requests for tick identifications and public concern about mosquitoes and, West Nile virus, the mosquito borne disease, also generated a high number of calls in 2001. The requests are summarized in Figure 10 and tables 21 through 24.

Specific information about forest and shade tree problems encountered during the year can be found elsewhere in the Insect and Disease Conditions Summary Report.

Table 21. Requests for quarantine advice and assistance in 2001

PROBLEM	JAN	FEB	MAR.	APR	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	Year total
ELC requests			5		2	1			2	1	1	1	13
Gypsy moth permits	23	18	13	13	7	25	20	19	29	17	12	4	200
HWA requests	5	9	12	8	16	235	42	10	10	6	6	4	363
Compliance agreements					2		1			12	3		18
Gypsy moth requests		2		4		2	1	3		1	1	1	15
Ribes													0
Pine shoot beetle	5	1	7	3	1	4	10	11	21	14	13	5	95
Other requests				1				1		1			3
TOTAL	**33**	**30**	**37**	**29**	**28**	**267**	**74**	**44**	**62**	**52**	**36**	**15**	**707**

Table 22. Requests for advice and assistance about pests causing human health problems in 2001

PROBLEM	JAN	FEB	MAR.	APR	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	Year total
Browntail moth	8	2	1	14	8	75	24	8	3	5	3		151
Ticks	3	2	13	18	157	112	71	19	14	96	97	58	660
Mosquitoes	4	3	5	5	15	18	18	4	2	5	2		81
Human health pests	3				1		1	2	3	1	1		12
Biting flies	2	2		7	6	10	2	1		1			31
Blackflies	1	1		1	6	1			1				11
TOTAL	**21**	**10**	**19**	**45**	**193**	**216**	**116**	**34**	**23**	**108**	**103**	**58**	**946**

Table 23. Requests for tree pest advice and assistance in 2001

PROBLEM	JAN	FEB	MAR.	APR	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	Year total
Abiotic factors	4	1		1	2	9	3	4	2	1	1		28
Adelgid galls on spruce						2	1			1			4
Animal damage			2		1	4							7
Annosus root rot								1					1
Anthracnose							1	1					2
Aphids					2	3	1	3					9
Apple scab disease						1							1
Arborvitae leafminers						3							3
Armyworm							22						22
Ash decline				1			1		1				3
Ash leaf & twig rust						1		2	1				4
Asian longhorned beetle		1		1	1	5	2	1			1		12
Balsam needle gall midge	5	1	4	5	19	7		1		1	1		44
Balsam twig aphid				3	10	12	1			1	2		29
Balsam woolly aphid	3	2	2	1	1	1						1	11
Bark beetles			1			4	1		1		1		8
Beech bark disease		1	1	1			3						6
Birch casebearer							2						2
Birch leafminers					2		4						6
Black knot of cherry				1		1							2
Bronze birch borer						2	5	4	1				12
Cankers						1	1	2		1	1		6
Chestnut blight fungus	2	1		1									4
Drought	2	3	2			3	5	4	5	5			29
Dutch elm disease		1				2	1	1	1				6
Eastern dwarf mistletoe	1		5	2		2		1	2	1			14
Eastern larch beetle	1		1	1			1	3	5	1	2		15
Eastern tent caterpillar				1	5	2			1				9
European larch canker			1			2							3
Fall webworm						1	6	4	4				15
FHM				3	2	4	1	2	3	2	1	4	22
FIA	275	277	125	34	79	134	99	102	125	97	12		1359
Galls on deciduous trees						4	1		1				6
Gypsy moth	1			2	1	24	8	3			1		40
Hemlock borer	2	1	1		2	2	2	4	3	1	2	1	21
Hemlock looper	4		8		10	20	29	29	27	12	2	2	143
Hemlock woolyadelgid				1	1	3							5
Herbicide						1	1			1			3
Ice storm damage	2	2	8	3	4	1		4		1	3	5	33
Introduced pine sawfly								1					1
Japanese beetles				1	1	1	6	3		1			13
Leaf beetles					3	5	2	1					11
Mites	1				1	5	4	3	1				15
Mountain ash sawfly						1	2			1			4
Pine shoot beetle						1							1
Poison ivy			1			1							2
Rose chafer					1	6	3						10
Roundheaded appletree borer									1				1
Salt injury			2		1	1							4
Sapsucker injury			1					2					3
Satin moth					1	5	2	3					11
Sawflies						2	3	1	1				7
Sawyer beetles						3							3
Scale insects									1				1
SNB				1									1
Spittlebugs						4	1						5
Spruce beetle	3	2	2	2	3		1	1	1		2		17
Spruce budworm		3	4	1		1			4	2	2	3	20
Spruce gall adelgids	1			2	1	2	1	1					8
Spruce health	1	2		1	1		2	4	2		2		15
Tussock moth caterpillars	1			1						1			3
White pine blister rust	1	3	6		1	3			1	1			16
White pine decline	8		7	1		1	2	3	5		2	1	30
White pine weevil	1		1	6	6	1	9	7	4	3		1	39
Woodborers			1	1	4	3	2	2	3	4			20
Yellowheaded spruce sawfly						5	6						11
Other requests	13	10	80	15	19	55	30	29	28	12	7	7	305
Totals	**332**	**311**	**266**	**94**	**185**	**367**	**278**	**237**	**235**	**151**	**45**	**25**	**2526**

Table 24. Requests for advice and assistance about household, public nuisance, and miscellaneous pests in 2001

PROBLEM	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL
Ants				4	2	4	6	1	2				19
Asian lady beetle	6	3	4	4	4		1		5	21	7	9	64
Bed bugs							1						1
Bees					1	1							2
Bird mites							1						1
Carpenter ants	1		2	3	3	8	3	3	1	3	3		30
Clover mite					1								1
Cluster flies	1	2							2	1		1	7
Cockroaches											1		1
Dermestid beetles			2		1			1		1			5
Firewood insects	1	1	1		1	2		1			1		8
Fleas								1					1
Flies					2	1		3			1		7
Fruit flies									1				1
Hornets and wasps						1		2	1	1			5
Indian meal moth							1		1	1			3
Ladybird beetles										1			1
Misc. insects*	2	6	3	1	3	5	5	5	9	3	2		44
Misc. non-insects**			1	2	1	1	1	2	1	2			11
Pantry pests	1										1		2
Powder post beetles			2	1		1			1				5
Silverfish					1				1	1			3
Spiders											1		1
Springtails		1	2	1					3				7
Termites								2					2
Western conifer seed	2		3	4						3	2	2	16
TOTAL	14	13	20	20	20	24	19	21	28	38	19	12	248

* include such things as silverfish and non powderposting woodborers ** include such things as house centipedes, millipedes and pseudoscorpions

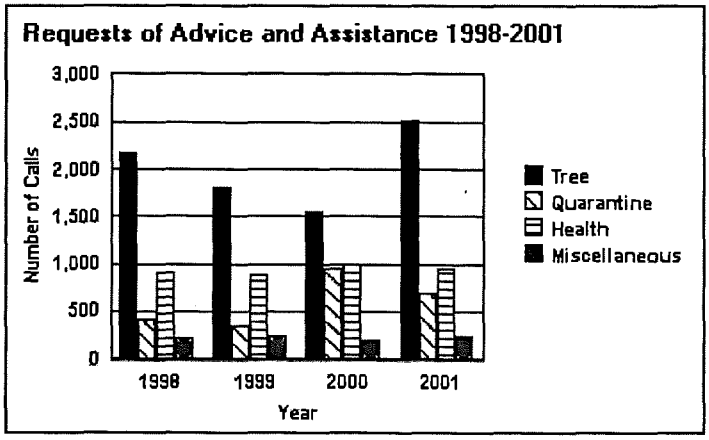


Figure 10

Termites - We again include this reminder that we do in fact have termites in Maine. Although a variety of species have been introduced at times, most did not find our climate suitable for establishment. The **eastern subterranean termite** (*Reticulitermes flavipes*), however, has found some suitable sites here and has become locally established. We now have records from:

Cumberland County - spotty but established in a number of towns
Kennebec County - Augusta only
Oxford County - Bethel only
York County - spotty but established in a number of towns

Spread from existing infestations has been slow and limited even in Cumberland and York counties. The Kennebec and Oxford county infestations have changed little over the past ten years. With the current moderation of climates, however, this may change.

DISEASES and INJURIES Associated With Trees in 2001

Acid Rain (caused by certain pollutants entering the atmosphere and reacting to form sulfuric and nitric acids) - This subject has received much play in the popular media over the years but most reports of damage are unfounded or attributable to other causes. But the perception persists that acid rain is significantly destructive to forest vegetation. Each year we receive calls expressing concern about the effect of acid rain on Maine forests.

Most recent research has concluded that there is no evidence of general, widespread decline of forest tree species due directly to acidic deposition, though there may be local effects due to acid fog at certain coastal or high elevation sites in the northeast. There may also be subtle effects of acid deposition such as increased nutrient leaching from plants and soils which may negatively impact tree growth or winter hardiness. And there is the possibility that effects of acidic precipitation may increase the susceptibility of trees and other plants to certain diseases. Studies are ongoing to elucidate these possible effects.

When the acid rain controversy first commanded national attention in the 1970's and 80's, it was common for weather forecasters to announce the acidity of precipitation events as part of local weather broadcasts. This practice has now largely ceased, but we recently asked our state Department of Environmental Protection about trends in acidic precipitation in recent years. We were interested to note there were no trends. The mean pH of precipitation statewide has held steady at about 4.6 since 1982.

Annosus Root Rot (caused by *Heterobasidion annosum* syn. *Fomes annosus*) - Every year we seem to confirm the presence of annosus root rot at one or more previously unreported sites. Last year was no exception. One infected red pine plantation in Hartland was brought to our attention by a concerned forester and another was reported in Liberty by a concerned homeowner. Disease was developing as "fomes holes" in plantations which had each been thinned once without stump treatments.

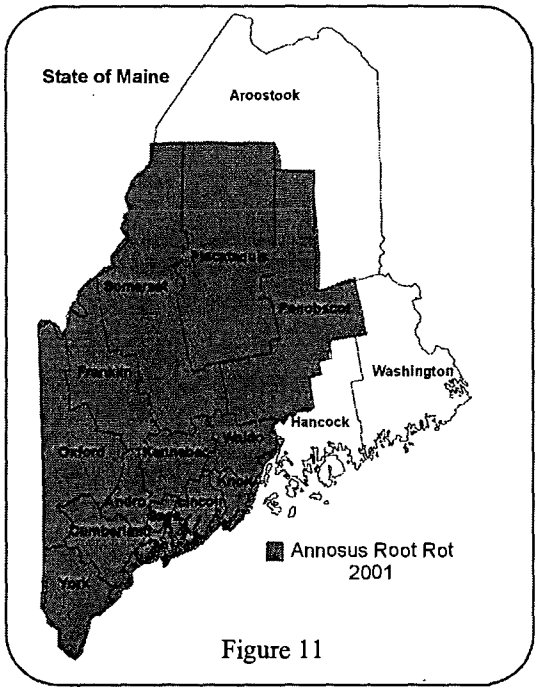


Figure 11

This is primarily a disease of plantation pine in Maine. To date we have recorded infected plantations in the following counties: Androscoggin, Cumberland, Franklin, Kennebec, Lincoln, Oxford, Penobscot, Piscataquis, Sagadahoc, Somerset, Waldo, and York (Figure 11).

When harvesting pines in red pine plantations, it is important to treat stumps with borax immediately following tree harvest. *Heterobasidion annosum* is a pioneer organism that colonizes only freshly cut stumps, and borax must be present on the stump before the organism has a chance to invade.

We recommend borax treatment of freshly cut stumps at all times of year, but clearly infection hazard is greatest in the fall when spores of the causal organism are being abundantly released.

Anthracnose of Ash, Birch, Catalpa, Maple, and Oak (caused by *Apiognomonia errabunda, Marssonina betulae, Glomerella cingulata, Kabatiella apocrypta* and *Discula quercina* respectively) - These diseases, which cause irregular tan or brown spots or blotches on leaves often followed by defoliation, were less common than usual in 2001. The spring of 2001 was relatively dry and rainfall at critical times during leaf expansion in May was not sufficient to promote substantial foliage infection on most sites.

Apple Scab (caused by *Venturia inaequalis*) - One of the most common non-forest diseases we encounter when responding to calls from the public is apple scab. Perhaps the most serious disease in commercial apple orchards, apple scab also defoliates and causes lesions on leaves, stems, and fruits of ornamental crabs. This is a fungal disease which is generally worse during moist seasons, but was less prevalent than usual during 2001 due to our relatively dry spring.

Control by spraying fungicides is possible, but the repeated applications which must be timed 7-10 days apart during wet weather become tedious even for commercial growers. A more practical approach for homeowners involves the raking and destruction of fallen leaves and fruits in the autumn, and the planting of resistant varieties. Among those types said to be resistant are the cultivars 'Adams', 'Baskatong', 'Beverly', 'Bob White', 'David', 'Dolgo', 'Donald Wyman', 'Henry Kohanke', 'Liset', 'Ormiston Roy', 'Professor Sprenger', 'Red Jewel', and 'Sugartyme', and the species *Malus floribunda*, *M. sargentii*, and *M. tschonoskii*.

Ash Leaf and Twig Rust (caused by *Puccinia sparganiodes*) - This disease was last epiphytotic in Maine from 1982-1984. The moderate outbreak of this disease which began in 1995 in the Stockton Springs/Frankfort/Winterport areas of mid coast Maine diminished in 1998 to endemic levels, remained endemic in 1999, but was a bit more conspicuous in 2000.

In 2001 the orange spots on leaves and twigs which are characteristic of this disease were very conspicuous on ash in the Stockton Springs area, but little defoliation was apparent there. However, in south coastal Maine, especially the Kittery/Wells/York/Ogunquit areas, considerable defoliation was apparent. And there is considerable likelihood that area will experience another severe outbreak in 2002.

This disease only occasionally kills trees, but may weaken them so they succumb to other causes, especially where the disease strikes heavily in successive years.

Atropellis Canker (caused by *Atropellis tingens*) - Atropellis canker is a relatively uncommon fungal disease of pines in Maine which is occasionally a problem in Scotch pine plantations and natural stands of pitch pine, particularly in the southwestern part of the state. This disease is characterized by sunken, perennial cankers on twigs, stems and branches. Wood beneath cankers is darkly stained bluish black in color. The bluish black stain often appears wedge-shaped when branches are cut and cankers are viewed in cross-section. Affected branches flag and needles turn brown in spring and early summer.

We received no new reports of this disease in 2001. The disease is potentially damaging to pines in Christmas tree plantations but usually is not much of a problem in Maine where relatively few pine species are now grown for Christmas trees. Where pines are planted, *Atropellis*-free planting stock is generally used and plantations are rarely established near infected natural stands, so chances for infection are low.

Balsam Fir Needlecasts (caused by *Isthmiella* and *Lirula* spp.) - These needlecast diseases were somewhat more common than usual on balsam fir Christmas trees again in 2001. The disease is widespread among stands of understory wild trees, but only occasionally a problem among cultivated trees.

Symptoms are generally confined to foliage two years old or older; current season growth, even when infected, remains green until the second growing season. But it is the infected third year growth upon which infective spores are generated and which in turn serve to cause infection of current season growth during the summer. Commonly a continuous dark line is noticeable on the undersides of infected third year needles, especially if *Lirula nervata* is the causal organism. Often trees infected by *Lirula* and *Isthmiella* needlecast fungi are attacked by other needlecast fungi as well, including species of *Rhizosphaera* and *Lophodermium*, which develop under the same sort of cool, moist conditions which favor the former pathogens.

No chemical control products are presently registered to help manage *Lirula* and *Isthmiella* infection in Christmas tree stands. Cultural control suggestions revolve around practices to open stands to light and promote good air circulation, low branch pruning, and confining shearing to dry weather only.

An excellent booklet How to Manage Needlecast Diseases on Balsam Fir prepared by the United States Forest Service is available free as single copies from this office. Supplies are limited.

Beech Bark Disease [caused by beech scale (*Cryptococcus fagisuga*) and *Nectria coccinea* var. *faginata*] - This disease, which was introduced into Maine in the early 1900's, continues to kill or reduce the quality of beech stems statewide. But beech bark disease does not threaten to eliminate beech from the Maine forest because some trees are resistant, and even susceptible trees sprout profusely from roots when trees are damaged, killed or harvested.

Infected trees exhibit rough patches of dead bark which may contain small, reddish fruiting bodies of the causal fungus. Scattered through most stands are a few smooth barked, resistant trees. Recent research by David Houston (see publication section of this report for reference) finds that landowners managing for beech should conduct winter harvests to enhance sprout development, growth, and persistence of beech, and identify and retain resistant beech trees even in clearcuts.

Losses attributable to beech bark disease are extensive but assessment of the damage is complicated by the effects of drought, oystershell scale, late spring frosts, and various hardwood defoliators.

Black Knot of Cherry (caused by *Apiosporina morbosa*) - This disease is common in forest situations throughout the state on wild cherry trees and is particularly conspicuous on black cherry where galls a foot or more in diameter may occur. Where these galls occur on the main stem the value of cherry for lumber is considerably reduced. Damage often extends internally well beyond the galled area, because the gall canker serves as an entry point for wood decay organisms which spread internally over time.

Frequently we receive reports of black knot infections on cultivated peach, cherry or plum trees in landscape or home orchard situations. All too often by the time we are consulted the disease has progressed to such an extent that the usual control practice of pruning knotted twigs and branches to remove infected tissue would essentially reduce the tree to a stump. It is important to diagnose this disease early, prune any knotted twigs each year before April 1, and spray if necessary with the fungicide thiophanate methyl in order to maintain healthy, productive fruit trees.

Brown Ash Decline (caused by environmental stresses, especially drought) - Black ash, *Fraxinus nigra*, (called brown ash in Maine) has largely recovered from the statewide decline which first became apparent in 1989.

Maine brown ash plots were not measured in 2001 but some plots were visited to check for drought effects. Forest Health & Monitoring staff made observations of crown conditions in 8 plots in August of 2001 and found that brown ash condition was stable with no obvious decline due to drought. If ash crowns were affected by low water in 2001, crown decline may be apparent in 2002. Measurement of a representative sample of brown ash plots is planned for 2002 to check for drought damage.

Nearly half of Maine's brown ash plots were remeasured in 2000 representing the most comprehensive reevaluation of brown ash in Maine since 1995.

Bud Abortion of Balsam and Fraser Fir (caused by low ambient air temperatures prior to bud break) - Bud abortion in 2001 was generally insignificant. Our observations from previous years, however, indicate that some seed sources of balsam fir predispose to bud abortion problems. Other contributing factors may be mild winters where warm temperatures lead to a premature loss of winter bud hardiness, excessive (especially nitrogen) fertilization, and nutrient deficiencies or imbalances.

We suggest growers avoid planting stock from seed sources which seem to predispose to this problem under their conditions and apply fertilizer according to recommendations based on foliar test results.

Butternut Canker (caused by *Sirococcus clavigignenti-juglandacearum*) - Butternut canker, a disease which has virtually eliminated butternut in the Carolinas, was first found in Maine in 1993 when we located the disease in Kennebec County. We continued to survey for this disease in succeeding years, and have now located it in all Maine counties except Washington County (Figure12).

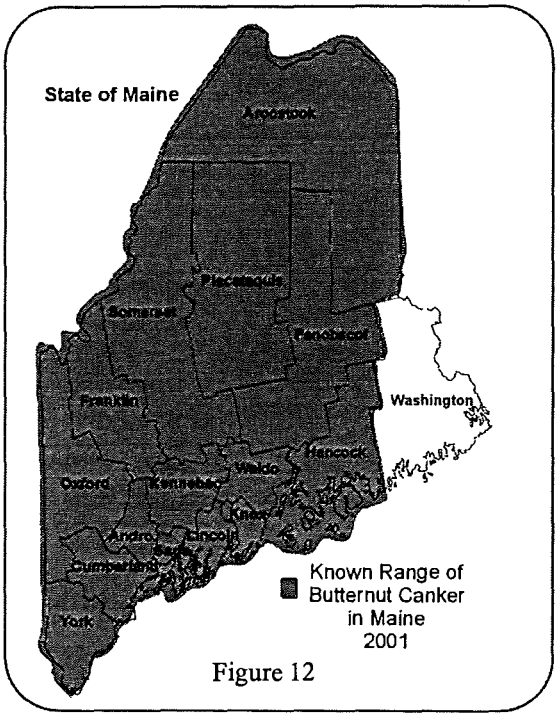


Figure 12

Butternut canker is characterized by dying branches and dead tops, development of epicormic branches, discolored bark which may ooze a thin black inky fluid in the spring, and cankers on the main stem, buttress roots, and branches. When bark in cankered areas is physically stripped away, the sapwood beneath exhibits dark brown, spindle-shaped, stained areas.

No effective controls are available to halt the spread of this disease at this time. Logging injuries should be minimized when harvesting. In nurseries, and perhaps in some homeowner situations, application of fungicides may be appropriate. In some states, butternut harvesting guidelines and even harvesting moratoriums are now in effect. There is considerable evidence that resistant individual butternut trees exist within the native population and researchers are now beginning to develop strategies to exploit that resistance to protect the species.

Caliciopsis Canker (caused by *Caliciopsis pinea*) - This is a generally minor, but occasionally important, disease of eastern white pine which is often overlooked. Though we have known about this disease for many years, we are only now becoming aware of its significance and widespread occurrence in Maine. Every year we receive a few inquiries about cankered trees in stagnated white pine stands, and frequently we diagnose Caliciopsis canker as the cause. Drought seems to predispose to Caliciopsis canker.

Cankers may occur anywhere on tree trunks or suppressed branches and usually occur only in small numbers on a single tree. However, severely attacked trees may contain as many as several hundred cankers. Cankers may be superficial or they may extend into the cambium, killing it.

This is primarily a disease of stagnated stands or suppressed trees in dense stands. It may be effectively managed through judicious and timely stand thinnings.

Chemical Injury (phytotoxicity due to chemical pesticide application) - We received many reports of chemical injury to trees and shrubs in 2001. Growers and landscape managers should be especially alert to the possible phytotoxic effects of certain pesticides when applied to tender, emerging plant foliage. Certain evergreens are quite susceptible, especially when applications involve emulsifiable concentrates, mist blower applications, and/or treatment during hot weather. We have repeatedly warned balsam fir Christmas tree growers to be careful of Diazinon AG 500 and Lorsban 4 E when applying them during late May and early June.

Chestnut Blight (caused by *Cryphonectria parasitica*) - This disease, which was introduced to North America around 1900 on nursery stock of oriental chestnuts, subsequently spread into Maine and quickly destroyed our native American chestnut resource. A few infected trees persist, often sprouting from old stumps, and occasionally a seedling will grow to considerable size in the woods before succumbing to the disease. American chestnut trees planted as landscape specimens also frequently attain considerable size before fatal infections develop. None of these native trees is truly resistant to the disease.

Recently considerable interest has been expressed in support of an effort to reintroduce the American chestnut into Maine forests. The Maine Chapter of the American Chestnut Foundation is proceeding to breed resistant strains of American chestnut using native Maine chestnut sources. These trees are being crossed with resistant hybrids which are under development by the American Chestnut Foundation in Virginia. Within twenty years or so it is hoped that blight resistant trees with native Maine genes will be ready to reintroduce the species to Maine forests.

Cones on Balsam and Fraser Fir Christmas Trees - After a big cone year in 1998, fir trees took a year off in 1999, then produced moderate numbers of cones again in 2000. In 2001, very few cones were produced especially on balsam fir. However, 2002 now looks likely to be a significant cone year, with all the challenges that will present to balsam and fraser fir Christmas tree growers.

Cristulariella Leaf Spot (caused by *Cristulariella* spp.) - This disease, which caused extensive leaf spotting and defoliation especially of boxelder in south central Maine in 1990, has since all but disappeared. Apparently the weather conditions which favor this disease, consecutive hot, summer days and nights with high dew points, have not recurred in Maine since that time.

Dutch Elm Disease (caused by *Ophiosoma ulmi* and *Ophiostoma novo-ulmi*) - Symptoms of Dutch elm disease (DED) were conspicuous throughout Maine during 2001 and generated occasional inquiries of our staff.

Many old elms which escaped the initial wave of infection now succumb each year, at least partially the result of the development of more aggressive strains of the disease organism. While protecting these older specimens is the concern of most of our clients, we occasionally receive calls regarding mortality of younger elm trees (4-8" dbh and 20-30 feet tall). Such trees are frequently numerous in old field areas, and along roadsides, the progeny of susceptible old elms now long gone. The progeny are, of course, also susceptible to Dutch elm disease and, due to their high numbers and density, are extremely vulnerable to mini-epiphytotics (epidemics).

Eastern Dwarf Mistletoe (*Arceuthobium pusillum*) - Severe damage as the result of infection by this parasitic plant) continues to occur in stands of white spruce in coastal areas of Maine. Evidence of significant mistletoe infestation was noted in 2001 on coastal headlands and islands from Machias in the east to the Boothbay region in the west. Drought in 2001 seemed to push many heavily infected trees "over the edge", with considerable mortality occurring in coastal areas such as Deer Isle.

Trees of landscape value succumb each year in the yards of coastal residences as this organism gradually drains trees of their vigor. Removal of witches'-brooms (infected portions of branches), together with appropriate fertilization, generally helps to maintain the vigor of affected landscape trees. But such measures are impractical in woodland areas, and several islands in Friendship and Port Clyde have recently been extensively harvested in response to mistletoe damage.

Dwarf mistletoe also frequently occurs on black spruce, particularly in inland bogs, and on red spruce in many forest situations. Brooms on red spruce are often more poorly developed than on white or black spruce and may be overlooked. However infected residual trees left during timber harvesting activity can result in the infection of spruce regeneration. Infected trees should therefore be identified if possible and removed during the harvesting operation, and harvested areas revisited every ten years or so to remove any symptomatic trees missed during the initial harvest.

European Larch Canker (caused by *Lachnellula willkommii)* - European larch canker is a fungal disease which originated in Europe and was first found on native larch (tamarack) in southeastern Maine in 1981. Information gathered from existing cankers indicates this disease has been present in Maine since at least the 1960's and perhaps much longer. This disease may infect any species of the genus Larix or Pseudolarix. Since larch canker has the potential for causing serious damage to both native larch stands and reforestation projects utilizing non-native larches in Maine and elsewhere, the disease is under state and federal quarantine (Figure 13 and page 59).

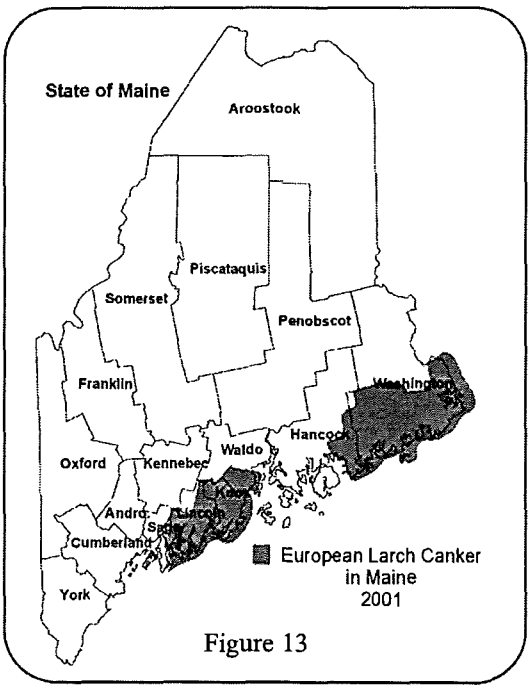


Figure 13

Horse-chestnut Leaf Blotch (caused by *Guignardia aesculi*) - This disease, which causes brown, irregular blotches on leaves often bordered by a yellow band, was less severe in 2001 than most previous years, but was still quite conspicuous.

Ice Damage to Trees (caused by the "Ice Storm of 1998") - The status and health of forest stands damaged by the "Ice Storm of 1998" varied greatly in 2001. Primary factors affecting stand recovery from ice damage are type and severity of damage, tree species, tree size, and stand density.

Trees that experienced main stem breakage remain alive for the most part but tree quality is generally declining. Decay in birches with main stem breaks is advancing rapidly whereas decay in maples, oaks, and most softwood species is progressing at a much slower rate. Crown regeneration and sprouting in trees with main stem breakage is significant in some species, such as maple, but nearly nonexistant in poplar. Many tree species that experienced only crown branch breakage have recovered significantly. For example, many white ash trees that lost most of their branches during the ice storm now have smaller but nearly normal appearing crowns. But other species such as quaking aspen, beech, and white pine have shown very little recovery. Branch breakage in maples, oaks, ashes, locust, elm, and willow stimulated significant crown sprouting which resulted in very dense crowns by the early summer of 2001. Many trees that experienced branch breakage in 1998 still retain these broken segments attached by splintered joints. On many tree species tufts of sprouts are prominent at these breaks.

Many small diameter (>6") stems of red maple, birch species, and beech were severely bent by the weight of ice during the 1998 storm. Most of these stems remain severely bent in 2001 and are not expected to straighten.

Lichens - Lichens growing on dead and dying conifers are frequently and falsely accused of having a role in tree decline and death. We had several reports in 2001 from landowners concerned about lichens. Lichens certainly look as though they ought to be parasitic and many people have a hard time believing that they are not. While they do grow profusely on declining and dead trees, those trees are almost certainly dying for other reasons.

Lichens are comprised of fungi and algae growing symbiotically. Since the algal component is a green plant, light is required for growth. Lichens grow more rapidly when exposed to full light, which explains their profusion on dead trees.

Needle Blight of White Pine (caused by ? *Canavirgella banfieldi*) - This disease, which we have called semimature tissue needle blight (SNB) in past years, was again conspicuous in 2001 for the second consecutive year. This disease causes needle tips to turn brown in July which then fade to a grayish tan overwinter. Typically not all needles in a fascicle are affected. During the summer affected needles, though brown at some point beyond the needle base, exhibit no outward signs of fungal infection. By the following spring, however, numerous fruiting bodies of various secondary fungi may be apparent, confounding attempts to identify a causal pathogen. Needle browning is typically more severe on sides and lower crowns of affected trees, while the top is less symptomatic. And some trees are apparently resistant, so only a portion of the trees in a stand is typically affected.

Affected needles and fascicles gradually weather from the trees during the spring, and tree appearance improves as new growth emerges.

While this problem generates many calls from homeowners, woodlot managers, and golf course superintendents, it is primarily an aesthetic problem except for Christmas tree growers, a percentage of whose trees may become unmarketable. Even colorants such as Greenzit do not successfully mask the brown discoloration.

Oak Leaf Blister (caused by *Taphrina caerulescens*) - This disease, characterized by raised yellowish blisters on leaf upper surfaces, diminished in intensity from the relatively high levels of the previous year.

Oak Wilt (caused by *Ceratocystis fagacearum*) - To date there is no evidence that this disease occurs in Maine.

Phomopsis Galls (caused by *Phomopsis* sp.) - Every year we receive a few calls regarding the presence of galls on various species of hardwoods, especially red and black oak. These galls are often very conspicuous, ranging from the size of a pea on smaller twigs to the size of a basketball on larger branches, and are especially evident when leaves are off trees. Typically only one or two trees will be affected in the landscape, with neighboring trees apparently not susceptible. Frequently galls will cause dieback of smaller branches, but generally trees seem to tolerate infection fairly well.

This is a difficult disease to diagnose with certainty because no fungal fruiting bodies are apparent on the galls. The fungus must be cultured from infected tissue and allowed to fruit before a positive diagnosis can be made.

Little is known about the etiology of this disease and it is therefore difficult to recommend effective control actions. However we suggest that in forest stands affected trees be harvested early or as encountered to reduce inoculum. In landscape settings affected trees should be diagnosed early so that attempts may be made to prune infected tissue from trees before the disease gets out of hand.

Pine-Pine Gall Rust (caused by *Endocronartium harknessii*) - This disease occurs in natural stands as well as in forest and Christmas tree plantations in Maine. We have found it in natural stands of jack pine in such diverse locales as Parlin Pond and Steuben, and in plantations of Scotch and jack pine from all over the state. It occurs especially frequently in Scotch pine plantations, even where no nearby infection is present in the wild, as the result of the planting of infected nursery stock.

Once established in a plantation this disease may be hard to manage. Removal of infected trees (or branches bearing galls) early in the rotation and before the end of April each year will help keep the disease from spreading to healthy trees. It is important when establishing plantations of hard pines to plant only healthy nursery stock.

We had no calls regarding this disease in 2001, but observed the disease frequently on our travels, especially on jack pine in east coastal Maine.

Pinewood Nematode (*Bursaphelenchus xylophilus*) - Pinewood nematode in Maine is primarily a problem of stressed trees, especially those stressed by being planted off site. But many plantations (including ornamental plantings) are in fact established off site and we suspect that pinewood nematode has played a role in the mortality of pine and perhaps other species in such situations, even though the presence of

pinewood nematode was never confirmed. The pinewood nematode, which causes the most serious disease of pines in Japan (pine wilt), also occurs in the United States in all states east of the Mississippi River. Although pinewood nematode was not discovered in the United States until 1929, it is considered to be a native, not introduced, pest. There is no indication that pinewood nematode has ever caused large scale mortality of conifers in Maine or elsewhere in North America.

Porcupine Damage (caused by *Erethizon dorsatum*) - Reports of porcupine damage to forest trees, evergreen plantations, and ornamental plantings continue at high levels statewide. It is uncertain whether porcupine populations have actually increased in recent years or whether the more numerous reports simply reflect an increasing acreage of higher value conifer plantation and seed orchard trees, situations where porcupine damage is less easily ignored.

In an attempt to define whether porcupine populations are indeed on the rise throughout Maine, one of our staff members has undertaken a count of porcupines killed by vehicles along roadsides in the course of his travels. This survey, known as SPLAT (Special Porcupine Lethal Automobile Tire survey), does not pretend to be scientific, but it may over time provide a rough approximation of porcupine population trends. The staff member undertaking the count consistently drives about 50,000 miles per year and covers the entire state, although the survey is weighted to the Central Maine area where relatively greater travel occurs.

The SPLAT survey is now seven years old and while no trends are apparent, there is also no indication that porcupine populations are declining. Total counts by years appear below:

1995---99	1999---110
1996---93	2000---100
1997---123	2001---116
1998---109	

Rhabdocline and Swiss Needlecasts of Douglas Fir (caused by *Rhabdocline pseudotsugae* and *Phaeocryptopus gaeumannii*) - In recent years we have experienced a gradual reduction in calls related to these two diseases as growers of Christmas trees have cut back or curtailed production of Douglas fir. But a few plantations persist, and where they are established on new sites where Douglas fir was not previously planted, transplants typically grow to almost Christmas tree size before disease becomes epiphytotic.

Many Maine Christmas tree growers lost interest in Douglas fir some time ago because of its extreme susceptibility to *Rhabdocline* and Swiss needle cast fungi under Maine conditions. And in the landscape not only is Douglas fir frequently attacked by these two disease fungi, but it also serves as a powerful alternate host for the buildup of Cooley spruce gall adelgid on Colorado blue spruce when it is planted nearby. So its liabilities often exceed its assets, though it does make a handsome Christmas tree when disease and adelgids are under control.

Rhabdocline and Swiss needlecasts appear similar to the casual eye, and while they have slightly different life cycles, the same spray program if broadly applied will control both diseases. For more information on diagnosis and control of these and other Christmas tree pest problems, you may wish to request our Circular No. 11, Integrated Crop Management Schedule for the Production of Christmas trees

Salt Damage (caused by movement of deicing salts from road surfaces to susceptible plant species) - Symptoms of salt damage to roadside vegetation were considerably more conspicuous than usual during the past winter season (2000-2001). Heavy snows during late winter prompted the use of large quantities of deicing salts and resulted in considerable damage to roadside conifers.

The damage noted was of two types: (1) foliage browning, especially of white pine which was growing very close to traveled road surfaces, the result of direct salt deposition on foliage and (2) foliage browning of fir, hemlock and white pine, growing at greater distances from traveled road surfaces, but sited where root systems could take up pooled salty water.

Affected trees recovered as the growing season progressed, with new growth masking the older, browned needles which generally fell prematurely as the growing season progressed.

Scleroderris Canker (caused by *Ascocalyx abietina*) - No new infestations of Scleroderris canker were located during 2001. This disease remains static at very low levels.

Sirococcus Blight of Red Pine (caused by *Sirococcus conigenus*) - Sirococcus blight of red pine seems to have increased in severity in Maine in recent years, especially in the Eustis-Flagstaff area, but also in plantations elsewhere in the state. Inquiries to us about this disease in managed forest areas generally fit into one of three categories: (1) infection of reproduction in thinned stands beneath infected overstory vegetation (2) infection of plantations established adjacent to infested natural stands or (3) infection within new plantations which were established in locations remote from known inoculum sources, due to the use of infested planting stock.

In many areas of Maine, serious infection of red pine reproduction beneath infected overstory trees is so probable that it is not cost effective to thin stands to allow for natural red pine regeneration. However white pine seems resistant and may perform well as an alternative regeneration species in such situations, unless soils are unusually droughty.

Infection of plantations established adjacent to infested natural stands is also highly likely, especially if tall overstory trees are left standing. Sirococcus often moves quickly into new plantations established under such circumstances, and by the time the disease is detected, it is often too late for sanitation pruning to be cost effective.

Infection of new plantations due to the use of infested planting stock is also a problem, since the disease is seed borne and seedlings are likely to be infected in nursery beds or greenhouses where container stock is produced. Use of disease free stock is of paramount importance when establishing red pine plantations.

Sirococcus conigenus disease is also occasionally a problem on various species of spruce in landscape situations.

For more information on diagnosis and control of this and other conifer plantation problems, you may wish to request our Circular No. 12, Integrated Crop Management Schedule for Softwood Timber Plantations and Conifer Seed Orchards.

Sphaeropsis Blight (caused by *Sphaeropsis sapinea* syn. *Diplodia pinea*) - This disease, primarily of two-and three-needle pines, seems to have increased in severity in recent years, especially on red pine in mid-coastal areas. Plantation pines seem especially hard hit with symptoms ranging from tip blight to the death of entire trees.

Other than in older red pine plantations in coastal areas, this disease is mostly a problem in landscape plantings around homes and estates, parks, along roadsides and on golf courses. It is generally not a problem in the natural forest environment.

Spring Frost Damage - We received very few reports of frost damage to balsam fir Christmas trees this past spring. However, Christmas tree growers culturing fir trees in forest pockets may be well advised to plant Canaan, rather than balsam fir, due to its tendency to flush new growth after danger of frost is past. Fraser fir, of course, also flushes relatively late in the spring, but frost pockets are often also characterized by wet soils, which are tolerated much more poorly by fraser than by Canaan fir.

Squirrel Damage to Pines (caused by *Sciurus hudsonicus)* - Flagging (dead branch tips) on red pine was reported from a plantation near Bingham during the summer of 2001. Closer inspection revealed mechanical damage to stems at the point of attachment of cones, where squirrels had torn cones from trees as they

gathered pine seeds for food. Portions of stems distal to the mechanical damage had dried and turned brown, the result of impaired water flow beyond damaged tissues.

We had noted a similar phenomenon in previous years on jack pine in a commercial seed orchard, where workers had gathered cones for seed by stripping cones from trees. Flagging symptoms developed several weeks later, and the wound symptoms were identical to the damage noted above as having been caused by squirrels.

Tar Spot of Maple (caused by *Rhytisma acerinum*) - This conspicuous but generally benign disease of red, silver, and sugar maple foliage was less common than usual in 2001.

Verticillium Wilt (caused by *Verticillium dahliae*) - This is primarily a disease of maples in ornamental situations but it affects other hardwood species in the landscape as well. Leaves yellow and wilt on branches of affected trees. The disease often progresses until wilt affects the entire crown. Greenish streaks or bands appear in sapwood beneath the bark. The green stain may appear as a partial or complete "ring" in the sapwood when a cut branch is viewed in cross section.

Affected trees may die or recover. Water and fertilizer may stimulate the growth of affected trees and improve prospects for recovery.

The causal fungus is soil borne, so replacing one tree which has succumbed to this disease with another susceptible species on the same site is a very risky proposition. Trees known to be resistant to Verticillium include all the gymnosperms, plus apple and crabapple, mountain ash, beech, birch, butternut, oak, poplar and willow.

Although this disease is not uncommon in Maine, we recorded no inquiries regarding it during 2001.

White Pine Blister Rust (caused by *Cronartium ribicola*) - We continue limited control efforts to manage this disease in certain high value pine stands each year. In 2001 a total of 462 acres of high quality pine timber was scouted for Ribes plants in Androscoggin, Oxford, and Cumberland counties. A total of 1,075 Ribes was destroyed.

Triclopyr (Garlon 4) remains our herbicide of choice, mixed at the rate of 6 oz./gallon of water. In 2001 a total of 42 ounces of Garlon 4 was mixed with water to provide a total finished volume of 7 gallons.

White pine blister rust continues to be a problem of trees in the landscape as well, often involving trees which were infected when purchased as nursery stock. Quarantine information can be found on page 59.

This disease remains static at moderate levels, but is common throughout the state.

White Pine Decline - The condition of pines affected by white pine decline seems to have stabilized in 2001.

Following the drought of 1995 and up until last year, white pines with symptoms of this disease declined and died on sites where rooting depth has been restricted. But studies of tree crown condition this summer noted no significant differences in crown transparency between previously symptomatic trees that have survived and previously non-symptomatic trees. There was also very little additional mortality in any of the nine symptomatic stands we have been monitoring.

Expanded rooting depth studies have supported previous findings that effective rooting depth was less than twelve inches in all declining stands and deeper than in all asymptomatic stands.

Our emphasis now is shifting from the study of the causes of white pine decline to studies of pine management techniques which may lessen the impact of this disease. We also plan to study the possible remediation of susceptible sites through subsoiling techniques, and plan surveys to identify just where sites are at risk for developing white pine decline. These studies are slated to begin during the summer of 2002.

Winter Injury - Winter injury effects on trees and shrubs were generally mild during the winter of 2000-2001. Forsythia over much of southern Maine flowered right to the tops of shrubs indicating little flower bud mortality. Tender ornamental evergreens such as yews, rhododendrons and dwarf Alberta spruce showed much less browning than usual.

Yellow Witches'-broom of Balsam Fir (caused by *Melampsorella caryophyllacearum*) - These perennial, bushy yellowish growths on branches of fir trees have been unusually abundant in Christmas tree plantations throughout the state in recent years. Many are now sufficiently large to leave significant "holes" in the crowns of trees when removed, as they generally are prior to sale of Christmas trees. If growths are not removed a hole is of course not created, but the remaining brushy growths are devoid of needles which were cast earlier in the season, and not at all attractive.

This disease is caused by a fungus which uses chickweed as an alternate host plant. Elimination of the alternate host plant through use of selective herbicides in and around plantations may reduce infection, but most fir Christmas tree growers are content to simply prune brooms from trees while those growths are still relatively small.

Forestry Related Quarantines in Maine - 2001

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.

I. The White Pine Blister Rust Regulations and Quarantine are listed under Title 12 MRSA 1988, Subchapter III, §803:8305 Shipment Prohibited.

The director may prohibit, prevent or regulate the entry into or movement within the State, from any part thereof to any other part, of any plants of the genus *Ribes* or other nursery or wildling plants, stock or parts of plants which may cause the introduction or spread of a dangerous forest insect or disease. The director may issue the necessary orders, permits and notices necessary to carry out this section which shall not be considered to require or constitute an adjudicatory proceeding under the Maine Administrative Procedure Act, Title 5, Chapter 375.

Regulation: White Pine Blister Rust, Quarantine on Currants and Gooseberry Bushes.

A. The sale, transportation, further planting or possession of plants of the genus *Ribes* (commonly) known as currant and gooseberry plants, including cultivated wild, or ornamental sorts) is prohibited in the following counties in the State of Maine, to wit: York, Cumberland, Androscoggin, Kennebec, Sagadahoc, Lincoln, Knox, Waldo, Hancock, and parts of Oxford, Franklin, Somerset, Piscataquis, Penobscot, Aroostook, and Washington.

B. The 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. This quarantine is administered by the Forest Health & Monitoring Division of the Maine Forest Service, phone 287-2431 or 287-2791.

II. The Gypsy Moth Quarantine is listed under 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.

A. This quarantine designates the infested area in Maine as quarantined for the movement of regulated articles, which includes wood such as logs, pulpwood, trees, shrubs, firewood, Christmas trees, and chips, and requires the inspection and certification of such material if movement is to non-infested states and foreign countries. This is administered by the USDA-APHIS, PPQ in Bangor, Maine, phone 945-0479.

B. Inasmuch as Maine is not completely infested and quarantined, wood or regulated articles moving from the infested area of the state to the non-infested area must be accompanied by a certificate or go to a mill 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 287-2431 or 287-2791.

III. The European Larch Canker Quarantine is listed under 7 CFR Part 301.91 of the United States Department of Agriculture, Animal & Plant Health Inspection Service, as published in the Federal Register, and also under Title 12 MRSA, §8305 of the Laws of the State of Maine.

A. This quarantines all parts of larch (*Larix* spp.) including logs, pulpwood, branches, twigs, etc., as regulated articles.

B. Also any other product, article, or means of conveyance whatsoever, when it has been determined by an inspector that it presents a risk of spread of the disease.

C. Designates parts of Hancock, Knox, Lincoln, Waldo, and Washington counties as the quarantined area from which movement is restricted. This is managed by the USDA-APHIS, PPQ in Bangor, Maine, phone 945-0479, and the Forest Health & Monitoring Division of the Maine Forest Service, phone 287-2431 or 287-2791.

IV. The Hemlock Woolly Adelgid Quarantine is listed under 7 MRSA, Chapter 409, §2301-2303 of the Laws of the State of Maine.

This quarantine was established to prevent the introduction of the hemlock woolly adelgid (*Adelges tsugae* Annand) into Maine. This serious pest causes mortality of Eastern hemlock (*Tsuga canadensis*) and other ornamental hemlocks in infested states. Since hemlock is a major component of Maine's forest on over one million acres, protection of this valuable resource from damage by the hemlock woolly adelgid is essential. The following is only a partial summary of the rules. Refer to the above cited statutory authority for complete quarantine regulations.

A. The quarantine regulates the shipment into Maine of hemlock woolly adelgid carriers which consists of any hemlock articles with attached bark, including hemlock seedlings and nursery stock, logs, lumber with bark, chips with bark, and uncomposted shipments of bark.

B. The area under quarantine in the northeastern United States consists of the counties included in the USDA Forest Service's publication entitled "List of Counties and States with Known Hemlock Woolly Adelgid Infestations"dated December 2000", In the western U.S., the states of Alaska, California, Oregon, and Washington are included in the quarantine.

C. Hemlock seedlings and nursery stock originating in or previously held in any area under quarantine are prohibited entry into Maine.

D. Hemlock seedlings and nursery stock shipped into Maine from non-quarantined areas must be accompanied by a State Phyto Sanitary Certificate with declarations of origin.

E. Hemlock logs, lumber with bark, chips with attached bark, or uncomposted bark, shipped into Maine from either **quarantined or non-quarantined** areas of other states or Canada can only be received under a written agreement between the shipper and the Maine Forest Service at pre-approved sites.

F. 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.

G. 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 04330-6514; Tel. (207) 287-2431.

V. The Pine Shoot Beetle Statutory Authority is listed under 7 MRSA, Chapter 409, Section 2301, Jan., 2001, Chapter 267, Pine Shoot Beetle Quarantine. A federal quarantine is still being finalized. The Maine PSB quarantine regulations may have to be amended later in 2002 to parallel the final version of federal quarantine regulations.

A. Designates the following local areas as infested and PSB regulated: Coos county in NH, Caledonia, Essex and Orleans counties in VT; 19 administrative regions south of the St. Lawrence river in Quebec; northern portions of Oxford county north of the Appalachian Trail. Maine's PSB quarantine is currently being amended to add the portion of Franklin county north of the Appalachian Trail to the regulated area.

B. Requires concerns buying, selling, or transporting pine products with bark to have written compliance agreements with the Maine Forest Service if they receive regulated pine products from the quarantine area.

C. Regulations restricting movement of regulated pine products with bark are complex and vary depending on the kind of product (logs or bark) and season of the year. Concerns and individuals engaged in moving

or receiving pine with bark or pine bark products should refer to the detailed regulations on our website or contact us at 287-2431 or 287-2791.

For additional information check our website: **<http://www.state.me.us/doc/mfs/idmhome.htm>**
And the following two free fold-out leaflets:

Maine Forest Service. 1989. European Larch Canker - The European Larch Canker in Maine. Maine Forest Service and USDA-APHIS. Color fold-out leaflet. 6 pp.

Ouellette, D.E. (Compiler). 1997 (April). Regulations and Guidelines for Shipping Christmas Trees, Wreaths and Decorative Plant Materials - Twigs, Nuts & Fruits Used in Wreath Making. A public information guide from the Plant Industry Div., Me. Dept. of Agr. and the MFS, FH&M Division. A pocket fold-out.

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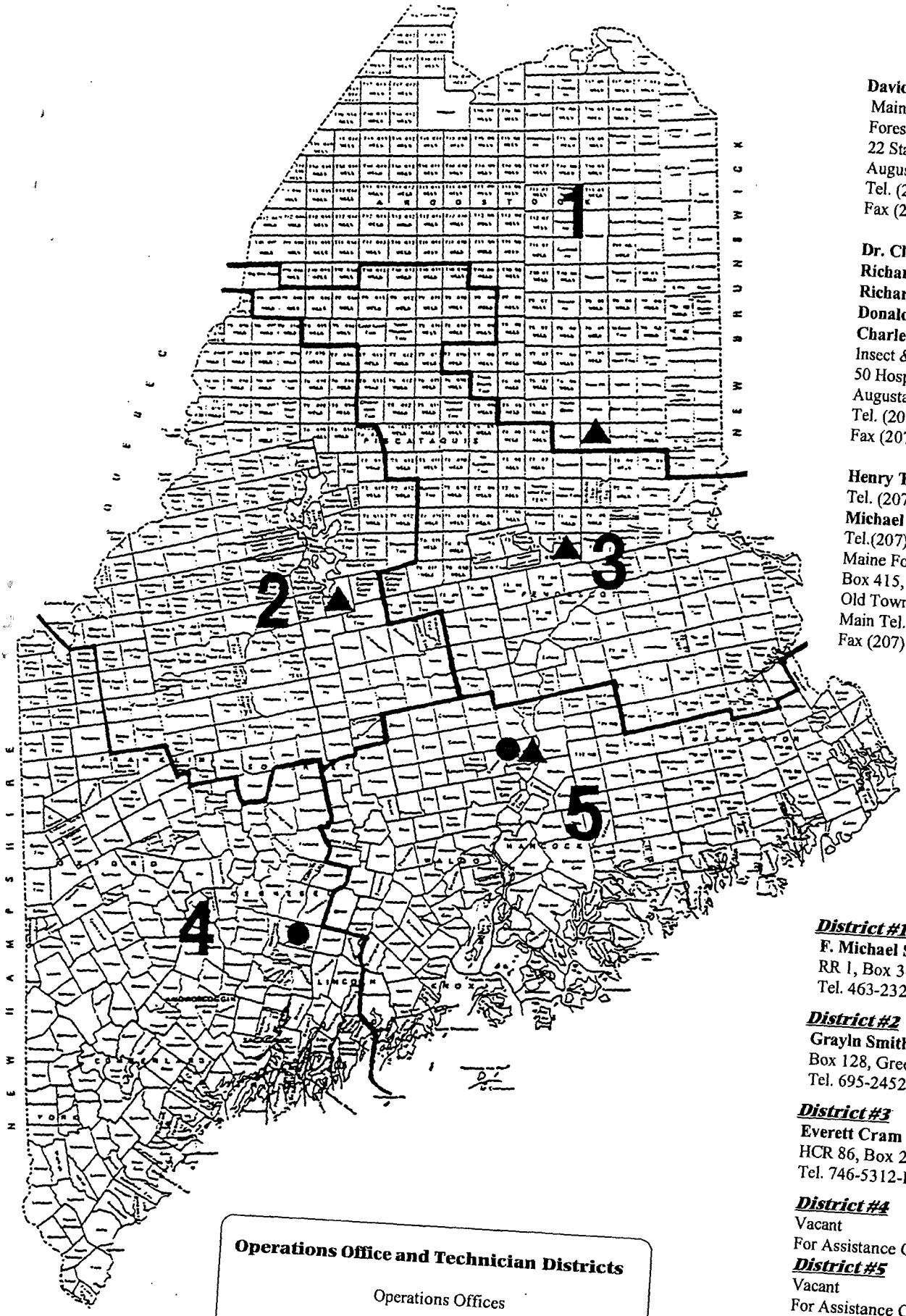

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